UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
PROGRAM PLANNING AND INTEGRATION
Silver Spring, Maryland 20910

DEC 18 2013

Dear Reviewer:

In accordance with provisions of the National Environmental Policy Act (NEPA), the National Oceanic and Atmospheric Administration (NOAA) intends to adopt the U.S. Navy's *Final Environmental Impact Statement/ Overseas Environmental Impa*[illegible]*ii-Southern California Training and Testing (FEIS/OEIS)* to comply with NEP [illegible] sion-making purposes. NOAA's proposed action is to issue a 5-year rulem[illegible]ed Letters of Authorization (LOAs) to the Navy to take marine mammals incidental [illegible] activities, respectively, in areas of the Pacific Ocean and is related to the Navy's [illegible]nduct military readiness activities in areas of the Pacific Ocean. NOAA has determi[illegible]S adequately analyzes and discloses the environmental impacts associated with thi[illegible]ve enclose this FEIS/OEIS for your review.

FY2014

This FEIS/OEIS is prepared pursuant to NEPA to assess the environmental impacts associated with NOAA proceeding with issuing the rulemaking and LOAs. NMFS' proposed action (issuance of regulations and LOAs) would authorize take of marine mammals incidental to a subset of the activities analyzed in the FEIS/OEIS that are anticipated to result in the take of marine mammals, i.e., those activities that involve the use of active sonar and explosive detonations. Thus, these components of the Navy's proposed action are interrelated as they are the subject of NMFS' MMPA regulatory action.

NOAA is not required to respond to comments received as a result of issuance of the FEIS/OEIS. The Navy made the FEIS/OEIS available on August 30, 2013 (78 FR 53754) and published a correction on September 27, 2013 (78 FR 59659) and received no public comments during the FEIS/OEIS wait period. However, comments will be reviewed and considered in preparing future NEPA documents. Please submit any written comments to responsible official named below.

Responsible Official: Samuel D. Rauch III
Deputy Assistant Administrator
for Regulatory Programs,
performing the functions and duties of the
Assistant Administrator for Fisheries
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
1315 East-West Highway
Silver Spring, Maryland 20910
Staff POC: Jolie Harrison, jolie.harrison@noaa.gov
Ph: 301-427-8401

Sincerely,

Patricia A. Montanio
NOAA NEPA Coordinator

Enclosure

Hawaii-Southern California
Training and Testing Activities
Final Environmental Impact Statement/
Overseas Environmental Impact Statement

Volume 1

August 2013

HSTT EIS/OEIS Project Manager
Naval Facilities Engineering Command, Pacific/EV21.CS
258 Makalapa Dr., Ste 100
Pearl Harbor, HI 96860-3134

FINAL ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT
for
HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING ACTIVITIES

Lead Agency:	United States Department of the Navy
Cooperating Agency:	National Marine Fisheries Service
Title of the Proposed Action:	Hawaii-Southern California Training and Testing Activities
Designation:	Final Environmental Impact Statement/Overseas Environmental Impact Statement

Abstract

The United States Department of the Navy (Navy) prepared this Environmental Impact Statement (EIS)/Overseas EIS (OEIS) in compliance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code §4321 et seq.); the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations [C.F.R.] §§1500 et seq.); Navy Procedures for Implementing NEPA (32 C.F.R. §775); and Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*. The Navy identified its need to support and conduct current, emerging, and future training and testing activities in the Hawaii-Southern California Study Area, which is made up of air and sea space off Southern California, around the Hawaiian Islands, and the air and sea space connecting them. Three alternatives were analyzed in this EIS/OEIS:

- The No Action Alternative represents those training and testing activities as set forth in previously completed environmental planning documentation.

- Alternative 1 includes the training and testing activities addressed in the No Action Alternative, plus an adjustment to the Hawaii study area boundaries and proposed adjustments to types, location, and levels of training and testing activities.

- Alternative 2 includes all elements of Alternative 1 plus establishes new range capabilities, modifies existing capabilities, and adjusts the type and tempo of training and testing.

In this EIS/OEIS, the Navy analyzed potential environmental impacts that result or could result from activities under the No Action Alternative, Alternative 1, and Alternative 2. The resources evaluated include sediments and water quality, air quality, marine habitats, marine mammals, sea turtles, seabirds, marine vegetation, marine invertebrates, fish, cultural resources, socioeconomic resources, and public health and safety.

Prepared by: United States Department of the Navy

Point of Contact: HSTT EIS/OEIS Project Manager
Naval Facilities Engineering Command, Pacific/EV21.CS
258 Makalapa Dr., Ste.100
Pearl Harbor, HI 96860-3134
(808) 472-1420

Foreword

FOREWORD

The Navy provided the Hawaii-Southern California Training and Testing (HSTT) Draft Environmental Impact Statement (EIS)/Overseas EIS (OEIS) for public review and comment from May 11 to July 10, 2012. Changes in this Final EIS/OEIS reflect all substantive comments made on the Draft EIS/OEIS during the public comment period and Navy refinements to the Proposed Action. Additionally, the analysis has been adjusted to more accurately quantify the expected acoustic effects to marine organisms, taking into consideration animal avoidance or movement and Navy mitigations. Public comments are summarized and responded to in Appendix E (Public Participation).

While most sections in the EIS/OEIS were changed in some manner between the draft and final versions, many of those changes entail minor modifications to improve wording or provide clarification. The key changes between the HSTT Draft EIS/OEIS and Final EIS/OEIS follow.

- Chapter 2 (Description of Proposed Action and Alternatives):

  Text was changed to clarify that San Diego Bay is included within the HSTT Study Area. Annual levels of certain activities and resulting quantities of associated military expended materials were adjusted to reflect more accurate estimates of future training and testing needs and to correct errors. The general types and locations of training and testing did not change.

- Section 3.0 (Introduction to Affected Environment and Environmental Consequences):

  Tables were updated to reflect different annual levels of certain activities and resulting quantities of associated military expended materials based on changes to Chapter 2 (Description of Proposed Action and Alternatives). Changes in the number of activities proposed also prompted updates to the tables describing the level of use of acoustic sources.

- Section 3.1 (Sediments and Water Quality):

  Changes in quantities of military expended materials were adjusted based on changes made to Chapter 2 (Description of Proposed Action and Alternatives) and military expended material numbers in Section 3.0 (Introduction). The analyses of impacts to water quality and sediments as a result of these changes were modified accordingly.

- Section 3.2 (Air Quality):

  The analyses of impacts to air quality as a result of changes to annual levels of certain activities, as detailed in Chapter 2 (Description of Proposed Action and Alternatives) were modified accordingly.

- Section 3.3 (Marine Habitats):

  The Navy clarified the locations where seafloor explosions would take place. Changes in quantities of military expended materials were adjusted based on changes made to Chapter 2 (Description of Proposed Action and Alternatives) and tables in Section 3.0.5.3 (Identification of Stressors for Analysis). The analyses of impacts to marine habitats as a result of these changes were modified accordingly.

- Section 3.4 (Marine Mammals):

  The analyses of impacts to marine mammals as a result of changes to annual levels of certain activities, as detailed in Chapter 2 (Description of Proposed Action and Alternatives) and tables in Section 3.0.5.3 (Identification of Stressors for Analysis) were modified accordingly. The acoustic analysis was revised to more accurately quantify the expected acoustic effects to marine mammals, taking into consideration animal avoidance or movement and standard Navy mitigations. These changes can be found in the Final EIS/OEIS in Section 3.4.3.1.8 (Quantitative Analysis), Section 3.4.3.1.10 (Implementing Mitigation to Reduce Sound Exposures), Section 3.4.3.2.1.3 (Avoidance Behavior and Mitigation Measures as Applied to Sonar and Other Active Acoustic Sources), and Section 3.4.3.2.2.2 (Avoidance Behavior and Mitigation Measures as Applied to Explosions).

- Section 3.5 (Sea Turtles):

  The analyses of impacts to sea turtles as a result of changes to annual levels of certain activities, as detailed in Chapter 2 (Description of Proposed Action and Alternatives) and tables in Section 3.0.5.3 (Identification of Stressors for Analysis) were modified accordingly. Also, as a result of new research, information on the San Diego Bay population of green sea turtles and their foraging range was updated in the text.

- Section 3.6 (Seabirds):

  The analyses of impacts to seabirds as a result of changes to annual levels of certain activities, as detailed in Chapter 2 (Description of Proposed Action and Alternatives) and tables in Section 3.0.5.3 (Identification of Stressors for Analysis) were modified accordingly. Additional discussion has been presented related to the risk of plastic ingestion and impaction in seabird chicks when compared to adults.

- Section 3.7 (Marine Vegetation):

  Information has been added regarding red tide and toxin releases associated with cyanobacteria and possible resultant impacts to marine vegetation.

- Section 3.8 (Marine Invertebrates):

  Language was added to clarify procedures taken during amphibious landings training in Hawaii to avoid coral reefs.

- Section 3.10 (Cultural Resources):

  Language was added to more fully explain and update the consultation process that has occurred between the Navy and the State Historic Preservation Officers. Language has been added to clarify those items considered cultural resources under the National Historic Preservation Act. Also, the Navy added a description of Programmatic Agreements regarding Navy undertakings in Hawaii and on San Clemente Island.

- Chapter 4 (Cumulative Impacts):

  Updates were made to the status of ongoing projects. In addition, updates were made to reflect changes made to other chapters in the EIS/OEIS.

- Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring):

  In response to public comment, modifications were made to the discussion of how activities recommence after a marine mammal or sea turtle sighting and to the Effectiveness and Operational Assessment discussions. Also as a result of public comment, modifications were made to improve consistency across mitigation measures wherever possible. Section 5.2.2.2 (Protective Measures Assessment Protocol) was revised to better explain how the Navy's Protective Measures Assessment Protocol is implemented. Changes were also made to Section 5.2.3 (Assessment Method) to clarify the Navy's effectiveness and operational assessment for procedural measures and proposed mitigation areas. Section 5.3.4 (Mitigation Measures Considered but Eliminated) was restructured, supplemented with additional discussion, and migrated into Section 5.3 (Mitigation Assessment). Additional information was added to Section 5.3.1.1 (Specialized Training) about the U.S. Navy Afloat Environmental Compliance Training Series, the Effectiveness Assessment for Lookout Procedural Measures was modified to provide a Study Area-specific detection probability table (Table 5.3-1), discussion of seafloor habitats was modified (Section 5.3.3.2, Seafloor Resources), and Table 5.4-1 (Summary of Recommended Mitigation Measures) was updated to reflect the changes made within the chapter. Finally, a figure was added (Figure 5.3-1) to show the Navy's humpback whale cautionary area as it relates to the Hawaiian Islands Humpback Whale National Marine Sanctuary.

- Chapter 6 (Additional Regulatory Considerations):

  A description of the National Historic Preservation Act was added to Table 6.1-1. Language providing historical context and importance of the Hawaiian Islands Humpback Whale National Marine Sanctuary has been added.

- Appendix A (Navy Activities Descriptions):

  Changes were made to reflect modifications made to Chapter 2 (Description of Proposed Action and Alternatives) and to correct errors.

- Appendix B (Federal Register Notices):

  The Navy added the following Federal Register notices:
    - Notice of Availability of the Draft EIS/OEIS
    - Notice of Public Meetings for the Draft EIS/OEIS
    - Revision to Notice of Availability, extending the comment period from 06/25/12 to 07/10/12

- Appendix C (Agency Correspondence):

  Agency correspondence received since the public release of the Draft EIS/OEIS was added.

- Appendix E (Public Participation):

  Information regarding the public meetings held in conjunction with the release of the Draft EIS/OEIS was added as well as public comments received on the Draft EIS/OEIS, pertinent comments received on the National Marine Fisheries Service Proposed Rule, and the Navy's responses to comments.

- Appendix F (Training and Testing Activities Matrices):

  Changes were made to reflect corrections made to Chapter 2 (Description of Proposed Action and Alternatives) and to correct errors.

EXECUTIVE SUMMARY

ES.1 INTRODUCTION

The United States (U.S.) Department of the Navy (Navy) prepared this Environmental Impact Statement (EIS)/Overseas EIS (OEIS) to assess the potential environmental impacts associated with two categories of military readiness activities: training and testing. Collectively, the at-sea areas in this EIS/OEIS are referred to as the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area) (Figure ES-1). The Navy also prepared this EIS/OEIS to comply with the National Environmental Policy Act (NEPA) and Executive Order (EO) 12114.

Major conflicts, terrorism, lawlessness, and natural disasters all have the potential to threaten national security of the United States. United States National security, prosperity, and vital interests are increasingly tied to other nations because of the close relationships between the United States and other national economies. The Navy carries out training and testing activities to be able to protect the United States against its enemies, as well as to protect and defend the rights of the United States and its allies to move freely on the oceans. Training and testing activities that prepare the Navy to fulfill its mission to protect and defend the United States and its allies potentially impact the environment. These activities may trigger legal requirements identified in many U.S. federal environmental laws, regulations, and executive orders.

After thoroughly reviewing its environmental compliance requirements for training and exercises at sea, the Navy instituted a policy in the year 2000 designed to comprehensively address these requirements. That policy—the Navy's At-Sea Policy—resulted, in part, in a series of comprehensive analyses of training and testing activities on U.S. at-sea range complexes and operating areas (OPAREAs). These analyses serve as the basis for the National Marine Fisheries Service (NMFS) to issue Marine Mammal Protection Act (MMPA) incidental take authorizations and incidental takes of threatened and endangered marine species under the Endangered Species Act (ESA) because of the potential effects of some training and testing activities on marine species protected by federal law. The first of these analyses and incidental take authorizations resulted in a series of NEPA documents, completed beginning in 2008 through 2012, for which incidental take authorizations will begin to expire in early 2014. This EIS/OEIS updates these analyses and supports issuance of new incidental take authorizations. This EIS/OEIS also furthers compliance with the Navy's policy for comprehensive analysis by expanding the geographic scope to include additional areas where training and testing activities have historically occurred.

The HSTT Draft EIS/OEIS was released for public review and comment 11 May 2012 through 10 July 2012. Changes in this Final EIS/OEIS reflect all substantive comments made on the Draft EIS/OEIS during the public comment period and Navy refinements to the Proposed Action. The key changes between the HSTT Draft EIS/OEIS and Final EIS/OEIS can be found in the Foreword.

The three EIS/OEIS documents being consolidated and analyzed are for the following range complexes: Hawaii Range Complex (HRC), Southern California (SOCAL) Range Complex, and Silver Strand Training Complex (SSTC). Furthermore, this EIS/OEIS also provides compliance with the Navy's policy for comprehensive analysis by expanding the geographic scope to include additional areas where training and testing activities have historically occurred and have previously not been the subject of NEPA analysis.

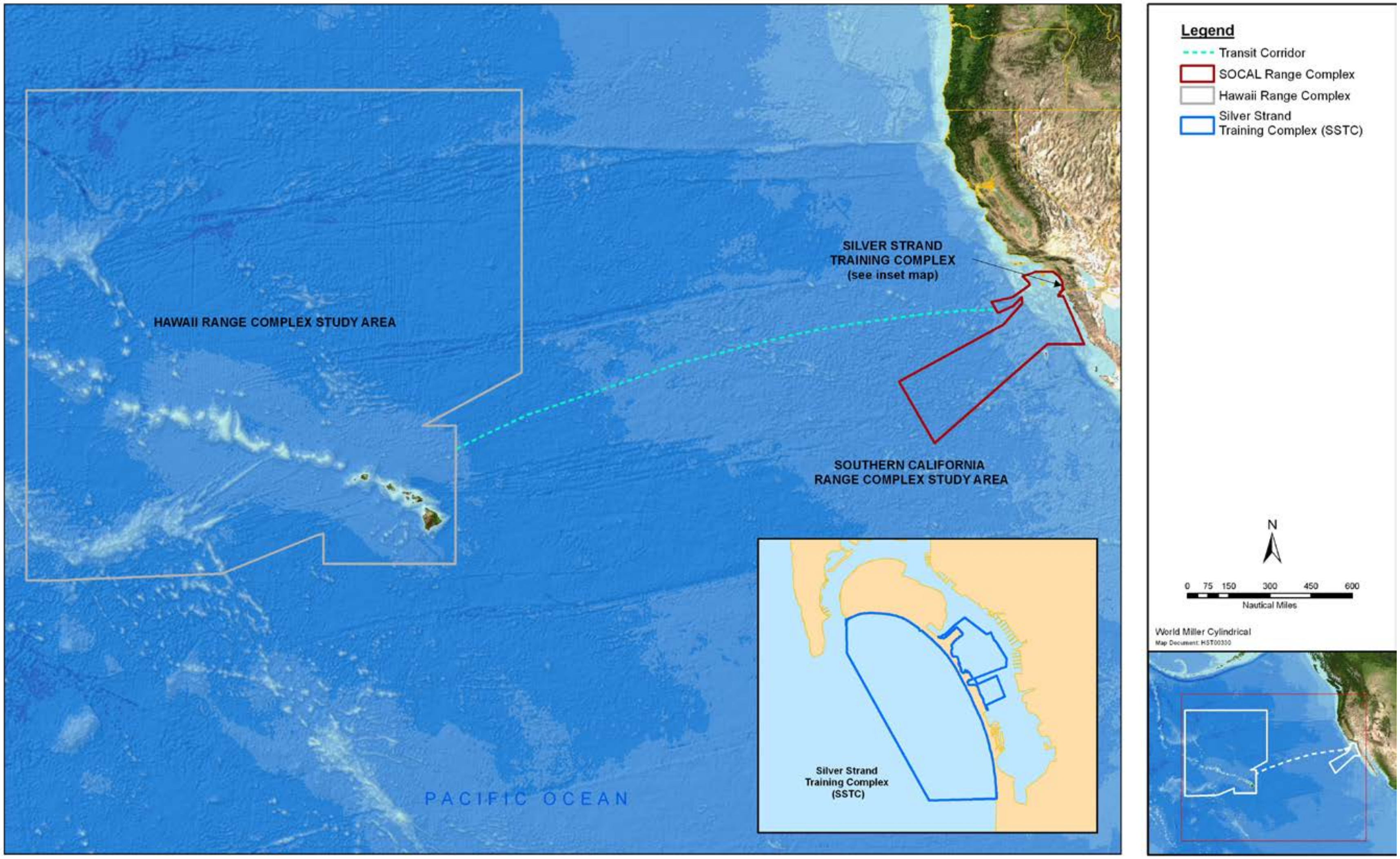


Figure ES-1: Hawaii-Southern California Training and Testing Study Area

ES.2 Purpose of and Need for Proposed Military Readiness Training and Testing Activities

The purpose of the Proposed Action is to conduct training and testing activities to ensure that the Navy meets its mission under Title 10 United States Code (U.S.C.) Section 5062, which is to maintain, train, and equip combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas. This mission is achieved in part by conducting training and testing within the Study Area.

ES.3 Scope and Content of the Environmental Impact Statement/Overseas Environmental Impact Statement

In this EIS/OEIS, the Navy assessed military readiness training and testing activities that could potentially impact human and natural resources, especially marine mammals, sea turtles, and other marine resources. The range of alternatives includes a No Action Alternative and other reasonable courses of action. Direct, indirect, cumulative, short-term, long-term, irreversible, and irretrievable impacts were also analyzed. The Navy is the lead agency for the Proposed Action and is responsible for the scope and content of this EIS/OEIS. The NMFS is a cooperating agency pursuant to 40 Code of Federal Regulations (C.F.R.) § 1501.6 because of its expertise and regulatory authority over marine resources. Additionally, this document will serve as NMFS' NEPA documentation for the rule-making process under the MMPA.

In accordance with the Council on Environmental Quality Regulations, 40 C.F.R. § 1505.2, the Navy will issue a Record of Decision. The decision will be based on factors analyzed in this EIS/OEIS, including military training and testing objectives, best available science and modeling data, potential environmental impacts, and public interest.

ES.3.1 National Environmental Policy Act

Federal agencies are required under NEPA to examine the environmental impacts of their proposed actions within the United States and its territories. An EIS is a detailed public document that provides an assessment of the potential effects that a major federal action might have on the human environment, which includes the natural environment. The Navy undertakes environmental planning for major Navy actions occurring throughout the world in accordance with applicable laws, regulations, and executive orders. Presidential Proclamation 5928, issued December 27, 1988, extended the exercise of U.S. sovereignty and jurisdiction under international law to 12 nautical miles (nm); however, the proclamation expressly provides that it does not extend or otherwise alter existing federal law or any associated jurisdiction, rights, legal interests, or obligations. Thus, as a matter of policy, the Navy analyzes environmental effects and actions within 12 nm under NEPA (an EIS).

ES.3.2 Executive Order 12114

This OEIS has been prepared in accordance with EO 12114 (44 Federal Register 1957) and Navy implementing regulations in 32 C.F.R. Part 187, *Environmental Effects Abroad of Major Department of Defense Actions*. An OEIS is required when a proposed action and alternatives have the potential to significantly harm the environment of the global commons. The global commons are defined as geographical areas outside the jurisdiction of any nation and include the oceans outside of the territorial limits (more than 12 nm from the coast) and Antarctica but do not include contiguous zones and fisheries zones of foreign nations (32 C.F.R. § 187.3). The EIS and OEIS have been combined into one document, as permitted under NEPA and EO 12114, to reduce duplication.

ES.3.3 Marine Mammal Protection Act

The MMPA of 1972 (16 U.S.C. § 1361 et seq.) established, with limited exceptions, a moratorium on the "taking" of marine mammals in waters or on lands under U.S. jurisdiction. The act further regulates "takes" of marine mammals in the global commons (that is, the high seas) by vessels or persons under U.S. jurisdiction. The term "take," as defined in Section 3 (16 U.S.C. § 1362(13)) of the MMPA, means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." "Harassment" was further defined in the 1994 amendments to the MMPA, which provided two levels of harassment: Level A (potential injury) and Level B (potential behavioral disturbance).

The MMPA directs the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if NMFS finds that the taking will have a negligible impact on the species or stock(s), and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). The authorization must set forth the permissible methods of taking, other means of attaining the least practicable adverse impact on the species or stock and its habitat, and requirements pertaining to the mitigation, monitoring, and reporting of such taking.

The National Defense Authorization Act of Fiscal Year 2004 (Public Law 108-136) amended the definition of harassment and removed the "small numbers" provision as applied to military readiness activities or scientific research activities conducted by or on behalf of the federal government consistent with Section 104(c)(3) (16 U.S.C. § 1374 [c][3]). The Fiscal Year 2004 National Defense Authorization Act adopted the definition of "military readiness activity" as set forth in the Fiscal Year 2003 National Defense Authorization Act (Public Law 107-314). A "military readiness activity" is defined as "all training and operations of the Armed Forces that relate to combat" and "the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use." Since the Proposed Action involves conducting military readiness activities, the relevant definition of harassment is any act that

- injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild ("Level A harassment") or
- disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behavioral patterns are abandoned or significantly altered ("Level B harassment") [16 U.S.C. § 1362(18)(B)(i) and (ii)].

ES.3.4 Endangered Species Act

The ESA of 1973 (16 U.S.C. § 1531 et seq.) established protection over and conservation of threatened and endangered species and the ecosystems upon which they depend. An "endangered" species is a species in danger of extinction throughout all or a significant portion of its range. A "threatened" species is one that is likely to become endangered within the near future throughout all or in a significant portion of its range. The U.S. Fish and Wildlife Service (USFWS) and NMFS jointly administer the ESA and are also responsible for the listing of species (designating a species as either threatened or endangered). The ESA allows the designation of geographic areas as critical habitat for threatened or endangered species. Section 7(a)(2) requires each federal agency to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When a federal agency's action “may affect” a listed species, that agency is required to consult with the Service (NMFS or U.S. Fish and Wildlife Service) that has jurisdiction over the species in question (50 C.F.R. § 402.14(a)). Under the terms of Section 7(b)(4) and Section 7(o)(2) of the ESA, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the act provided that such taking complies with the terms and conditions of an Incidental Take Statement. The ESA applies to marine mammals, sea turtles, sea birds, marine invertebrates, fish, and plants evaluated in this EIS/OEIS.

ES.3.5 Other Environmental Requirements Considered

The Navy must comply with all applicable federal environmental laws, regulations, and EOs, including, but not limited to, those listed below. Further information on Navy compliance with these and other environmental laws, regulations, and EOs can be found in Chapter 3 (Affected Environment and Environmental Consequences) and Chapter 6 (Additional Regulatory Considerations).

- Abandoned Shipwreck Act
- Antiquities Act
- Clean Air Act
- Clean Water Act
- Coastal Zone Management Act
- Magnuson-Stevens Fishery Conservation and Management Act
- Migratory Bird Treaty Act
- National Historic Preservation Act
- National Marine Sanctuaries Act
- Rivers and Harbors Act
- EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*
- EO 12962, *Recreational Fisheries*
- EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*
- EO 13089, *Coral Reef Protection*
- EO 13158, *Marine Protected Areas*
- EO 13175, *Consultation and Coordination with Indian Tribal Governments*
- EO 13178, *Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve*
- EO 13547, *Stewardship of the Ocean, Our Coasts, and the Great Lakes*

ES.4 Public Involvement

The NEPA of 1969 requires federal agencies to examine the environmental effects of their proposed actions within U.S. territories. An EIS is a detailed public document that provides an assessment of the potential effects that a major federal action might have on the human environment. The Navy undertakes environmental planning for major Navy actions occurring throughout the world in accordance with applicable laws, regulations, and executive orders.

The first step in the NEPA process for an EIS is to prepare a Notice of Intent to develop an EIS. The Navy published a Notice of Intent for this EIS/OEIS in the *Federal Register* and several newspapers on 15 July, 2010. In addition, Notice of Intent/Notice of Scoping Meeting Letters were distributed on 14 July 2010, to 230 federal, state, and local elected officials and government agencies. The Notice of Intent provided an overview of the Proposed Action and the scope of the EIS, and initiated the scoping process.

ES.4.1 Scoping Process

Scoping is an early and open process for developing the "scope" of issues to be addressed in an EIS and for identifying significant issues related to a proposed action. During scoping, the public helps define and prioritize issues through public meetings and written comments.

Six scoping meetings were held on August 4, 5, 24, 25, 26 and 27 in the cities of San Diego, CA; Lakewood, CA; Lihue, HI; Honolulu, HI; Hilo, HI; and Kahului, HI, respectively. At each scoping meeting, staffers at the welcome station greeted guests and encouraged them to sign in to be added to the project mailing list to receive future notifications. In total, 131 people signed in at the welcome table. The meetings were held in an open house format, presenting informational posters and written information, with Navy staff and project experts available to answer participants' questions. Additionally, a digital voice recorder was available to record participants' oral comments. The interaction during the information sessions was productive and helpful to the Navy.

ES.4.2 Scoping Comments

Scoping participants submitted comments in five ways:

- Oral statements at the public meetings (as recorded by the tape recorder)
- Written comments at the public meetings
- Written letters (received any time during the public comment period)
- Electronic mail (received any time during the public comment period)
- Comments submitted directly on the project website (received any time during the public comment period)

In total, the Navy received comments from 72 individuals and groups. Because many of the comments addressed more than one issue, 228 total comments resulted. Table ES-1 provides a breakdown of areas of concern based on comments received during scoping.

ES.4.3 Draft Environmental Impact Statement/Overseas Environmental Impact Statement

The Draft EIS/OEIS was prepared to assess potential impacts of the proposed action and alternatives on the environment. A Notice of Availability was published in the *Federal Register* and notices were placed in local and regional newspapers announcing the availability of the Draft EIS/OEIS. The Draft EIS/OEIS was circulated for review and comment, and public meetings were held.

ES.4.4 Final Environmental Impact Statement/Overseas Environmental Impact Statement/Record of Decision

This Final EIS/OEIS addresses all public comments received on the Draft EIS. Responses to public comments include correction of data, clarifications of and modifications to analytical approaches, and inclusion of new or additional data or analyses. New data and analyses in this Final EIS/OEIS include adjustments to levels of certain training and testing activities, and consideration of animal avoidance or movement to more accurately quantify the expected acoustic effects to these marine organisms. Additional detail on these changes can be found in the Foreword of this Final EIS/OEIS.

The decision-maker will issue a Record of Decision no earlier than 30 days after the Final EIS/OEIS is made available to the public.

Table ES-1: Public Scoping Comment Summary

Area of Concern	Count	Percent of Total
Sonar/Underwater Detonations	44	19.3%
Marine Mammals	43	18.9%
Other	30	13.2%
Fish/Marine Habitat	29	12.7%
Meeting/NEPA Process	11	4.8%
Alternatives	10	4.4%
Regional Economy	9	3.9%
Noise	9	3.9%
Threatened and Endangered Species	8	3.5%
Proposed Action	7	3.1%
Water Quality	6	2.6%
Air Quality	5	2.2%
Depleted Uranium	5	2.2%
Public Health and Safety	4	1.8%
Cumulative Impacts	4	1.8%
Terrestrial/Birds	3	1.3%
Recreation	1	0.4%
TOTAL	**228**	

ES.5 PROPOSED ACTION AND ALTERNATIVES

The Navy proposes to conduct military readiness training and testing activities throughout the in-water areas around the Hawaiian Islands and off the coast of Southern California, primarily in established operating and military warning areas of the Study Area. In order to both achieve and maintain Fleet readiness, the Navy proposes to:

- Reassess the environmental analyses of Navy at-sea training and testing activities contained in three separate EIS/OEIS documents and various Environmental Assessment (EA)/Overseas EAs (OEAs), and consolidate these analyses into a single environmental planning document. The three EIS/OEIS documents are for the HRC (U.S. Department of the Navy 2008a), SOCAL Range Complex (U.S. Department of the Navy 2008b), and SSTC (U.S. Department of the Navy 2011). The reassessment of the environmental analyses of these documents will support reauthorization of incidental takes of marine mammals under the MMPA and Section 7 consultation under the ESA.
- Adjust baseline training and testing activities from current levels needed to support Navy training and testing requirements beginning in 2014. As part of the adjustment to current baseline activities, the Navy is accounting for other activities and sound sources not addressed in the previous analyses that have previously not been the subject of NEPA analysis.
- Analyze the environmental impacts of training and testing activities conducted during transits between SOCAL and HRC, in additional areas where training and testing have historically occurred, and at Navy ports, Navy shipyards, contractor shipyards and the transit channels serving these areas that have previously not been the subject of NEPA analysis.

- Update the at-sea impact analysis in the previous documents to account for force structure changes, including those resulting from the development and testing and use of new platforms, weapons, and systems expected to reach initial operating capability after 2014 and before 2019.
- Implement enhanced range capabilities.
- Update environmental analyses with the best available science and acoustic analysis methods currently available to evaluate the potential effects of military training and testing activities on the marine environment.

ES.5.1 No Action Alternative

The No Action Alternative is required by regulations of the Council on Environmental Quality as a baseline against which the impacts of the Proposed Action are compared. The No Action Alternative continues baseline training and testing activities and force structure requirements as defined by existing Navy environmental planning documents.

The No Action Alternative represents the current level of activities and events and those analyzed in previously completed documents. However, it would fail to meet the current purpose and need for the Navy's Proposed Action because it would not allow the Navy to conduct the training and testing activities necessary to achieve and maintain Fleet readiness. For example, the baseline activities do not account for changes in force structure requirements, the introduction of new weapons and platforms, and the training and testing required for proficiency with these systems.

ES.5.2 Alternative 1

This alternative consists of the No Action Alternative, plus the expansion of Study Area boundaries and adjustments to location and tempo of training and testing activities.

- **Adjustment of the Study Area:** This alternative contains analysis of areas where Navy training and testing would continue as in the past, but were not considered in previous environmental analyses. This Alternative would not expand the area where the Navy trains and tests, but would simply expand the area that is to be analyzed.
- **Adjustments to Locations and Tempo of Training and Testing Activities:** This alternative also includes changes to training and testing requirements necessary to accommodate (a) the relocation of ships, aircraft, and personnel, (b) planned aircraft, vessels, and weapons systems, and (c) ongoing activities not addressed in previous documentation.
    - **Force Structure Changes:** Force structure changes involve the relocation of ships, aircraft, and personnel. As forces are moved within the existing Navy structure, training needs will necessarily change as the location of forces change.
    - **Planned Aircraft, Vessels, and Weapons Systems:** This EIS/OEIS examines the training and testing requirements of planned vessels, aircraft, and weapons systems that the Navy would use in the Study Area.
    - **Ongoing Activities:** Current training and testing activities that were not analyzed under NEPA in previous documentation are analyzed in this EIS/OEIS.

Alternative 1 reflects the adjustment to the baseline necessary to support all current and proposed Navy at-sea training and testing activities through 2019.

ES.5.3 Alternative 2 (Preferred Alternative)

Alternative 2 is the Preferred Alternative. Alternative 2 consists of Alternative 1 plus: the establishment of new range capabilities, as well as modifications of existing capabilities; adjustments to type and tempo of training and testing; and the establishment of additional locations to conduct activities between the range complexes. This alternative is contingent upon potential budget increases, strategic necessity, and future training and testing requirements.

Alternative 2 includes the following:

- New infrastructure requirements for the testing of autonomous vehicles near San Clemente Island.
- Introduction of surface ships outfitted with kinetic energy weapon capability, and the testing of, and training with this new weapon system.
- Introduction of broad area maritime surveillance unmanned aerial vehicles and their use during maritime patrol aircraft anti-submarine warfare testing and training events;
- Incremental (10 percent) increase in testing events, such as an increased number of unmanned/autonomous vehicle activities.
- Analysis of increased number of ship trials and other post delivery test and trial events necessitated by an increased/accelerated delivery of surface ships.
- Hydrophone modification, upgrade, and replacement at underwater tracking ranges at the Pacific Missile Range Facility.

ES.6 Summary of Environmental Effects

Environmental effects which might result from the implementation of the Navy's Proposed Action or alternatives have been analyzed in this EIS/OEIS. Resource areas analyzed include sediments and water quality, air quality, marine habitats, marine mammals, sea turtles, sea birds, marine vegetation, marine invertebrates, fish, cultural resources, socioeconomic resources, and public health and safety. Table ES-2 provides a comparison of the potential environmental impacts of the No Action Alternative, Alternative 1, and Alternative 2 (Preferred Alternative).

Table ES-2: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2

Resource Category	Summary of Impacts
Section 3.1 Sediments and Water Quality	**No Action Alternative:** Stressors analyzed include explosives and explosive byproducts, metals, chemicals other than explosives, and other materials. Explosive Byproducts: Impacts of explosive byproducts could be short-term and local, while impacts of unconsumed explosives and metals could be long-term and local. Chemical, physical, or biological changes in sediment or water quality would be measurable but below applicable standards, regulations, and guidelines, and within existing conditions or designated uses. Metals: Impacts of metals could be long-term and local. Corrosion and biological processes would reduce exposure of military expended materials to seawater, decreasing the rate of leaching, and most leached metals would bind to sediments and other organic matter. Sediments near military expended materials would contain some metals, but concentrations would be below applicable standards, regulations, and guidelines. Chemicals Other than Explosives: Impacts of chemicals other than explosives and impacts of other materials could be both short- and long-term and local. Chemical, physical, or biological changes in sediment or water quality would not be detectable, and would be within existing conditions or designated uses. Other Materials: Impacts of other materials could be short-term and local. Most other materials from military expended materials would not be harmful to marine organisms, and would be consumed during use. Chemical, physical, or biological changes in sediment or water quality would not be detectable. **Alternative 1:** The number of individual impacts may increase under Alternative 1, but the types of impacts would be the same as the No Action Alternative. Despite the increase, changes to sediments and water quality under Alternative 1 would be considered localized, short- and long-term. Impacts under Alternative 1 would be below applicable standards, regulations, and guidelines and would be within existing conditions or designated uses. **Alternative 2 (Preferred Alternative):** The number of individual impacts may increase under Alternative 2, but the types of impacts would be the same as the No Action Alternative. Despite the increase, changes to sediments and water quality under Alternative 2 would be considered localized, short- and long-term. Impacts under Alternative 2 would be below applicable standards, regulations, and guidelines and would be within existing conditions or designated uses.
Section 3.2 Air Quality	**No Action Alternative:** Stressors analyzed include criteria air pollutants and hazardous air pollutants. All reasonably foreseeable direct and indirect emissions of criteria air pollutants in nonattainment and maintenance areas do not equal or exceed applicable *de minimis* levels. The Navy's Proposed Action conforms to the applicable State Implementation Plan, and formal conformity determination procedures are not required. A Record of Non-Applicability has been prepared. The public would be exposed to only minor and localized levels of hazardous air pollutants. **Alternative 1:** The number of individual impacts may increase under Alternative 1, but the types of impacts would be the same as the No Action Alternative. Despite the increase in criteria air pollutants, changes to air quality under Alternative 1 would be considered minor; changes to air quality from hazardous air pollutants are not expected to be detectable. **Alternative 2 (Preferred Alternative):** The number of individual impacts may increase under Alternative 2, but the types of impacts would be the same as the No Action Alternative. Despite the increase in criteria air pollutants, changes to air quality under Alternative 2 would be considered minor; changes to air quality from hazardous air pollutants are not expected to be detectable.

Table ES-2: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	Summary of Impacts
Section 3.3 Marine Habitats	**No Action Alternative:** Stressors analyzed include acoustic (underwater explosives) and physical disturbance and strike (vessels and in-water devices, military expended materials, seafloor devices). Acoustics: Most of the high-explosive military expended materials would detonate at or near the water surface. Only bottom-laid explosives could affect bottom substrate and, therefore, marine habitats. Habitat utilized for underwater detonations would primarily be soft-bottom sediment. The surface area of bottom substrate affected would be a fraction of the total training and testing area available in the Study Area. Physical Disturbance and Strike: Ocean approaches would not be expected to affect marine habitats because of the nature of high-energy surf and shifting sands. Seafloor devices would be located in areas that would be primarily soft-bottom habitat. Most seafloor devices would be placed in areas that would result in minor bottom substrate impacts. Once on the seafloor, military expended material would be buried by sediments, corroded from exposure to the marine environment, or colonized by benthic organisms. The surface area of bottom substrate affected would be a fraction of the total training and testing area available in the Study Area. Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of explosives on or near the bottom, military expended materials, and seafloor devices during training and testing activities may have an adverse effect on Essential Fish Habitat by reducing the quality and quantity of non-living substrates that constitute Essential Fish Habitat and Habitat Areas of Particular Concern. **Alternative 1:** The number of individual impacts may increase under Alternative 1, but the types of impacts would be the same as the No Action Alternative. Despite the increases, most detonations would continue to occur at or near the surface, and those that do occur on the seafloor would be located in primarily soft-bottom habitat. Changes to marine substrates could include localized disturbance of the seafloor and cratering of soft bottom sediments. Impacts on soft bottom habitats would be short term, and impacts on hard bottom would be long term. Activities under Alternative 1 would not impact the ability of marine substrates to serve their function as habitat. **Alternative 2 (Preferred Alternative):** The number of individual impacts may increase under Alternative 2, but the types of impacts would be the same as the No Action Alternative. Despite the increases, most detonations would continue to occur at or near the surface, and those that do occur on the seafloor would be located in primarily soft-bottom habitat. Changes to marine substrates could include localized disturbance of the seafloor and cratering of soft bottom sediments. Impacts on soft bottom habitats would be short term, and impacts on hard bottom would be long term. Activities under Alternative 2 would not impact the ability of marine substrates to serve their function as habitat.

Table ES-2: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	Summary of Impacts
Section 3.4 Marine Mammals	**No Action Alternative:** Stressors analyzed include acoustic (sonar and other active acoustic sources; underwater explosives; pile driving; airguns; weapons firing, launch, and impact noise; vessel noise; and aircraft noise), energy (electromagnetic devices), physical disturbance and strike (vessels, in-water devices, military expended materials, and seafloor devices), entanglement (fiber optic cables, guidance wires, and parachutes), ingestion (munitions and military expended materials other than munitions), and secondary (explosives and byproducts, metals, chemicals, and transmission of marine diseases and parasites). Acoustics: Pursuant to the Marine Mammal Protection Act (MMPA), the use of sonar and other active acoustic sources and explosives may result in Level A harassment or Level B harassment of certain marine mammals; underwater explosives may result in Level A harassment, Level B harassment, or mortality of certain marine mammals; pile driving is not expected to result in mortality or Level A harassment but may result in Level B harassment of certain marine mammals; the use of swimmer defense airguns is not expected to result in mortality or Level A harassment but may result in Level B harassment of California sea lion; weapons firing, launch, and impact noise; vessel noise; and aircraft noise are not expected to result in mortality, Level A harassment, or Level B harassment of any marine mammals. Pursuant to the Endangered Species Act (ESA), the use of sonar and other active acoustic sources and explosives may affect and is likely to adversely affect certain ESA-listed marine mammals. Pile driving; swimmer defense airguns; weapons firing, launch, and impact noise; vessel noise; and aircraft noise may affect but are not likely to adversely affect certain ESA-listed marine mammals. Acoustic sources would have no effect on marine mammal critical habitats. Energy: Pursuant to the MMPA, the use of electromagnetic devices is not expected to result in mortality, Level A harassment, or Level B harassment of any marine mammals. Pursuant to the ESA, the use of electromagnetic devices may affect but is not likely to adversely affect certain ESA-listed marine mammals and would have no effect on marine mammal critical habitats. Physical Disturbance and Strike: Pursuant to the MMPA, the use of vessels may result in mortality or Level A harassment of certain marine mammal species but is not expected to result in Level B harassment. The use of in-water devices, military expended materials, and seafloor devices is not expected to result in mortality, Level A harassment, or Level B harassment of any marine mammal. Pursuant to the ESA, vessel use may affect and is likely to adversely affect certain ESA-listed species. The use of in-water devices and military expended materials may affect but is not likely to adversely affect certain marine mammal species. The use of seafloor devices would have no effect on any ESA-listed marine mammal. The use of vessels, in-water devices, military expended materials, and seafloor devices would have no effect on marine mammal critical habitats. Entanglement: Pursuant to the MMPA, the use of fiber optic cables, guidance wires, and parachutes is not expected to result in mortality, Level A harassment, or Level B harassment of any marine mammal. Pursuant to the ESA, the use of fiber optic cables, guidance wires, and parachutes may affect but is not likely to adversely affect certain ESA-listed marine mammals and would have no effect on marine mammal critical habitats. Ingestion: Pursuant to the MMPA, the potential for ingestion of military expended materials is not expected to result in mortality, Level A harassment, or Level B harassment of any marine mammal. Pursuant to the ESA, the potential for ingestion of military expended materials may affect but is not likely to adversely affect certain ESA-listed species. Secondary Stressors: Pursuant to the MMPA, secondary stressors are not expected to result in mortality, Level A harassment, or Level B harassment of any marine mammal. Pursuant to the ESA, secondary stressors may affect but are not likely to adversely affect certain ESA-listed marine mammals and would have no effect on marine mammal critical habitats. **Alternative 1:** The number of individual impacts under the No Action Alternative may increase under Alternative 1, but the types of impacts would be the same as under the No Action Alternative. Despite the increase, impacts on marine mammals under Alternative 1 are not expected to decrease the overall fitness of any marine mammal population.

Table ES-2: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	Summary of Impacts
Section 3.4 Marine Mammals (continued)	**Alternative 2 (Preferred Alternative):** The number of individual impacts under the No Action Alternative may increase under Alternative 2, but the types of impacts would be the same as under the No Action Alternative. Despite the increase, impacts on marine mammals under Alternative 2 are not expected to decrease the overall fitness of any marine mammal population. The use of sonar and other active acoustic sources is not expected to result in mortality, although the potential for beaked whale mortality coincident with use of sonar and other active acoustic sources is considered. The Navy has requested two annual beaked whale mortality takes under the MMPA as part of all training activities under Alternative 2 to account for any unforeseen potential impacts.
Section 3.5 Sea Turtles	**No Action Alternative:** Stressors analyzed include acoustic (sonar and other active acoustic sources; underwater explosives; pile driving; swimmer defense airguns; weapons firing, launch, and impact noise; aircraft noise; and vessel noise), energy (electromagnetic devices), physical disturbance and strike (vessels and in-water devices, military expended materials, seafloor devices), entanglement (fiber optic cables, guidance wires, and parachutes), ingestion (munitions, military expended materials other than munitions), and secondary (habitat, sediments, and water quality). Acoustics: Pursuant to the ESA, the use of sonar, other active acoustic sources, and underwater explosives may affect and is likely to adversely affect ESA-listed green, hawksbill, olive ridley, leatherback, and loggerhead sea turtles. Pile driving and swimmer defense airguns may affect but are not likely to adversely affect green sea turtles, and would have no effect on hawksbill, olive ridley, leatherback, and loggerhead sea turtles. Weapons firing, launch, and impact noise, and vessel and aircraft noise may affect but are not likely to adversely affect green, hawksbill, olive ridley, leatherback, and loggerhead sea turtles. Energy: Pursuant to the ESA, the use of electromagnetic devices may affect but is not likely to adversely affect green, hawksbill, olive ridley, leatherback, and loggerhead sea turtles. Physical Disturbance and Strike: Pursuant to the ESA, the use of vessels may affect and is likely to adversely affect, ESA-listed green, hawksbill, olive ridley, leatherback, and loggerhead turtles. The use of in-water devices, military expended materials, and seafloor devices may affect but is not likely to adversely affect green, hawksbill, olive ridley, leatherback, and loggerhead sea turtles. Entanglement: Pursuant to the ESA, fiber optic cables, guidance wires, and parachutes may affect but is not likely to adversely affect ESA-listed green, hawksbill, olive ridley, leatherback, and loggerhead sea turtles. Ingestion: Pursuant to the ESA, the potential for ingestion of military expended materials may affect but are not likely to adversely affect ESA-listed green, hawksbill, olive ridley, leatherback, and loggerhead sea turtles. Secondary: Pursuant to the ESA, secondary stressors may affect but are not likely to adversely affect sea turtles because changes in sediment, water, and air quality from explosives, explosive byproducts and unexploded ordnance, metals, and chemicals are not likely to be detectable, and no detectable changes in growth, survival, propagation, or population-levels of sea turtles are anticipated. **Alternative 1:** The number of individual impacts under the No Action Alternative may increase under Alternative 1, but the types of impacts would be the same as under the No Action Alternative. Despite the increase, impacts on sea turtles under Alternative 1 are not expected to decrease the overall fitness of any sea turtle population. **Alternative 2 (Preferred Alternative):** The number of individual impacts under the No Action Alternative may increase under Alternative 2, but the types of impacts would be the same as under the No Action Alternative. Despite the increase, impacts on sea turtles under Alternative 2 are not expected to decrease the overall fitness of any sea turtle population.

Table ES-2: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	Summary of Impacts
Section 3.6 Seabirds	**No Action Alternative:** Stressors analyzed include acoustic (sonar and other active acoustic sources, underwater explosives, pile driving, swimmer defense airguns, vessel noise, and aircraft noise), energy (electromagnetic devices), physical disturbance and strike (aircraft, vessels and in-water devices, and military expended materials), ingestion (munitions, military expended materials other than munitions), and secondary. Acoustics: Pursuant to the ESA, the use of sonar and other active acoustic sources, underwater explosives, swimmer defense airguns, and aircraft noise may affect but is not likely to adversely affect ESA-listed seabirds. Pile driving may affect but is not likely to adversely affect California least terns and would have no effect on other ESA-listed seabirds. Vessels would have no effect on ESA-listed seabirds. Acoustic sources would have no effect on critical habitat. Energy: Pursuant to the ESA, the use of electromagnetic devices may affect but is not likely to adversely affect ESA-listed seabirds. Energy sources would have no effect on critical habitat. Physical Disturbance and Strike: Pursuant to the ESA, the use of aircraft, vessels and in-water devices, and military expended materials may affect but is not likely to adversely affect ESA-listed seabirds. Physical disturbance and strike sources would have no effect on critical habitat. Ingestion: Pursuant to the ESA, the potential for ingestion of military expended materials may affect but is not likely to adversely affect ESA-listed seabirds. Secondary: Pursuant to the ESA, secondary stressors may affect but are not likely to adversely affect ESA-listed seabirds. Secondary stressors would have no effect on critical habitat. **Alternative 1:** The number of individual impacts under the No Action Alternative may increase under Alternative 1, but the types of impacts would be the same as under the No Action Alternative. Despite the increase, impacts on seabirds under Alternative 1 are not expected to decrease the overall fitness of any bird population. **Alternative 2 (Preferred Alternative):** The number of individual impacts under the No Action Alternative may increase under Alternative 2, but the types of impacts would be the same as under the No Action Alternative. Despite the increase, impacts on seabirds under Alternative 2 are not expected to decrease the overall fitness of any bird population.

Table ES-2: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	Summary of Impacts
Section 3.7 Marine Vegetation	**No Action Alternative:** Stressors analyzed include acoustic (underwater explosives), physical disturbance and strike (vessels and in-water devices, military expended materials, seafloor devices), and secondary (sediments, water quality). No ESA-listed marine vegetation species are found in the Hawaii-Southern California Training and Testing Study Area. Acoustics and Physical Disturbance and Strike: Explosives and physical disturbance or strikes could affect marine vegetation by destroying individual plants or damaging parts of plants. The impacts of these stressors are not expected to result in detectable changes in growth, survival, or propagation, and are not expected to result in population-level impacts on marine plant species. Secondary: Secondary stressors are not expected to result in detectable changes in growth, survival, propagation, or population-level impacts because changes in sediment and water quality or air quality are not likely to be detectable. These conclusions are based on the fact that the areas of impact are very small compared to the relative distribution and the locations where explosions or physical disturbance or strikes occur. Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of explosives, vessel movement, in-water devices, military expended materials, and seafloor devices during training and testing activities may have an adverse effect on Essential Fish Habitat by reducing the quality and quantity of marine vegetation that constitutes Essential Fish Habitat or Habitat Areas of Particular Concern. **Alternative 1:** The number of individual impacts under the No Action Alternative may increase under Alternative 1, but the types of impacts would be the same as under the No Action Alternative. Despite the increase, impacts from acoustic stressors and physical disturbance are not expected to result in detectable changes to marine vegetation growth, survival, or propagation and are not expected to result in population-level impacts. **Alternative 2 (Preferred Alternative):** The number of individual impacts under the No Action Alternative may increase under Alternative 2, but the types of impacts would be the same as under the No Action Alternative. Despite the increase, impacts from acoustic stressors and physical disturbance are not expected to result in detectable changes to marine vegetation growth, survival, or propagation and are not expected to result in population-level impacts.

Table ES-2: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	Summary of Impacts
Section 3.8 Marine Invertebrates	**No Action Alternative:** Stressors analyzed include acoustic (sonar and other active acoustic sources, underwater explosives), energy (electromagnetic devices), physical disturbance and strike (vessels and in-water devices, military expended materials, seafloor devices), entanglement (fiber optic cables, guidance wires, and parachutes), ingestion (military expended materials), and secondary (metals and chemicals). Acoustics: Pursuant to the ESA, the use of sonar and other active acoustic sources would have no effect on ESA-listed black abalone (*Haliotis cracherodii*) or white abalone (*Haliotis sorenseni*) species or on ESA-listed coral species. The use of underwater explosives may affect but is not likely to adversely affect black abalone or white abalone, and would have no effect on ESA-listed coral species. Acoustic stressors would have no effect on designated critical habitat. Energy: Pursuant to the ESA, the use of electromagnetic devices would have no effect on ESA-listed black abalone, white abalone or coral species. The use of electromagnetic devices would have no effect on designated critical habitat. Physical Disturbance and Strike: Pursuant to the ESA, the use of vessels and in-water devices, military expended materials, and seafloor devices may affect but is not likely to adversely affect ESA-listed black abalone and white abalone, and would have no effect on coral species proposed for ESA listing. Physical disturbance and strike stressors would have no effect on designated critical habitat. Entanglement: Pursuant to the ESA, the use of fiber optic cables, guidance wires, and parachutes would have no effect on ESA-listed black abalone, white abalone or coral species. Entanglement stressors would have no effect on designated critical habitat. Ingestion: Pursuant to the ESA, the potential for ingestion of military expended materials would have no effect on ESA-listed black abalone, white abalone or coral species. Secondary: Pursuant to the ESA, secondary stressors may affect but are not likely to adversely affect ESA-listed black abalone, white abalone or coral species, and would not affect coral species proposed for ESA listing. Secondary stressors would have no effect on designated critical habitat. Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of sonar and other active acoustic sources, vessel movement, in-water devices, and metal, chemical, or other material contaminants would have no adverse effect on sedentary invertebrate beds or reefs that constitute Essential Fish Habitat or Habitat Areas of Particular Concern. The use of explosives, pile driving, military expended materials, seafloor devices, and explosives and explosive byproduct contaminants may have an adverse effect on Essential Fish Habitat by reducing the quality and quantity of sedentary invertebrate beds or reefs that constitute Essential Fish Habitat or Habitat Areas of Particular Concern. **Alternative 1:** The number of individual impacts under the No Action Alternative may increase under Alternative 1, but the types of impacts would be the same as under the No Action Alternative. Despite the increase, impacts on black abalone, white abalone, or coral species would not change, and impacts on other marine invertebrates under Alternative 1 are not anticipated to result in population-level impacts. **Alternative 2 (Preferred Alternative):** The number of individual impacts under the No Action Alternative may increase under Alternative 2, but the types of impacts would be the same as under the No Action Alternative. Despite the increase, impacts on black abalone, white abalone, or coral species would not change, and impacts on other marine invertebrates under Alternative 2 are not anticipated to result in population-level impacts.

Table ES-2: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	Summary of Impacts
Section 3.9 Fish	**No Action Alternative:** Stressors analyzed include acoustic (sonar and other active acoustic sources, underwater explosives), energy (electromagnetic devices), physical disturbance and strike (vessels and in-water devices, military expended materials, seafloor devices), entanglement (fiber optic cables, guidance wires, and parachutes), ingestion (munitions, military expended materials other than munitions). Acoustics: Pursuant to the ESA, the use of sonar and other active acoustic sources may affect but is not likely to adversely affect ESA-listed steelhead trout. The use of underwater explosives and other impulsive acoustic sources may affect and is likely to adversely affect ESA-listed steelhead trout. Acoustic sources would have no effect on critical habitat. Energy: Pursuant to the ESA, the use of electromagnetic devices may affect but is not likely to adversely affect ESA-listed steelhead trout. Energy sources would have no effect on critical habitat. Physical Disturbance and Strike: Pursuant to the ESA, the use of vessels and in-water devices, military expended materials, and seafloor devices may affect but is not likely to adversely affect ESA-listed steelhead trout. Physical disturbance and strikes would have no effect on critical habitat. Entanglement: Pursuant to the ESA, the use of fiber optic cables, guidance wires, and parachutes may affect but is not likely to adversely affect ESA-listed steelhead trout. Entanglement sources would have no effect on critical habitat. Ingestions: Pursuant to the ESA, the potential for ingestion of military expended materials may affect but is not likely to adversely affect ESA-listed steelhead trout. Secondary: Pursuant to the ESA, secondary stressors may affect but are not likely to adversely affect ESA-listed steelhead trout. Secondary sources would have no effect on critical habitat. **Alternative 1:** The number of individual impacts under the No Action Alternative may increase under Alternative 1, but the types of impacts would be the same as under the No Action Alternative. Despite the increase, impacts on fish under Alternative 1 are not expected to decrease the overall fitness of any fish population. **Alternative 2 (Preferred Alternative):** The number of individual impacts under the No Action Alternative may increase under Alternative 2, but the types of impacts would be the same as under the No Action Alternative. Despite the increase, impacts on fish under Alternative 2 are not expected to decrease the overall fitness of any fish population.

Table ES-2: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	Summary of Impacts
Section 3.10 Cultural Resources	**No Action Alternative:** Stressors analyzed include acoustic (underwater explosives and pile-driving) and physical disturbance (use of towed-in-water devices, military expended materials, and sea floor devices). Acoustics and Physical Disturbance: Acoustic and physical stressors, as indicated above, would not affect submerged prehistoric sites or submerged historic resources within United States territorial waters in accordance with Section 106 of the National Historic Preservation Act because measures were previously implemented to protect these resources. A Finding of No Effects on historic properties within the Area of Potential Effect has been determined by the U.S. Department of the Navy and the California State Historic Preservation Officer (California State Historic Preservation Office 2012). **Alternative 1:** The number of individual impacts under the No Action Alternative may increase under Alternative 1, but the types of impacts would be the same as under the No Action Alternative. Because of the increase in activity under Alternative 1, there could be an increased probability of disturbing submerged cultural resources depending on the location of the activity when compared to the No Action Alternative. **Alternative 2 (Preferred):** The number of individual impacts under the No Action Alternative may increase under Alternative 2, but the types of impacts would be the same as under the No Action Alternative. Because of the increase in activity under Alternative 2, there could be an increased probability of disturbing submerged cultural resources depending on the location of the activity when compared to the No Action Alternative.
Section 3.11 Socioeconomic Resources	**No Action Alternative:** Stressors analyzed include accessibility (limiting access to the ocean and the air), physical disturbance and strike (aircraft, vessels and in-water devices, and military expended materials), airborne acoustics (weapons firing, aircraft and vessel noise), and secondary stressors from changes to the availability of marine resources. Accessibility: Accessibility stressors are not expected to result in impacts on commercial transportation and shipping, commercial and recreational fishing, subsistence use, or tourism because inaccessibility to areas of co-use would be temporary and of short duration (hours). Physical Disturbance and Strike: Physical disturbance and strikes are not expected to result in impacts on commercial and recreational fishing, subsistence use, or tourism because of the large size of the Study Area, the limited areas of operations, and implementation of the Navy's standard operating procedures. Airborne Acoustics: Airborne acoustic stressors are not expected to result in impacts to tourism or recreational activity because the Navy's training and testing would occur well out to sea, far from tourism and recreation locations. Secondary: Secondary stressors are not expected to result in impacts to fishing, subsistence use, or tourism, based on the level of impacts described in other resources sections. **Alternative 1:** The number of individual impacts under the No Action Alternative may increase under Alternative 1, but the types of impacts would be the same as under the No Action Alternative. Despite the increase in activity under Alternative 1, impacts to socioeconomic resources are not expected. **Alternative 2 (Preferred Alternative):** The number of individual impacts under the No Action Alternative may increase under Alternative 2, but the types of impacts would be the same as under the No Action Alternative. Despite the increase in activity under Alternative 2, impacts to socioeconomic resources are not expected.

Table ES-2: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	Summary of Impacts
Section 3.12 Public Health and Safety	**No Action Alternative:** Stressors analyzed include underwater energy, in-air energy, physical interactions, and secondary impacts from sediment and water quality changes. Because of the Navy's standard operating procedures, impacts on public health and safety would be unlikely. **Alternative 1:** Despite the increase in activities under Alternative 1, Navy safety procedures would continue to prevent proposed activities being co-located with public activities. Because of the Navy's safety procedures, the potential for activities to impact public health and safety under Alternative 1 would be unlikely. **Alternative 2 (Preferred Alternative):** Despite the increase in activities under Alternative 2, Navy safety procedures would continue to prevent proposed activities being co-located with public activities. Because of the Navy's safety procedures, the potential for activities to impact public health and safety under Alternative 2 would be unlikely.

Notes: EIS/OEIS = Environmental Impact Statement/Overseas Environmental Impact Statement, ESA = Endangered Species Act, MMPA = Marine Mammal Protection Act

ES.7 Cumulative Impacts

The analyses presented in Chapter 3 (Affected Environment and Environmental Consequences) and Chapter 4 (Cumulative Impacts), indicate that the potential incremental contribution of the No Action Alternative, Alternative 1, or Alternative 2 to cumulative impacts on sediments and water quality, air quality, marine habitats, seabirds, marine vegetation, marine invertebrates, fish, socioeconomic resources, and public health and safety would be negligible. When considered with other actions, the No Action Alternative, Alternative 1, or Alternative 2 might contribute to cumulative impacts on submerged prehistoric and historic resources, if such resources are present in areas where bottom-disturbing training and testing activities take place. The No Action Alternative, Alternative 1, or Alternative 2 would also make an incremental contribution to greenhouse gas emissions, each representing approximately 0.03 percent of U.S. 2009 greenhouse gas emissions.

Marine mammals and sea turtles are the primary resources of concern for cumulative impacts analysis for the following reasons:

- Past human activities have impacted these resources to the extent that several marine mammal species and all sea turtles species occurring in the Study Area are ESA-listed.
- These resources would be impacted by multiple ongoing and future actions.
- Explosive detonations and vessel strikes under the No Action Alternative, Alternative 1, and Alternative 2 have the potential to disturb, injure, or kill marine mammals and sea turtles.

The aggregate impacts of past, present, and other reasonably foreseeable future actions are expected to result in significant impacts on marine mammal and sea turtle species, although the contribution to those impacts from the Navy's proposed activities is low (see Summary of Impacts to marine mammals and sea turtles in Table ES-2 above). The No Action Alternative, Alternative 1, or Alternative 2 would contribute to cumulative impacts, but the relative contribution would be low compared to other actions outside of this EIS/OEIS. Compared to potential mortality or injury resulting from Navy training and testing activities, marine mammal and sea turtle mortality and injury from bycatch, commercial vessel ship strikes, entanglement, ocean pollution, and other human causes are estimated to be orders of magnitude greater (hundreds of thousands of animals versus tens of animals).

ES.8 Standard Operating Procedures, Mitigation, and Monitoring

Within the Study Area, the Navy implements standard operating procedures, mitigation measures, and marine species monitoring and reporting. Navy standard operating procedures have the indirect benefit of reducing potential impacts on marine resources. Mitigation measures are designed to help reduce or avoid potential impacts on marine resources. Marine species monitoring efforts are designed to track compliance with take authorizations, evaluate the effectiveness of mitigation measures, and improve understanding of the impacts of training and testing activities on marine resources.

ES.8.1 Standard Operating Procedures

The Navy currently employs standard practices to provide for the safety of personnel and equipment, including ships and aircraft, as well as the success of the training and testing activities. In many cases there are incidental environmental, socioeconomic, and cultural benefits resulting from standard operating procedures. Standard operating procedures serve the primary purpose of providing for safety and mission success, and are implemented regardless of their secondary benefits. This is what distinguishes standard operating procedures, which are a component of the Proposed Action, from mitigation measures, which are designed entirely for the purpose of reducing environmental impacts resulting from the Proposed Action. Because standard operating procedures are crucial to safety and mission success, the Navy will not modify them as a way to further reduce effects to environmental resources. Because of their importance for maintaining safety and mission success, standard operating procedures have been considered as part of the Proposed Action under each alternative, and therefore are included in the Chapter 3 (Affected Environment and Environmental Consequences) environmental analyses for each resource.

ES.8.2 MITIGATION

The Navy recognizes that the Proposed Action has the potential to impact the environment. Unlike standard operating procedures, which are established for reasons other than environmental benefit, mitigation measures are modifications to the Proposed Action that are implemented for the sole purpose of reducing a specific potential environmental impact on a particular resource. These measures have been coordinated with NMFS and USFWS through the consultation and permitting processes. The Record of Decision for this EIS/OEIS will address any additional mitigation measures that may result from ongoing regulatory processes.

Additionally, the Navy has engaged in consultation processes under the ESA with regard to listed species that may be affected by the Proposed Action described in this EIS/OEIS. For the purposes of the ESA section 7 consultation, the mitigation measures proposed here may be considered by NMFS as beneficial actions taken by the Federal agency or applicant (50 C.F.R. 402.14(g)(8)). If necessary to satisfy requirements of the ESA, NMFS may develop an additional set of measures contained in reasonable and prudent alternatives, reasonable and prudent measures, or conservation recommendations in any Biological Opinion issued for this Proposed Action.

The Navy’s mitigation measures are organized into two categories: (1) procedural measures, and (2) mitigation areas. The Navy undertook two assessment steps for each recommended mitigation measure. Step 1 is an effectiveness assessment to ensure that mitigations are effective at reducing potential impacts on the resource. Step 2 is an operational assessment of the impacts on safety, practicability, and readiness from the proposed mitigation measure. In determining effectiveness at avoiding or reducing the impact, information was collected from published and readily available sources, as well as Navy after-action and monitoring reports. Table ES-3 summarizes the Navy’s recommended mitigation measures with currently implemented mitigation measures for each activity category also summarized in the table.

ES.8.3 MITIGATION MEASURES CONSIDERED BUT ELIMINATED

A number of possible alternative or additional mitigation measures have been suggested during the public comment periods of this or previous Navy environmental documents. In addition, through the evaluation process, some measures were deemed to either be ineffective, have an unacceptable impact on the proposed training and testing activities, or both, and will not be carried forward for further consideration.

ES.8.4 MONITORING

The Navy is committed to demonstrating environmental stewardship while executing its National Defense Mission and complying with the suite of federal environmental laws and regulations. As a complement to the Navy’s commitment to avoiding and reducing impacts of the Proposed Action through mitigation, the Navy will undertake monitoring efforts to track compliance with take authorizations, help investigate the effectiveness of implemented mitigation measures, and better understand the impacts of the Proposed Action on marine resources. Taken together, mitigation and monitoring comprise the Navy's integrated approach for reducing environmental impacts from the Proposed Action. The Navy's overall monitoring approach will seek to leverage and build on existing research efforts whenever possible.

Consistent with the cooperating agency agreement with NMFS, mitigation and monitoring measures presented in this EIS/OEIS focus on the requirements for protection and management of marine resources. Since monitoring will be required for compliance with the Final Rule issued for the Proposed Action under the MMPA, details of the monitoring program are being developed in coordination with NMFS through the regulatory process.

The Integrated Comprehensive Monitoring Program is intended to coordinate monitoring efforts across all regions where the Navy trains and to allocate the most appropriate level and type of effort for each range complex. The current Navy monitoring program is composed of a collection of "range-specific" monitoring plans, each developed individually as part of MMPA and ESA compliance processes as environmental documentation was completed. These individual plans establish specific monitoring requirements for each range complex and are collectively intended to address the Integrated Comprehensive Monitoring Program top-level goals. A Scientific Advisory Group of leading marine mammal scientists developed recommendations that would serve as the basis for a Strategic Plan for Navy monitoring. The Strategic Plan is intended to be a primary component of the Integrated Comprehensive Monitoring Program and provide a "vision" for Navy monitoring across geographic regions - serving as guidance for determining how to most efficiently and effectively invest the marine species monitoring resources to address Integrated Comprehensive Monitoring Program top-level goals and satisfy MMPA regulatory requirements. The objective of the Strategic Plan is to continue the evolution of Navy marine species monitoring towards a single integrated program, incorporating Scientific Advisory Group recommendations, and establishing a more transparent framework for soliciting, evaluation, and implementing monitoring work across the Fleet range complexes.

ES.8.5 Reporting

The Navy is committed to documenting and reporting relevant aspects of training and testing activities in order to reduce environmental impacts and improve future environmental assessments. Initiatives include exercise and monitoring reporting, stranding response planning, and bird strike reporting.

ES.8.6 Other Considerations

ES.8.6.1 Consistency with Other Federal, State, and Local Plans, Policies and Regulations

Based on an evaluation of consistency with statutory obligations, the Navy's proposed training and testing activities would not conflict with the objectives or requirements of federal, state, regional, or local plans, policies, or legal requirements. The Navy consulted with regulatory agencies as appropriate during the NEPA process and prior to implementation of the Proposed Action to ensure all legal requirements are met.

ES.8.6.2 Relationship Between Short-term Use of the Environment and Maintenance and Enhancement of Long-term Productivity

In accordance with NEPA, this EIS/OEIS provides an analysis of the relationship between a project's short-term impacts on the environment and the effects that these impacts may have on the maintenance and enhancement of the long-term productivity of the affected environment.

Table ES-3: Summary of Recommended Mitigation Measures

Mitigation Measure	Benefit	Evaluation Criteria	Implementation	Responsible Command	Date Implemented
Marine Species Awareness Training All personnel standing watch on the bridge and Lookouts will successfully complete the training before standing watch or serving as a Lookout.	To learn the procedures for searching for and recognizing the presence of marine species, including detection cues (e.g., congregating seabirds) so that potentially harmful interactions can be avoided.	Successful completion of training by all personnel standing watch and all personnel serving as Lookouts. Personnel successfully applying skills learned during training.	The multimedia training program has been made available to personnel required to take the training. Personnel have been and will continue to be required to take the training prior to standing watch and serving as Lookouts.	Officer Conducting the Exercise or Test or civilian equivalent	Ongoing
Lookouts					
Use of Four Lookouts for Underwater Detonations Mine countermeasure and neutralization activities using time-delay will use four Lookouts, depending on the explosives being used. If applicable, aircrew and divers will report sightings of marine mammals or sea turtles.	Lookouts can visually detect marine species so that potentially harmful impacts to marine mammals and sea turtles from explosives use can be avoided. Lookouts can more quickly and effectively relay sighting information so that corrective action can be taken. Support from aircrew and divers, if they are involved in the activity, will increase the probability of sightings, reducing the potential for impacts.	Annual report documenting the number of marine mammals and sea turtles sighted, including trend analysis after 3 years and organized by species. Annual report documenting the number of incidents when a Navy activity was halted or delayed as a direct result of a marine mammal or sea turtle sighting.	All Lookouts will receive marine species awareness training and will be positioned on vessels and aircraft as described in Section 5.3.1.2 1 (Acoustic Stressors – Non-Impulsive Sound).	Officer Conducting the Exercise or Test or civilian equivalent	Ongoing
Use of One or Two Lookouts Vessels using low-frequency active sonar or hull-mounted mid-frequency active sonar associated with anti-submarine warfare activities will have either one or two Lookouts, depending on the activity and size of the vessel. Mine countermeasure and neutralization activities with positive control will use two Lookouts, with one on each support vessel. If applicable, aircrew and divers will also report the presence of marine mammals or sea turtles. One Lookout may be used under certain circumstances specific in Section 5.3.1.2.1.2.4 (Mine Countermeasure and Neutralization Activities Using Positive Control Firing Devices). Sinking Exercises will use two Lookouts (one in an aircraft and one on a surface vessel). At-sea explosives testing will have at least one Lookout.	Lookouts can visually detect marine species so that potentially harmful impacts to marine mammals and sea turtles from Navy sonar and explosives use can be avoided. Lookouts can more quickly and effectively relay sighting information so that corrective action can be taken. Support from aircrew and divers, if they are involved in the activity, will increase the probability of sightings, reducing the potential for impacts.				
Use of One Lookout Vessels and aircraft conducing anti-submarine warfare, anti-surface warfare, or mine warfare activities using high-frequency active sonar, non-hull mounted mid-frequency active sonar, helicopter dipping mid-frequency active sonar, anti-swimmer grenades, explosive buoys, surface gunnery activities, surface missile activities, bombing activities, torpedo (explosive) testing, elevated causeway system pile driving, towed mine neutralization activities, full power propulsion testing of vessels, and activities using non-explosive practice munitions, will have one Lookout.	Lookouts can visually detect marine species so that potentially harmful impacts to marine mammals and sea turtles from Navy sonar, explosives, sonobuoys, gunnery rounds, missiles, explosive torpedoes, pile driving, towed systems, vessel propulsion, and non-explosive munitions can be avoided. A Lookout can more quickly and effectively relay sighting information so that corrective action can be taken.				

Table ES-3: Summary of Recommended Mitigation Measures (continued)

Mitigation Measure	Benefit	Evaluation Criteria	Implementation	Responsible Command	Date Implemented
Mitigation Zones					
Use of a Mitigation Zone A mitigation zone is an area defined by a radius and centered on the location of a sound source or activity. The size of each mitigation zone is specific to a particular training or testing activity (e.g., sonar use or explosive use).	A mitigation zone defines the area in which Lookouts survey for marine mammals and sea turtles. Mitigation zones reduce the potential for injury to marine species.	For those activities where monitoring is required, record observations of marine mammals and sea turtles located outside of the mitigation zone and note any apparent reactions to on-going Navy activities. Observation of acute reactions may be used as an indicator that the radius of the mitigation zone needs to be increased.	Mitigation zones have been and will continue to be implemented as described in Section 5.3.2 (Mitigation Zone Procedural Measures). Lookouts are trained to conduct observations within mitigation zones of different sizes.	Officer Conducting the Exercise or Test or civilian equivalent	Ongoing
Establishment of the Humpback Whale Cautionary Area The Navy has designated a humpback whale cautionary area (described in Section 5.3.3, Mitigation Areas), which consists of a 5 km (3.1 miles [mi.]) mitigation zone that has been identified as having one of the highest concentrations of humpback whales during the period between 15 December and 15 April.	Expanded mitigation zone, greater than mitigation zones typically established for applicable activities, would provide greater protection for humpback whales from mid-frequency active sonar between 15 December and 15 April. This approach will reduce potential interactions between humpback whales and U.S. Navy training activities during the period when the whales are most common. This training can occur in this area during this time period only with approval by the Commander, U.S. Pacific Fleet. This requirement elevates awareness of the importance of environmental stewardship at all levels within the Navy.	Record observations of humpback whales within the mitigation zone and note any apparent reactions to on-going Navy activities. Observation of acute reactions may be used as an indicator that the radius of the mitigation zone needs to be increased or that the cautionary area needs to be centered on a different location. Reduction in the number of interactions with humpback whales between 15 December and 15 April.	The cautionary area has been and will continue to be implemented as described in Section 5.3.3 (Mitigation Areas). Lookouts are trained to conduct observations within the cautionary area.	Commander, Pacific Fleet	Implemented as of 28 June, 2008.
Recognize the Importance of Marine Protected Areas In general, most Armed Forces activities are exempt from the prohibitions of marine protected areas. Nevertheless, the Navy would carry out its training and testing activities in a manner that will avoid, to the maximum extent practicable and consistent with training and testing requirements, adverse impacts to National Marine Sanctuary resources.	Avoiding or minimizing impacts while operating in or near marine protected areas could result in improved health of the resources in the areas.	No known evaluation criteria	The Navy includes maps in the Protective Measures Assessment Protocol to define marine protected areas. To the greatest extent practicable, adverse impacts to these areas will be avoided.	Officer Conducting the Exercise or Test or civilian equivalent	Ongoing

The Proposed Action may result in both short- and long-term environmental effects. However, the Proposed Action would not be expected to result in any impacts that would reduce environmental productivity, permanently narrow the range of beneficial uses of the environment, or pose long-term risks to health, safety, or the general welfare of the public.

ES.8.6.3 Irreversible or Irretrievable Commitment of Resources

For the alternatives including the Proposed Action, most resource commitments are neither irreversible nor irretrievable. Most impacts are short-term and temporary or, if long lasting, are negligible. No habitat associated with threatened or endangered species would be lost as result of implementation of the Proposed Action. Since there would be no building or facility construction, the consumption of materials typically associated with such construction (e.g., concrete, metal, sand, fuel) would not occur. Energy typically associated with construction activities would not be expended and irreversibly lost.

Implementation of the Proposed Action would require fuels used by aircraft and vessels. Since fixed- and rotary-wing flight and ship activities could increase, relative total fuel use could increase. Therefore, if total fuel consumption increased, this nonrenewable resource would be considered irretrievably lost.

ES.8.6.4 Energy Requirements and Conservation Potential of Alternatives and Mitigation Measures

Resources that will be permanently and continually consumed by project implementation include water, electricity, natural gas, and fossil fuels; however, the amount and rate of consumption of these resources would not result in significant environmental impacts or the unnecessary, inefficient, or wasteful use of resources. Prevention of the introduction of potential contaminants is an important component of mitigation of the alternative’s adverse impacts. To the extent practicable, considerations in the prevention of introduction of potential contaminants are included.

Sustainable range management practices are in place that protect and conserve natural and cultural resources and preserve access to training areas for current and future training requirements while addressing potential encroachments that threaten to impact range and training area capabilities.

This Page Intentionally Left Blank

REFERENCES

California State Historic Preservation Office. (2008). Programmatic Agreement Among the Commanding Officer, Naval Base Coronado, California State Historic Preservation Officer, and Advisory Council on Historic Preservation Regarding Operational and Developmental Undertakings at San Clemente Island, California. (Including areas in and around San Clemente Island; off-island ranges; and operational training areas within the respective territorial and administrative jurisdictions of the United States and the State of California.)

U.S. Department of the Navy. (2008a). Hawaii Range Complex, Final Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS). Prepared by Pacific Missile Range Facility.

U.S. Department of the Navy. (2008b). Southern California Range Complex Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS). U.S. Navy Pacific Fleet. Prepared by Naval Facilities Engineering Command Southwest.

U.S. Department of the Navy. (2011). Silver Strand Training Complex Environmental Impact Statement (EIS). Prepared by U.S. Pacific Fleet.

This Page Intentionally Left Blank

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1 Purpose and Need

There are no tables in this section.

CHAPTER 2 Description of Proposed Action and Alternatives

CHAPTER 3 Affected Environment and Environmental Consequences

3.0 Introduction

Section 3.1 Sediments and Water Quality

Section 3.2 Air Quality

Section 3.3 Marine Habitats

Section 3.4 Marine Mammals

Section 3.5 Sea Turtles

Section 3.6 Seabirds

Section 3.7 Marine Vegetation

Section 3.8 Marine Invertebrates

Section 3.9 Fish

Section 3.10 Cultural Resources

Section 3.11 Socioeconomic Resources

Section 3.12 Public Health and Safety

There are no tables in this section.

CHAPTER 4 Cumulative Impacts

CHAPTER 5 Standard Operating Procedures, Mitigation, and Monitoring

CHAPTER 6 Additional Regulatory Considerations

CHAPTER 7 List of Preparers

There are no tables in this section.

APPENDIX A Navy Activities Descriptions

There are no tables in this section.

APPENDIX B Federal Register Notices

There are no tables in this section.

APPENDIX C Agency Correspondence

There are no tables in this section.

APPENDIX D Air Quality Example Emissions Calculations and Example RONA

APPENDIX E Public Participation

APPENDIX F Training and Testing Activities Matrices

LIST OF FIGURES

CHAPTER 1 Purpose and Need

CHAPTER 2 Description of Proposed Action and Alternatives

CHAPTER 3 Affected Environment and Environmental Consequences

Section 3.0 Introduction

Section 3.1 Sediments and Water Quality

Section 3.2 Air Quality

Section 3.3 Marine Habitats

Section 3.4 Marine Mammals

Section 3.5 Sea Turtles

Section 3.6 Seabirds

There are no figures in this section.

Section 3.7 Marine Vegetation

There are no figures in this section.

Section 3.8 Marine Invertebrates

Section 3.9 Fish

Section 3.10 Cultural Resources

Section 3.11 Socioeconomic Resources

Section 3.12 Public Health and Safety

CHAPTER 4 Cumulative Impacts

There are no figures in this section.

CHAPTER 5 Standard Operating Procedures, Mitigation, and Monitoring

CHAPTER 6 Additional Regulatory Considerations

CHAPTER 7 List of Preparers

There are no figures in this section.

APPENDIX A Navy Activities Descriptions

APPENDIX B Federal Register Notices

There are no figures in this section.

APPENDIX C Agency Correspondence

There are no figures in this section.

APPENDIX D Air Quality Example Emissions Calculations and Example RONA

APPENDIX E Public Participation

There are no figures in this section.

APPENDIX F Training and Testing Activities Matrices

There are no figures in this section.

APPENDIX G Statistical Probability Analysis for Estimating Direct Strike Impact and Number of Potential Exposures

There are no figures in this section.

ACRONYMS AND ABBREVIATIONS

C.F.R.	Code of Federal Regulations
DEIS	Draft Environmental Impact Statement
DoD	Department of Defense
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
HRC	Hawaii Range Complex
MMPA	Marine Mammal Protection Act
Navy	U.S. Department of the Navy
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
OEIS	Overseas Environmental Impact Statement
OPAREA	Operating Area
SOCAL	Southern California
SSTC	Silver Strand Training Complex

This Page Intentionally Left Blank

1 Purpose and Need

TABLE OF CONTENTS

LIST OF TABLES

There are no tables in this section.

LIST OF FIGURES

This Page Intentionally Left Blank

1 PURPOSE AND NEED

1.1 INTRODUCTION

Major conflicts, terrorism, lawlessness, and natural disasters all have the potential to threaten national security of the United States. The security, prosperity, and vital interests of the United States (U.S.) are increasingly tied to other nations because of the close relationships between the United States and other national economies. The U.S. Department of the Navy (Navy) carries out training and testing activities to be able to protect the United States against its enemies, to protect and defend the rights of the United States and its allies to move freely on the oceans, and to provide humanitarian assistance to failed states. The Navy operates on the world's oceans, seas, and coastal areas—the international maritime domain—on which 90 percent of the world's trade and two-thirds of its oil are transported. The majority of the world's population also lives within a few hundred miles of an ocean.

The U.S. Congress, after World War II, established the National Command Authority to identify defense needs based on the existing and emergent situations in the United States and overseas that must be dealt with now or may be dealt with in the future. The National Command Authorities, which are comprised of the President and the Secretary of Defense, divide defense responsibilities among services. The heads (secretaries) of each service ensure that military personnel are trained, prepared, and equipped to meet those operational requirements.

Training and testing activities that prepare the Navy to fulfill its mission to protect and defend the United States and its allies have the potential to impact the environment. These activities may trigger legal requirements identified in a number of U.S. federal environmental laws, regulations, and executive orders.

Training. Navy personnel first undergo entry-level (or schoolhouse) training, which varies according to their assigned warfare community (aviation, surface warfare, submarine warfare, and special warfare) and the community's unique requirements. Personnel then train within their warfare community at sea in preparation for deployment; each warfare community has primary mission areas (areas of specialized expertise that involve multiple warfare communities) that overlap with one another, described in detail in Chapter 2 (Description of Proposed Action and Alternatives). The Marine Corps similarly trains to support its core capabilities.

Testing. The Navy researches, develops, tests, and evaluates new platforms,[1] systems, and technologies. Many tests are conducted in realistic conditions at sea, and can range in scale from testing new software to operating manned-portable devices. Testing activities may occur independently of or in conjunction with training activities.

The Navy prepared this Environmental Impact Statement (EIS)/Overseas EIS (OEIS) to assess the potential environmental impacts associated with two categories of military readiness activities: training and testing. Collectively, the at-sea areas in this EIS/OEIS are referred to as the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area) (Figure 1.1-1). The Navy also prepared this EIS/OEIS to comply with the National Environmental Policy Act (NEPA) and Executive Order (EO) 12114.

[1] Throughout this EIS/OEIS, ships and aircraft may be referred to as "platforms" and weapons, combat systems, sensors, and related equipment may be referred to as "systems."

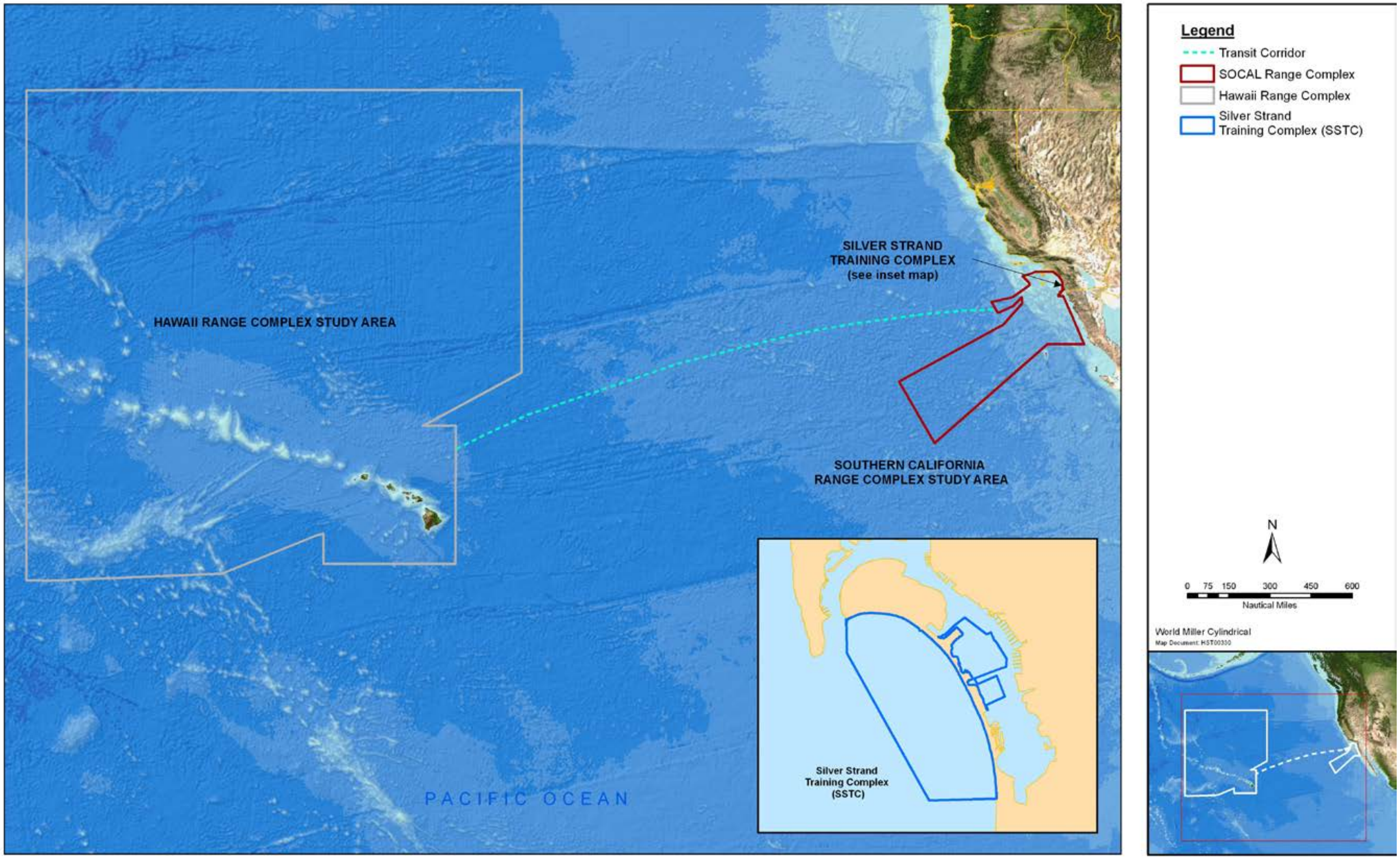


Figure 1.1-1: Hawaii Southern California Training and Testing Study Area[2]

[2] The Hawaii Range Complex is approximately 2,000 nautical miles from the Southern California (SOCAL) Range Complex. Typical Navy ship transit time between the two range complexes is five to seven days.

The land areas and land activities associated with the range complexes and operating areas (OPAREAs) within the Study Area were covered in previous environmental documents and are not part of the analysis in this EIS/OEIS. The prior NEPA analysis on these land-based activities remains effective.

1.2 THE NAVY'S ENVIRONMENTAL COMPLIANCE AND AT-SEA POLICY

In 2000, the Navy completed a thorough review of its environmental compliance requirements for training at sea and instituted a policy designed to comprehensively address them. The policy, known as the "At-Sea Policy," directed, in part, that the Navy develop a programmatic approach to environmental compliance for exercises and training at sea for ranges and OPAREAs within its areas of responsibility (U.S. Department of the Navy 2000). Ranges affected by the "At-Sea Policy" are designated water areas that are managed and used to conduct training or testing activities. OPAREAs affected by the policy are those ocean areas, defined by specific geographic coordinates, used by the Navy to undertake training and testing activities. To meet the requirements of the policy, the Navy developed an updated Concept of Operations for Phase II Environmental Planning and Compliance for Navy Military Readiness and Scientific Research Activities At Sea in September of 2010. The concept of operations laid out a plan to achieve comprehensive environmental planning and compliance for Navy training and testing activities at sea.

Phase I of the planning program. The first phase of the planning program was accomplished by the preparation and completion of individual or separate environmental documents for each range complex and OPAREA. The Navy previously prepared NEPA/EO 12114 documents for three ranges, including the Hawaii Range Complex (HRC), Southern California Range Complex (SOCAL), and Silver Strand Range Complex (SSTC)—as well as NEPA documents for other OPAREAs in the Study Area—that analyzed training and testing activities. Many of these range complexes and OPAREAs pre-date World War II and have remained in continuous use by naval forces. The previous NEPA/EO 12114 documents cataloged training and testing activities; analyzed potential environmental impacts; and supported permit and other requirements under applicable environmental laws, regulations, and executive orders. As an example, Marine Mammal Protection Act (MMPA) incidental take authorizations (also known as "Letters of Authorization"), issued by the National Marine Fisheries Service (NMFS), were obtained for HRC and SOCAL, and those authorizations will expire in early 2014.[3]

Phase II of the planning program. The second phase of the planning program will cover activities previously analyzed in Phase I NEPA/EO 12114 documents, and also analyze additional geographic areas including, but not limited to, pierside locations and transit corridors. This EIS/OEIS is part of the second phase of environmental planning documents needed to support the Navy's request to obtain an incidental take authorization from NMFS. The Navy re-evaluated impacts from historically conducted activities and updated the training and testing activities based on changing operational requirements, including those associated with new platforms and systems. The Navy will use this new analysis to support incidental take authorizations under the MMPA.

The Study Area (Figure 1.1-1) combines the geographic scope of the HRC, SOCAL, and SSTC documents, and analyzes ongoing, routine at-sea activities that occur during transit between these range complexes and OPAREAs. Under the Proposed Action, the Navy would continue training and testing as in the past. The Navy would expand the area to be analyzed, but would not expand the area where the Navy trains

[3] The Navy did not re-analyze the land portions of these range complexes in this EIS/OEIS because the incidental take statements and biological opinions of non-jeopardy for those land portions will not be altered by the Proposed Action.

and tests. This EIS/OEIS also includes new platforms and weapon systems not addressed in previous NEPA/EO 12114 documents.

1.3 PROPOSED ACTION

The Navy's Proposed Action, described in detail in Chapter 2, is to conduct training and testing activities—which may include the use of active sonar and explosives—primarily within existing range complexes and OPAREAs located along the coast of Southern California and around the Hawaiian Islands (Figure 1.1-1). Navy OPAREAs include designated ocean areas near fleet homeports. The Proposed Action also includes activities such as sonar maintenance and gunnery exercises conducted concurrently with ship transits and which may occur outside Navy range complexes and testing ranges. The Proposed Action includes pierside sonar testing conducted as part of overhaul, modernization, maintenance, and repair activities at shipyards and Navy piers within the Study Area.

1.4 PURPOSE OF AND NEED FOR PROPOSED MILITARY READINESS TRAINING AND TESTING ACTIVITIES

The purpose of the Proposed Action is to conduct training and testing activities to ensure that the Navy meets its mission, which is to maintain, train, and equip combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas. This mission is achieved in part by conducting training and testing within the Study Area.

The following sections are an overview of the need for military readiness training and testing activities.

> Title 10 Section 5062 of the U.S. Code provides: "The Navy shall be organized, trained, and equipped primarily for prompt and sustained combat incident to operations at sea. It is responsible for the preparation of naval forces necessary for the effective prosecution of war except as otherwise assigned and, in accordance with integrated joint mobilization plans, for the expansion of the peacetime components of the Navy to meet the needs of war."

1.4.1 WHY THE NAVY TRAINS

Naval forces must be ready for a variety of military operations—from large-scale conflict to maritime security and humanitarian assistance/disaster relief—to deal with the dynamic, social, political, economic, and environmental issues that occur in today's world. The Navy supports these military operations through its continuous presence on the world's oceans: the Navy can respond to a wide range of issues because, on any given day, over one-third of its ships, submarines, and aircraft are deployed overseas. Naval forces must be prepared for a broad range of capabilities—from full-scale armed conflict in a variety of different geographic areas[4] to disaster relief efforts[5]—prior to deployment on the world's oceans. To learn these capabilities, personnel must train with the equipment and systems that will achieve military objectives. The training process provides personnel with an in-depth understanding of their individual limits and capabilities; the training process also helps the testing community improve new weapon systems.

Modern weapons bring both unprecedented opportunity and innumerable challenges to the Navy. For example, modern (or smart) weapons are very accurate and help the Navy accomplish its mission with greater precision and far less collateral damage than in past conflicts; however, modern weapons are very complex to use. Military personnel must train regularly with these weapons to understand the

[4] Operation Iraqi Freedom in Iraq and Operation Enduring Freedom in Afghanistan; maritime security operations, including anti-piracy efforts like those in Southeast Asia and the Horn of Africa.
[5] Evacuation of non-combatants from American embassies under hostile conditions, as well as humanitarian assistance/disaster relief like the tsunami responses in 2005 and 2011, and Haiti's earthquake in 2009.

capabilities, limitations, and operations of the platform or system. Modern military actions require teamwork among hundreds or thousands of people and the use of various equipment, vehicles, ships, and aircraft to achieve success.

Military readiness training and preparation for deployment include everything from teaching basic and specialized individual military skills to intermediate skills or small unit training. As personnel increase in skill level and complete the basic training, they advance to intermediate and larger exercise training events, which culminate in advanced, integrated training events composed of large groups of personnel and, in some instances, joint service exercises.[6]

Military readiness training must be as realistic as possible to provide the experiences so important to success and survival. While simulators and synthetic training are critical elements of training—to provide early skill repetition and enhance teamwork—there is no substitute for live training in a realistic environment. The range complexes and OPAREAs have these realistic environments, with sufficient sea and airspace vital for safety and mission success. Just as a pilot would not be ready to fly solo after simulator training, a Navy commander cannot allow military personnel to engage in real combat activities based merely on simulator training.

1.4.2 Fleet Readiness Training Plan

The Navy developed the Fleet Response Plan to ensure the constant readiness of naval forces. This plan maintains, staffs, and trains naval forces to deploy for missions. The Fleet Response Plan increases the number of personnel and vessels that can be deployed on short notice. For example, the Navy was able to complete an unscheduled deployment of an additional aircraft carrier to the Middle East in January 2007 because of adherence to the Fleet Response Plan. Observance of the Fleet Response Plan allows the Navy to respond to global events more robustly while maintaining a structured process that ensures continuous availability of trained, ready Navy forces.

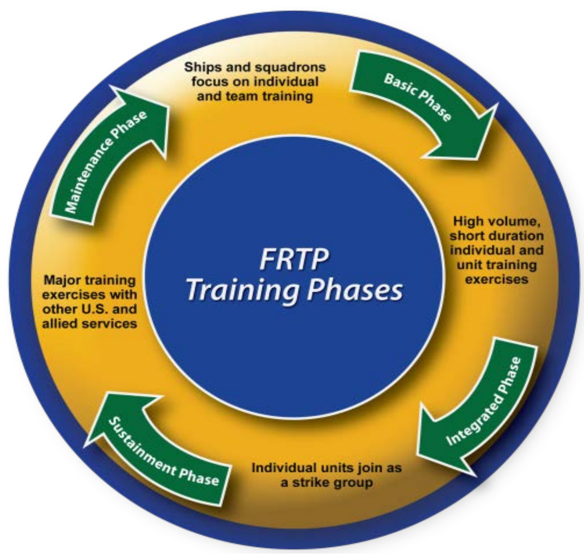


Figure 1.4-1: Fleet Readiness Training Plan

The Fleet Readiness Training Plan implements the requirements in the Fleet Response Plan. The Fleet Readiness Training Plan outlines the training activities required for military readiness that prepares Navy personnel for any conflict or operation. The Navy's building-block approach to training is cyclical and qualifies its personnel to perform their assigned missions. Training activities proceed in four phases: basic, integrated, sustainment, and maintenance, as depicted in Figure 1.4-1.

1.4.2.1 Basic Phase

The basic phase consists of training exercises performed by individual ships and aircraft; it is characterized mostly as unit level training. Fundamental combat skills are learned and practiced during

[6] Large group exercises may include carrier strike groups and expeditionary strike groups. Joint exercises may be with other United States services and other nations.

this phase. Operating area and range support requirements for unit level training are relatively modest in size compared to large-scale, major exercises. Training exercises with two or more units (ships, aircraft, or both), known as coordinated unit level training exercises, are also included in the basic phase. These training exercises further refine the basic, fundamental skills while increasing difficulty through coordination with other units.

Access to local range complexes and OPAREAs in proximity to the locations where Sailors and Marines are stationed reduces the amount of travel time and training costs.

1.4.2.2 Integrated Phase

The integrated phase combines the units involved in the basic, coordinated unit level training into strike groups. Strike groups are composed of multiple ships and aircraft. Strike group skills and proficiencies are developed and evaluated through major exercises. The integrated phase concludes when the strike group is certified for deployment, meaning that the strike group demonstrated the skills and proficiencies across the entire spectrum of warfare that may be needed during deployment.

Major exercises in this phase require access to large, relatively unrestricted ocean OPAREAs, multiple targets, and unique range attributes (oceanographic features, proximity to naval bases, and land-based targets).

1.4.2.3 Sustainment Phase

The strike group needs continued training activities to maintain its skills after certification for deployment in the integrated phase; these continued training activities fall within the sustainment phase. Sustainment phase activities provide strike groups additional training, as well as the ability to evaluate new and developing technologies, and evaluate and develop new tactics.

Similar to the integrated phase, sustainment exercises require access to large, relatively unrestricted ocean OPAREAs, and unique range attributes to support the scenarios.

1.4.2.4 Maintenance Phase

Naval forces enter the maintenance phase after forces return from deployment. Maintenance may involve relatively minor repair or major overhaul depending on the system and its age. The maintenance phase also includes testing of a ship's systems; these tests may take place pierside or at sea. Naval forces reenter the basic phase upon completion of the maintenance phase.

1.4.3 WHY THE NAVY TESTS

The Navy’s research and acquisition community conducts military readiness activities that involve testing. The Navy tests ships, aircraft, weapons, combat systems, sensors and related equipment, and conducts scientific research activities to achieve and maintain military readiness. The fleet identifies military readiness requirements to support its mission; the Navy's research and acquisition community, including the Navy's systems commands and associated scientific research organizations, provides Navy personnel with ships, aircraft, weapons, combat systems, sensors, and related equipment. The Navy’s research and acquisition community is responsible for researching, developing, testing, evaluating, acquiring, and delivering modern platforms and systems to the fleet—and supporting the systems throughout their life. The Navy’s research and acquisition community is responsible for furnishing high-quality platforms, systems, and support matched to the requirements and priorities of the fleet, while providing the necessary high return on investment to the American taxpayer.

The Navy's research and acquisition community includes the following:

- The Naval Air Systems Command, which develops, acquires, delivers, and sustains aircraft and systems with proven capability and reliability to ensure Sailors achieve mission success
- The Naval Sea Systems Command, which develops, acquires, delivers, and maintains surface ships, submarines, and weapon system platforms that provide the right capability to the Sailor
- The Space and Naval Warfare Systems Command, which provides the Sailor with knowledge superiority by developing, delivering, and maintaining effective, capable, and integrated command, control, communications, computer, intelligence, and surveillance systems
- The Office of Naval Research, which plans, fosters, and encourages scientific research that promotes future naval seapower and enhances national security
- The Naval Research Laboratory, which conducts a broad program of scientific research, technology, and advanced development to meet the complex technological challenges of today's world

The Navy's research and acquisition community, in cooperation with private companies, designs, tests and builds components, systems, and platforms to address requirements identified by the fleet. Private companies are contracted to assist the Navy in acquiring the platform, system, or upgrade. The Navy's research and acquisition community must test and evaluate the platform, system, or upgrade to validate whether it performs as expected and to determine whether it is operationally effective, suitable, survivable, and safe for its intended use by the fleet.

Testing performed by the Navy's research and acquisition community can be categorized as scientific research testing, private contractor testing, developmental testing and operational testing (including lot acceptance testing), fleet training support, follow-on test and evaluation, or maintenance and repair testing. Fleet training events often offer the most suitable environment for testing a system because training events are designed to accurately replicate operational conditions. System tests, therefore, are often embedded in training events such that it would be difficult for an observer to differentiate the two activities.

- **Scientific research testing.** Navy testing organizations conduct scientific research to evaluate emerging threats or technology enhancement before development of a new system. As an example, testing might occur on a current weapon system to determine if a newly developed technology would improve system accuracy or enhance safety to personnel.
- **Private contractor testing.** Contractors are often required to conduct performance and specification tests prior to delivering a system or platform to the Navy. These tests may be conducted on a Navy range, in a Navy OPAREA, or seaward of ranges and OPAREAs; these tests are sometimes done in conjunction with fleet training activities.
- **Developmental testing.** A series of tests are conducted by specialized Navy units to evaluate a platform or system's performance characteristics and to ensure that it meets all required specifications.
- **Operational testing.** Operations are conducted with the platform or system as it would be used by the fleet.
- **Fleet training support.** Systems still under development may be integrated on ships or aircraft for testing. If training has not been developed for use of a particular system, the Navy's systems commands may support the fleet by providing training on the operation, maintenance, and repair of the system during developmental testing activities.

- **Follow-on test and evaluation.** A follow-on test and evaluation phase occurs when a platform receives a new system, after a significant upgrade to an existing system, or when the system failed to meet contractual performance specifications during previous testing. Tests similar to those conducted during the developmental testing or operational testing phase are conducted again, as needed, to ensure that the modified or new system meets performance requirements and does not conflict with existing platform systems and subsystems.
- **Maintenance and repair testing.** Following periodic maintenance, overhaul, modernization, or repair of systems, testing of the systems may be required to assess performance. These testing activities may be conducted at shipyards or Navy piers.

Preparatory checks of a platform or system-to-be-tested are often made prior to actual testing to ensure the platform or system is operating properly. This preparatory check is similar to checking the wipers and brakes on a car before taking a trip. These checks are done to ensure everything is operating properly before expending the often-considerable resources involved in conducting a full-scale test. For example, the MH-60 helicopter program often conducts a functional check of its dipping sonar system in a nearshore area before conducting a more rigorous test of the sonar system farther offshore. Pierside platform and systems checks are conducted during Navy repair and construction activities and are essential to ensure safe operation of the platform or system at sea.

The Navy uses a number of different testing methods, including computer simulation and analysis, throughout the development of platforms and systems. Although simulation is a key component in the development of platforms and systems, it cannot provide information on how a platform or system will perform or whether it will be able to meet performance and other specification requirements in the environment in which it is intended to operate without comparison to actual performance data. For this reason, platforms and systems must undergo at-sea testing at some point in the development process. Thus, like the fleet, the research and acquisition community requires access to large, relatively unrestricted ocean OPAREAs, multiple strike targets, and unique range attributes to support its testing requirements. Navy platforms and systems must be tested and evaluated within the broadest range of operating conditions available (e.g., bathymetry, topography, geography) because Navy personnel must be capable of performing missions within the wide range of conditions that exist worldwide. Furthermore, Navy personnel must be assured that platforms and systems will meet performance specifications in the real-world environment in which they will be operated.

1.5 Overview and Strategic Importance of Existing Range Complexes

The Navy historically uses areas around the Hawaiian Islands, as well as those areas near San Diego and areas off the coast of Southern California for training and testing. These areas have been designated by the Navy into geographic regions and named "range complexes." A range complex is a set of adjacent areas of sea space, undersea space, land ranges, and overlying airspace delineated for military training and testing activities. Range complexes provide controlled and safe environments where military ship, submarine, and aircraft crews can train in realistic conditions. The combination of undersea ranges and OPAREAs with land training ranges, safety landing fields, and nearshore amphibious landing sites is critical to realistic training, and allows electronics on the range to capture data on the effectiveness of tactics and equipment—data that provide a feedback mechanism for training evaluation.

Systems commands also require access to a realistic environment to conduct testing. The systems commands frequently conduct tests on fleet range complexes and use fleet assets to support the testing, while fleet assets alternately support testing activities on test ranges; however, there are no dedicated test ranges within the Study Area. Thus, the range complexes in the Study Area must provide flexibility to meet diverse testing requirements, given the wide range of various advanced platforms and systems and proficiencies the fleets must demonstrate before certification for deployment.

The range complexes analyzed in this EIS/OEIS have each existed for many decades, dating back to the 1930s. Range use and infrastructure have developed over time as training and testing requirements in support of modern warfare have evolved. The Navy has not proposed and is not proposing to create new range complexes or OPAREAs. Further, only activities historically conducted or similar to those historically conducted within the at-sea portions of the current range complexes are proposed and therefore analyzed within this EIS/OEIS. Land-based activities were analyzed in prior EIS/OEISs and have not been altered, and therefore are not re-addressed within this document. Thus, for example, the on-shore training beach lanes of the SSTC and activities on San Clemente Island are not included in this EIS/OEIS.

Proximity of HRC, SOCAL, and SSTC to naval homeports is strategically important to the Navy because close access allows for efficient execution of training and testing activities and non-training maintenance functions, as well as access to alternate airfields when necessary. The proximity of training to homeports also ensures that Sailors and Marines do not have to routinely travel far from their families. For example, the Hawaii and San Diego areas are home to thousands of military families. The Navy is required to track and, where possible, limit the amount of time Sailors and Marines spend deployed from home (U.S. Department of the Navy 2007a). Less time away from home is an important factor in military readiness, morale, and retention. The proximate availability of the SOCAL, SSTC, and HRC training ranges is critical to Navy efforts in these areas.

1.5.1 Hawaii Range Complex

The at-sea portion of the HRC geographically encompasses ocean areas located around the major islands of the Hawaiian Islands chain. The offshore areas form an area approximately 1,700 nautical miles (nm) by 1,600 nm. The component areas of the HRC include the Hawaii OPAREA which consists of 235,000 square nautical miles (nm^2) of surface and subsurface ocean areas and special use airspace as well as various Navy land ranges and other services' land used for military training and test activities.

The existing HRC is the only range complex in the mid-Pacific Region and it is used for training and assessment of operational forces, missile testing, testing of military systems and equipment, and other military activities. The HRC is characterized by a unique combination of attributes that make it a strategically important range complex for the Navy, including its proximity to the homeport of Pearl Harbor and the Western Pacific. The HRC also provides those deployed forces based on the West Coast an opportunity to train and test in an unfamiliar environment, as well as opportunity to evaluate and sharpen skills developed during the previous training cycle.

The HRC's electronic tracking ranges at the Pacific Missile Range Facility, as well as warning areas and special use airspace, enable training to proceed in a safe and structured manner while retaining the flexibility needed to achieve training diversity and realism. The Pacific Missile Range Facility also provides the Navy and Department of Defense an unparalleled ability to engage in the training and testing of missile systems that involve the use or operation of military facilities in California, Alaska, and the western Pacific.

1.5.2 Southern California Range Complex

As in the HRC, the at-sea portion of the SOCAL Range Complex includes two components: ocean OPAREAs and associated special use airspace.

The SOCAL Range Complex is situated between Dana Point and San Diego, and extends more than 600 nm southwest into the Pacific Ocean (see Figure 1.1-1), encompassing 120,000 nm^2 of sea space, 113,000 nm^2 of special use airspace, and over 56 square miles ($mi.^2$) (145 square kilometers) of land area. The SOCAL Range Complex is divided into numerous subcomponent ranges or training areas for range management and scheduling purposes (described in detail in Chapter 2). The at-sea portion of the SOCAL Range Complex is characterized by a unique combination of attributes that make it a strategically important range complex for the Navy, including its proximity to the homeport of San Diego, its proximity to other training ranges, and its complex underwater training environment.

1.5.3 Silver Strand Training Complex

The SSTC is composed of oceanside beach and boat training lanes, ocean anchorage areas, bayside water training areas in the San Diego Bay and its bayside beaches; however, in this EIS/OEIS, the Navy analyzed only the in-water portions of the SSTC.

At-sea SSTC training areas provide critical training venues for west coast naval amphibious, special warfare, and mine countermeasure activities. The SSTC is critical to Navy training programs because of its unique combination of attributes. The training environment and terrain are among those attributes. For example, the temperate, sub-tropical climate and the attendant dry summers of Southern California allow for year-round training and testing for military readiness. The location of the training complex, with easy access to rough oceanside waters and calm San Diego Bay waters, allows personnel to start training in a calmer bayside environment, and then quickly and easily transition to more challenging situations in the oceanside waters as skills and fitness levels improve. This training complex is unique as there are no other training areas located in or around San Diego that have such a capability. Further, the SSTC’s long stretches of open, nearshore water and established ocean anchorages, make the area ideal for amphibious, special warfare, and mine countermeasure training.

1.6 The Environmental Planning Process

The National Environmental Policy Act of 1969 (NEPA) requires federal agencies to examine the environmental effects of their proposed actions within U.S. territories. An EIS is a detailed public document that provides an assessment of the potential effects that a major federal action might have on the human environment, which includes the natural environment. The Navy undertakes environmental planning for major Navy actions occurring throughout the world in accordance with applicable laws, regulations, and executive orders.

1.6.1 National Environmental Policy Act Requirements

The first step in the NEPA process (Figure 1.6-1) for an EIS is to prepare a Notice of Intent to develop an EIS. The Notice of Intent is published in the *Federal Register* and provides an overview of the proposed action and the scope of the EIS. The Notice of Intent is also the first step in engaging the public.

Scoping is an early and open process for developing the “scope” of issues to be addressed in an EIS and for identifying significant issues related to a proposed action. The scoping process for an EIS is initiated by publication of a Notice of Intent in the *Federal Register* and local newspapers. During the scoping process, the public helps define and prioritize issues through public meetings and written comments.

Subsequent to the scoping process, a Draft EIS is prepared to assess potential impacts of the proposed action and alternatives on the environment. When completed, a Notice of Availability is published in the *Federal Register* and notices are placed in local or regional newspapers announcing the availability of the Draft EIS. The Draft EIS is circulated for review and comment; public meetings are also held.

The Final EIS addresses all public comments received on the Draft EIS. Responses to public comments may include correction of data, clarifications of and modifications to analytical approaches, and inclusion of new or additional data or analyses.

Finally, the decision-maker will issue a Record of Decision no earlier than 30 days after a Final EIS is made available to the public.

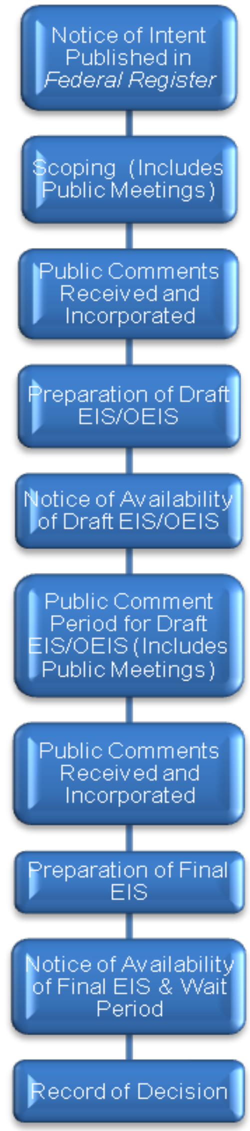


Figure 1.6-1: National Environmental Policy Act Process

1.6.2 EXECUTIVE ORDER 12114

Executive Order 12114, *Environmental Impacts Abroad of Major Federal Actions*, directs federal agencies to provide for informed environmental decision-making for major federal actions outside the United States and its territories. Presidential Proclamation 5928, issued 27 December 1988, extended the exercise of U.S. sovereignty and jurisdiction under international law to 12 nm; however, the proclamation expressly provides that it does not extend or otherwise alter existing federal law or any associated jurisdiction, rights, legal interests, or obligations. Thus, as a matter of policy, the Navy analyzes environmental effects and actions within 12 nm under NEPA (an EIS) and those effects occurring beyond 12 nm under the provisions of EO 12114 (an OEIS).

1.6.3 OTHER ENVIRONMENTAL REQUIREMENTS CONSIDERED

The Navy must comply with all applicable federal environmental laws, regulations, and executive orders, including, but not limited to, those listed below. Further information can be found in Chapters 3 and 6.

- Abandoned Shipwreck Act
- Antiquities Act
- Clean Air Act
- Clean Water Act
- Coastal Zone Management Act
- Endangered Species Act
- Magnuson-Stevens Fishery Conservation and Management Act
- Marine Mammal Protection Act
- Migratory Bird Treaty Act
- National Historic Preservation Act
- National Marine Sanctuaries Act
- Rivers and Harbors Act
- EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*
- EO 12962, *Recreational Fisheries*

- EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*
- EO 13089, *Coral Reef Protection*
- EO 13158, *Marine Protected Areas*
- EO 13175, *Consultation and Coordination with Indian Tribal Governments*
- EO 13178, *Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve*
- EO 13547, *Stewardship of the Ocean, Our Coasts, and the Great Lakes*

1.7 SCOPE AND CONTENT

In this EIS/OEIS, the Navy assessed military readiness training and testing activities that could potentially impact human and natural resources, especially marine mammals, sea turtles, and other marine resources. The range of alternatives includes the No Action Alternative and other reasonable courses of action. In this EIS/OEIS, the Navy analyzed direct, indirect, cumulative, short-term, long-term, irreversible, and irretrievable impacts. The Navy is the lead agency for the Proposed Action and is responsible for the scope and content of this EIS/OEIS. The NMFS is a cooperating agency because of its expertise and regulatory authority over marine resources. Additionally, this document will serve as NMFS's NEPA documentation for the rule-making process under the MMPA.

In accordance with Council on Environmental Quality Regulations, 40 Code of Federal Regulations § 1505.2, the Navy will issue a Record of Decision that provides the rationale for choosing one of the alternatives. The decision will be based on factors analyzed in this EIS/OEIS, including military training and testing objectives, best available science and modeling data, potential environmental impacts, and public interest.

1.8 ORGANIZATION OF THIS ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT

To meet the need for decision-making, this EIS/OEIS is organized as follows:

- Chapter 1 describes the purpose of and need for the Proposed Action.
- Chapter 2 describes the Proposed Action, alternatives considered but eliminated in the EIS/OEIS, and alternatives to be carried forward for analysis in the EIS/OEIS (including the preferred alternative).
- Chapter 3 describes the existing conditions of the affected environment and analyzes the potential impacts of the training and testing activities in each alternative.
- Chapter 4 describes the analysis of cumulative impacts, which are the impacts of the Proposed Action when added to past, present, and reasonably foreseeable future actions.
- Chapter 5 describes the measures the Navy evaluated that could mitigate impacts to the environment.
- Chapter 6 describes other considerations required by NEPA and describes how the Navy complies with other federal, state, and local plans, policies, and regulations.
- Chapter 7 includes a list of the EIS/OEIS preparers.
- Chapter 8 includes a list of agencies, government officials, tribes, groups, and individuals on the distribution list for receipt of the Draft EIS/OEIS.
- Appendices provide technical information that supports the EIS/OEIS analyses and its conclusions.

1.9 RELATED ENVIRONMENTAL DOCUMENTS

Documentation under NEPA/EO 12114 for Navy training and testing activities has developed from individual range complex planning to theater assessment planning that covers multiple range complexes. The following publicly available documents related to Navy training and testing activities may be referenced in this EIS/OEIS, as appropriate:

- *Southern California Range Complex EIS/OEIS*, December 2008a (U.S. Department of the Navy 2008d)
- *Hawaii Range Complex Final EIS/OEIS*, May 2008 (U.S. Department of the Navy 2008b)
- *Silver Strand Training Complex Final EIS*, June 2011 (U.S. Department of the Navy 2011a)
- *Taking and Importing Marine Mammals; U.S. Navy Training in the Southern California Range Complex; Final Rule. Federal Register 74* (12): 3882-3918, January 21, 2009 (National Oceanic Atmospheric Administration 2009)
- *Taking and Importing Marine Mammals; U.S. Navy Training in the Hawaii Range Complex; Final Rule. Federal Register 74* (7): 1456-1491, January 12, 2009 (Department of Commerce and National Oceanic Atmospheric Administration 2009)
- National Marine Fisheries Service *Incidental Harassment Authorization* for the Silver Strand Training Complex EIS, July 2012
- *Biological Opinion for the Southern California Range Complex EIS/OEIS*, January 2009 (National Oceanic Atmospheric Administration 2009)
- *Biological Opinion for the Hawaii Range Complex EIS/OEIS*, January 2009 (National Marine Fisheries Service 2009)
- *Biological Opinion on the Effects of the U.S. Navy's Proposal to Conduct Training Exercises in the Hawaii Range Complex and the National Marine Fisheries Service's Permits, Conservation, and Education Division's proposal to issue a Letter of Authorization* (National Marine Fisheries Service 2011)
- *Final Environmental Assessment for Helicopter Wings Realignment and MH-60 R/S Helicopter Transition at Naval Base Coronado, CA,* August 2011 (U.S. Department of the Navy 2011b)
- *Final Environmental Assessment for the Transition of E-2C Hawkeye to E-2D Advanced Hawkeye at Naval Station Norfolk, Virginia and Naval Base Ventura County Point Mugu, California*, January 2009 (U.S. Department of the Navy 2009)
- *EIS for Introduction of the P-8A Multi-Mission Maritime Aircraft into the U.S. Navy Fleet*, November 2008 (U.S. Department of the Navy 2008c)
- *United States Marine Corps F-35B West Coast Basing EIS*, October 2010 (U.S. Marine Corps 2010)
- *Final Environmental Assessment For the Homeporting of Six Zumwalt Class Destroyers at East and West Coast Installations (including Hawaii)*, May 2008 (U.S. Department of the Navy 2008d)
- *Final Supplemental EIS/OEIS for Surveillance Towed Array Sensor System Low-Frequency Active Sonar System*, April 2007 (U.S. Department of the Navy 2007b)
- *Final Environmental Assessment for the Homeporting of the Littoral Combat Ship on the West Coast of the United States, April 2012* (U.S. Department of the Navy 2012)

This Page Intentionally Left Blank

REFERENCES

Department of Commerce & National Oceanic Atmospheric Administration. (2009). Taking and Importing Marine Mammals; U.S. Navy Training in the Hawaii Range Complex; Final Rule. *Federal Register, 50 C.F.R. Part 216*(1456), 1491.

National Marine Fisheries Service. (2009). Endangered Species Act Section 7 Consultation Final Biological Opinion, Hawai'i Range Complex. (pp. 320).

National Marine Fisheries Service. (2011). Biological Opinion on the Effects of the U.S. Navy's Proposal to Conduct Training Exercises in the Hawai'i Range Complex and the National Marine Fisheries Service's Permits, Conservation, and Education Division's proposal to issue a Letter of Authorization. (pp. 328).

National Oceanic Atmospheric Administration. (2009). Taking and Importing Marine Mammals; U.S. Navy Training in the Southern California Range Complex; Final Rule. [Electronic Version]. *Federal Register, 50 C.F.R. Part 216*(3882), 3918.

U.S. Department of the Navy. (2000). Compliance with Environmental Requirements in the Conduct of Naval Exercises or Training At Sea. (pp. 11). Prepared for Chief of Naval Operations, Commandant of Marine Corps.

U.S. Department of the Navy. (2007a). Chief of Naval Operations Instruction 3000.13C, Personnel Tempo of Operations Program, January 16, 2007.

U.S. Department of the Navy. (2007b). Final Supplemental Environmental Impact Statement for Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar.

U.S. Department of the Navy. (2008a). Southern California Range Complex Environmental Impact Statement/Overseas Environmental Impact Statement. U.S. Navy Pacific Fleet. Prepared by Naval Facilities Engineering Command Southwest.

U.S. Department of the Navy. (2008b). Hawaii Range Complex, Final Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS). Hawaii Range Complex. Prepared by Pacific Missile Range Facility.

U.S. Department of the Navy. (2008c). Final Environmental Impact Statement for the Introduction of the P-8A Multi-Mission Maritime Aircraft into the U.S. Navy Fleet.

U.S. Department of the Navy. (2008d). Final Environmental Assessment for the Homporting of Six Zumwalt Class Destroyers at East and West Coast Installations (including Hawaii). (pp. 258). Norfolk, Virginia. Prepared by Naval Facilities Engineering Command Atlantic.

U.S. Department of the Navy. (2009). Final Environmental Assessment Transition of E-2C Hawkeye to E-2D Advanced Hawkeye at Naval Station Norfolk, Virginia and Naval Base Ventura County Point Mugu, California. (pp. 335). Prepared by U.S. Department of the Navy.

U.S. Department of the Navy. (2011a). Silver Strand Training Complex Environmental Impact Statement [EIS]. Prepared by U.S. Pacific Fleet.

U.S. Department of the Navy. (2011b). Final Environmental Assessment for Helicopter Wings Realignment and MH-60 R/S Helicopter Transition at Naval Base Coronado, CA, August 2011. Prepared by U.S. Department of the Navy and U.S. Fleet Forces Command.

U.S. Department of the Navy. (2012). Final Environmental Assessment for the Homporting of the Littoral Combat Ship on the West Coast of the United States. Prepared by Naval Facilities Engineering Command Southwest.

U.S. Marine Corps. (2010). Final United States Marine Corps F-35B West Coast Basing Environmental Impact Statement (EIS). Prepared by Naval Facilities Engineering Command Southwest.

2 Description of Proposed Action and Alternatives

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

2 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

The United States (U.S.) Department of the Navy's (Navy's) Proposed Action is to conduct training and testing activities—which may include the use of active sonar and explosives[1]—throughout the in-water areas around the Hawaiian Islands and off the coast of Southern California, the transit corridor between Hawaii and Southern California, and Navy pierside locations. The Proposed Action includes activities such as sonar maintenance and gunnery exercises that are conducted concurrently with ship transits and may occur outside the geographic boundaries of Navy range complexes. The Proposed Action also includes pierside sonar testing that is conducted as part of overhaul, modernization, maintenance and repair activities at Navy piers located in Hawaii and Southern California.

Through this Environmental Impact Statement (EIS)/Overseas EIS (OEIS), the Navy will:

- Reassess the environmental analyses of Navy at-sea training and testing activities contained in three separate EIS/OEISs and various environmental planning documents, and consolidate these analyses into a single environmental planning document. This reassessment will support reauthorization of marine mammal incidental take permits under the Marine Mammal Protection Act (MMPA) and incidental takes of threatened and endangered marine species under the Endangered Species Act (ESA). The three EIS/OEIS documents being consolidated analyzed the following range complexes:
  - Hawaii Range Complex (HRC)
  - Southern California (SOCAL) Range Complex
  - Silver Strand Training Complex (SSTC)
- Adjust baseline training and testing activities from current levels to the levels needed to support Navy training and testing requirements beginning January 2014. As part of these adjustments, the Navy proposes to account for other activities and sound sources not addressed in the previous analyses.
- Analyze the potential environmental impacts of training and testing activities in additional areas (areas not covered in previous National Environmental Protection Act (NEPA) documents where training and testing historically occurs, including Navy ports, naval shipyards, and Navy-contractor shipyards and the transit corridor between Hawaii and Southern California.
- Update the at-sea environmental impact analyses for Navy activities in the previous documents to account for force structure changes, including those resulting from the development, testing, and use of weapons, platforms, and systems that will be operational by 2019.
- Implement enhanced range capabilities.
- Update environmental analyses with the best available science and most current acoustic analysis methods to evaluate the potential effects of training and testing activities on the marine environment.

In this chapter, the Navy will build upon the purpose and need to train and test by describing the Study Area and identifying the primary mission areas under which these activities are conducted. Each warfare community conducts activities that uniquely contribute to the success of a primary mission area (described in Section 2.2, Primary Mission Areas). Each primary mission area requires unique skills, sensors, weapons, and technologies to accomplish the mission. For example, in the primary mission area of anti-submarine warfare, surface, submarine, and aviation communities each utilize different skills,

[1] The terms 'explosive' and 'high explosive' will be used interchangeably throughout the document.

sensors, and weapons to locate, track, and eliminate submarine threats. The testing community contributes to the success of anti-submarine warfare by anticipating and identifying technologies and systems that respond to the needs of the warfare communities. As each warfare community develops its basic skills and integrates them into combined units and strike groups, the problems of communication, coordination and planning, movement and positioning of naval forces and targeting/delivery of weapons become increasingly complex. This complexity creates a need for coordinated training and testing between the fleets and systems commands.

In order to address the activities needed to accomplish training and testing in this EIS/OEIS, the Navy has broken down each training and testing activity into basic components that are analyzed for their potential environmental impacts. The training and testing events are captured in tables and the discussion that follows. Additionally, Chapter 2 provides detailed discussion of how the training and testing activities occur and the platforms, weapons, and systems that are required to complete the activities.

Chapter 2 is organized into eight sections.

- Section 2.1 outlines the area where these activities would occur.
- Section 2.2 outlines the primary mission areas.
- Section 2.3 provides information on sonar, ordnance and munitions, and targets utilized during training and testing activities.
- Section 2.4 outlines the proposed training and testing activities.
- Section 2.5 outlines the process to develop the alternatives for the Proposed Action.
- Sections 2.6, 2.7, and 2.8 outline the No Action Alternative and the Action Alternatives proposed in this EIS/OEIS.

The proposed activities are complex and therefore, the Navy has prepared several appendices that provide a greater level of detail. These appendices will be referenced in the appropriate chapters.

2.1 Description of the Hawaii-Southern California Training and Testing Study Area

The Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area) is comprised of established operating and warning areas across the north-central Pacific Ocean, from Southern California west to Hawaii and the International Date Line. The Study Area includes three existing Navy range complexes: the SOCAL Range Complex, HRC, and SSTC. The Proposed Action also includes pierside testing at Navy piers located in Hawaii and Southern California, and transit corridors on the high seas that are not part of the range complexes, where training and sonar testing may occur during vessel transit.[2]

A range complex is a designated set of specifically bounded geographic areas and encompasses a water component (above and below the surface), airspace, and may encompass a land component where

[2] Vessel transit corridors are the routes typically used by Navy assets to traverse from one area to another. The route depicted in Figure 2.1-1 is the shortest route between Hawaii and Southern California, making it the quickest and most fuel-efficient. Depicted vessel transit corridor is notional and may not represent the actual routes used by ships and submarines transiting from Southern California to Hawaii and back. Actual routes navigated are based on a number of factors including, but not limited to, weather, training, and operational requirements.

training and testing of military platforms, tactics, munitions, explosives, and electronic warfare systems occurs. Range complexes include established ocean operating areas (OPAREAs) and special use airspace, which may be further divided to provide better control of the area and events for safety reasons.

- **Operating Area.** An ocean area defined by geographic coordinates with defined surface and subsurface areas and associated special use airspace. OPAREAs may include the following:
  - **Danger Zones.** A danger zone is a defined water area used for target practice (gunnery), bombing, rocket firing or other especially hazardous military activities. Danger zones are established pursuant to statutory authority of the Secretary of the Army and are administered by the Army Corps of Engineers. Danger zones may be closed to the public on a full-time or intermittent basis (33 Code of Federal Regulations [C.F.R.] 334).
  - **Restricted Areas.** A restricted area is a defined water area for the purpose of prohibiting or limiting public access to the area. Restricted areas generally provide security for Government property and/or protection to the public from the risks of damage or injury arising from the Government's use of that area (33 C.F.R. 334).
- **Special Use Airspace.** Airspace of defined dimensions where activities must be confined because of their nature or where limitations may be imposed upon aircraft operations that are not part of those activities (Federal Aviation Administration Order 7400.8). Types of special use airspace most commonly found in range complexes include the following:
  - **Restricted Areas.** Airspace where aircraft are subject to restriction due to the existence of unusual, often invisible hazards (e.g., release of ordnance) to aircraft. Some areas are under strict control of the Department of Defense (DoD) and some are shared with non-military agencies.
  - **Military Operations Areas.** Airspace with defined vertical and lateral limits established for the purpose of separating or segregating certain military training activities from instrument flight rules traffic and to identify visual flight rules traffic where these activities are conducted.
  - **Warning Area.** Areas of defined dimensions, extending from 3 nautical miles (nm) outward from the coast of the United States, which serve to warn nonparticipating aircraft of potential danger.
  - **Air Traffic Control Assigned Airspace.** Airspace that is Federal Aviation Administration defined and is not over an existing OPAREA. It is used to contain specified activities, such as military flight training, that are segregated from other instrument flight rules air traffic.

The Study Area includes the transit corridor and only the at-sea components of SOCAL, HRC, and SSTC, and pierside locations in Hawaii and Southern California. The land-based portions of the range complexes are not a part of the Study Area and Navy activities occurring in these locations (including aviation activities occurring over these land areas) will be or have been addressed under separate NEPA documentation. Some training and testing occurs outside the OPAREAs (i.e., some activities are conducted seaward of the OPAREAs, and a limited amount of active sonar is used shoreward of the OPAREAs, at and in transit to and from Navy piers). The Study Area and typical transit corridor are depicted in Figure 2.1-1.

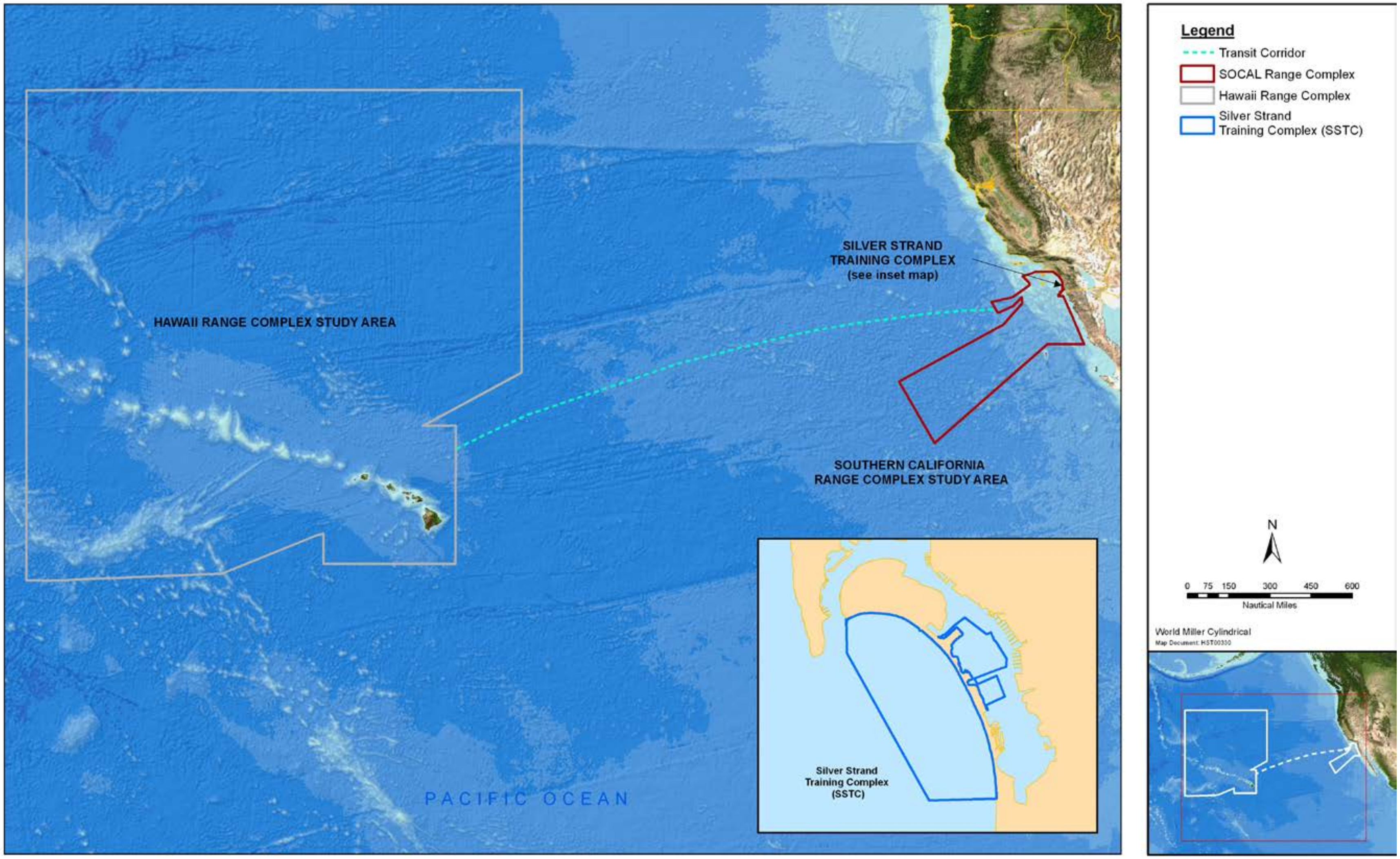


Figure 2.1-1: Hawaii-Southern California Training and Testing Study Area

2.1.1 HAWAII RANGE COMPLEX

The HRC geographically encompasses ocean areas located around the Hawaiian Islands chain. The ocean areas extend from 16 degrees north latitude to 43 degrees north latitude and from 150 degrees west longitude to the International Date Line, forming an area approximately 1,700 nm by 1,600 nm.

The largest component of the HRC is the Temporary OPAREA, extending north and west from the island of Kauai, and comprising over 2 million square nautical miles (nm^2) of air and sea space. This area is used for Navy ship transits throughout the year, and is used only a few times each year for missile defense testing activities. In spite of the Temporary OPAREA's size, nearly all of the training and testing activities in the HRC take place within the smaller Hawaii OPAREA, that portion of the range complex immediately surrounding the island chain from Hawaii to Kauai (Figure 2.1-2). The Hawaii OPAREA consists of 235,000 nm^2 of special use airspace, and sea and undersea ocean areas.

The Navy did not re-analyze the land portions of the HSTT range complexes because the National Historic Preservation Act compliance, incidental take statements, and biological opinions of non-jeopardy for land-based activities will not be altered by the Proposed Action. Likewise, ballistic missile defense activities at the Pacific Missile Range Complex will not be re-analyzed.

2.1.1.1 Special Use Airspace

The HRC includes over 115,000 nm^2 of special use airspace. As depicted in Figure 2.1-2, this airspace is almost entirely over the ocean and includes warning areas, air traffic control assigned airspace, and restricted areas.

- Warning Areas of the HRC make up more than 58,000 nm^2 of special use airspace and include the following: W-186, W-187, W-188, W-189, W-190, W-191, W-192, W-193, W-194, and W-196.
- The air traffic control assigned airspace areas of the HRC account for more than 57,000 nm^2 of special use airspace and include the following areas: Luna East, Luna Central, Luna West, Mahi, Haka, Mela South, Mela Central, Mela North, Nalu, Taro, Kaela East, Kaela West, Pele, and Pele South.
- The restricted area airspace over or near land areas within the HRC make up another 81 nm^2 of special use airspace and include R-3101, R-3103, and R-3107. Kaula Island is located completely within R-3107, west-southwest of Kauai. This EIS/OEIS will include analysis of only the marine environment surrounding Kaula Island, and not potential impacts to the island itself. Impacts to the natural and cultural resources of Kaula Island were analyzed in the HRC EIS/OEIS (U.S. Department of the Navy 2008a) and remain current.

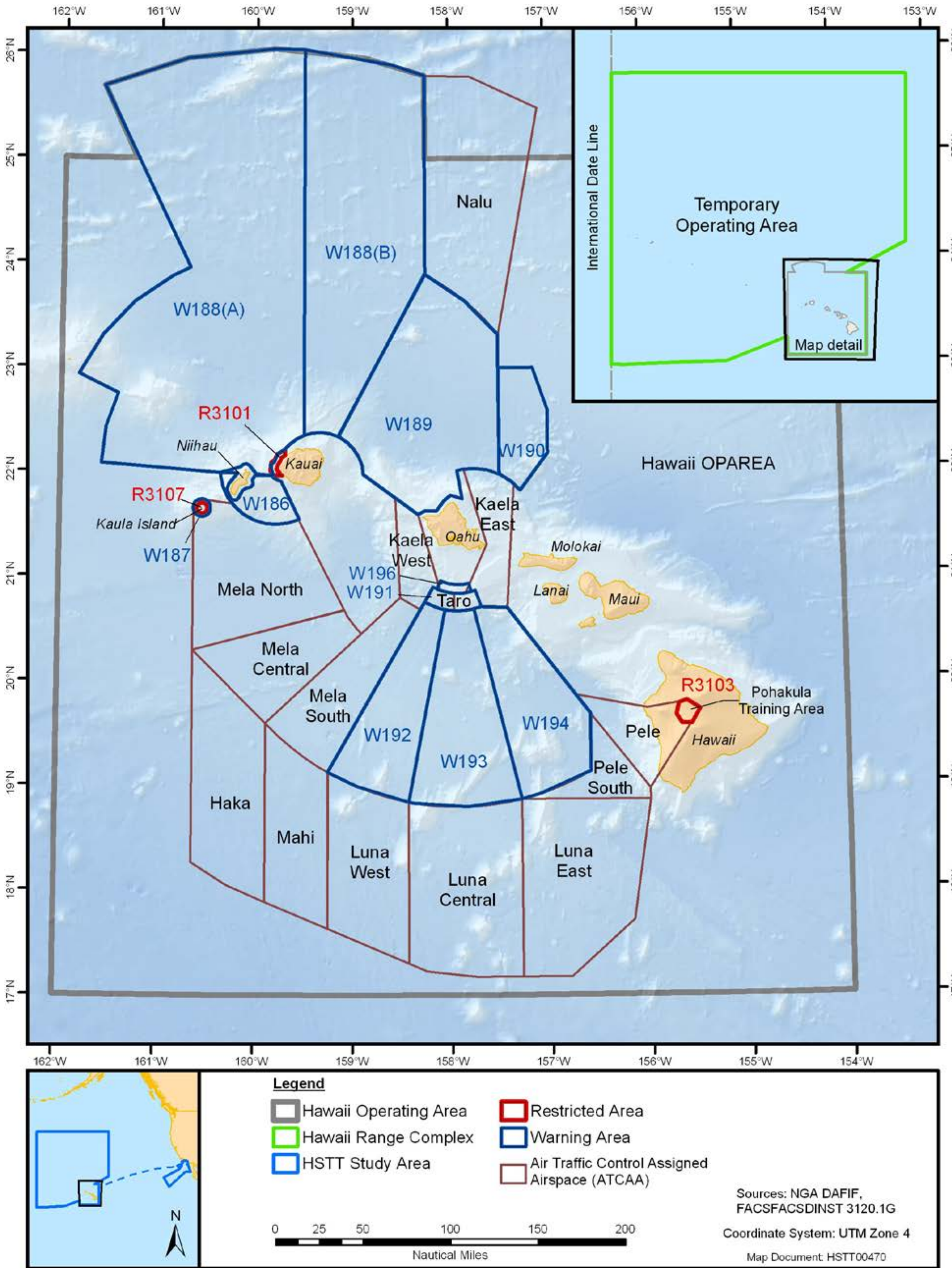


Figure 2.1-2: Hawaii Range Complex

2.1.1.2 Sea and Undersea Space

The HRC includes the ocean areas as described above, as well as specific training areas around the islands of Kauai (Figure 2.1-3), Oahu (Figure 2.1-4), and Maui (Figure 2.1-5). The HRC also includes the ocean portion of the Pacific Missile Range Facility (PMRF) on Kauai (Figure 2.1-3), which is both a fleet training range and a fleet and DoD testing range. The facility includes 1,020 nm^2 of instrumented ocean area at depths between 1,800 feet (ft.) (549 meters [m]) and 15,000 ft. (4,572 m).

2.1.2 SOUTHERN CALIFORNIA RANGE COMPLEX

The SOCAL Range Complex is situated between Dana Point and San Diego, and extends more than 600 nm southwest into the Pacific Ocean (Figure 2.1-6). The two primary components of the SOCAL Range Complex are the ocean OPAREAs and the special use airspace. These components encompass 120,000 nm^2 of sea space; 113,000 nm^2 of special use airspace; and over 56 square miles ($mi.^2$) (145 square kilometers [km^2]) of land area. Although the land activities at San Clemente Island were analyzed in the SOCAL EIS/OEIS (U.S. Department of the Navy 2008b, c) and will not be reanalyzed in this EIS/OEIS, the offshore and nearshore areas around San Clemente Island are included for analysis (Figure 2.1-7 and Figure 2.1-8).

2.1.2.1 Special Use Airspace

Most of the special use airspace in the SOCAL Range Complex is defined by Warning Area 291 (W-291) (Figure 2.1-9). Warning Area 291 extends vertically from the ocean surface to 80,000 ft. (24,400 m) above mean sea level and encompasses 113,000 nm^2 of airspace. In addition to W-291, the SOCAL Range Complex includes the following two areas:

- Western San Clemente OPAREA is a special use airspace that extends from the surface to 5,000 ft. (1,500 m) above mean sea level.
- Helicopter Offshore Training Area is located off the coast of San Diego, and extends from the surface to 1,000 ft. (300 m) above mean sea level.

2.1.2.2 Sea and Undersea Space

The SOCAL Range Complex includes approximately 120,000 nm^2 of sea and undersea space, largely defined as that ocean area underlying the Southern California special use airspace described above. The SOCAL Range Complex also extends beyond this airspace to include the surface and subsurface area from the northeastern border of W-291 to the coast of San Diego County, and includes San Diego Bay. In addition, a small part of the Point Mugu Sea Range is included in the Study Area. This approximately 1,000 nm^2 area of the Point Mugu Sea Range, and only that part of the Point Mugu Sea Range, is used by the Navy for anti-submarine warfare training conducted in the course of major range events and is analyzed under this document. The remaining portions of the 27,278 nm^2 Point Mugu Sea Range including San Nicolas island are subject to separate NEPA analysis (U.S. Department of the Navy 2002).

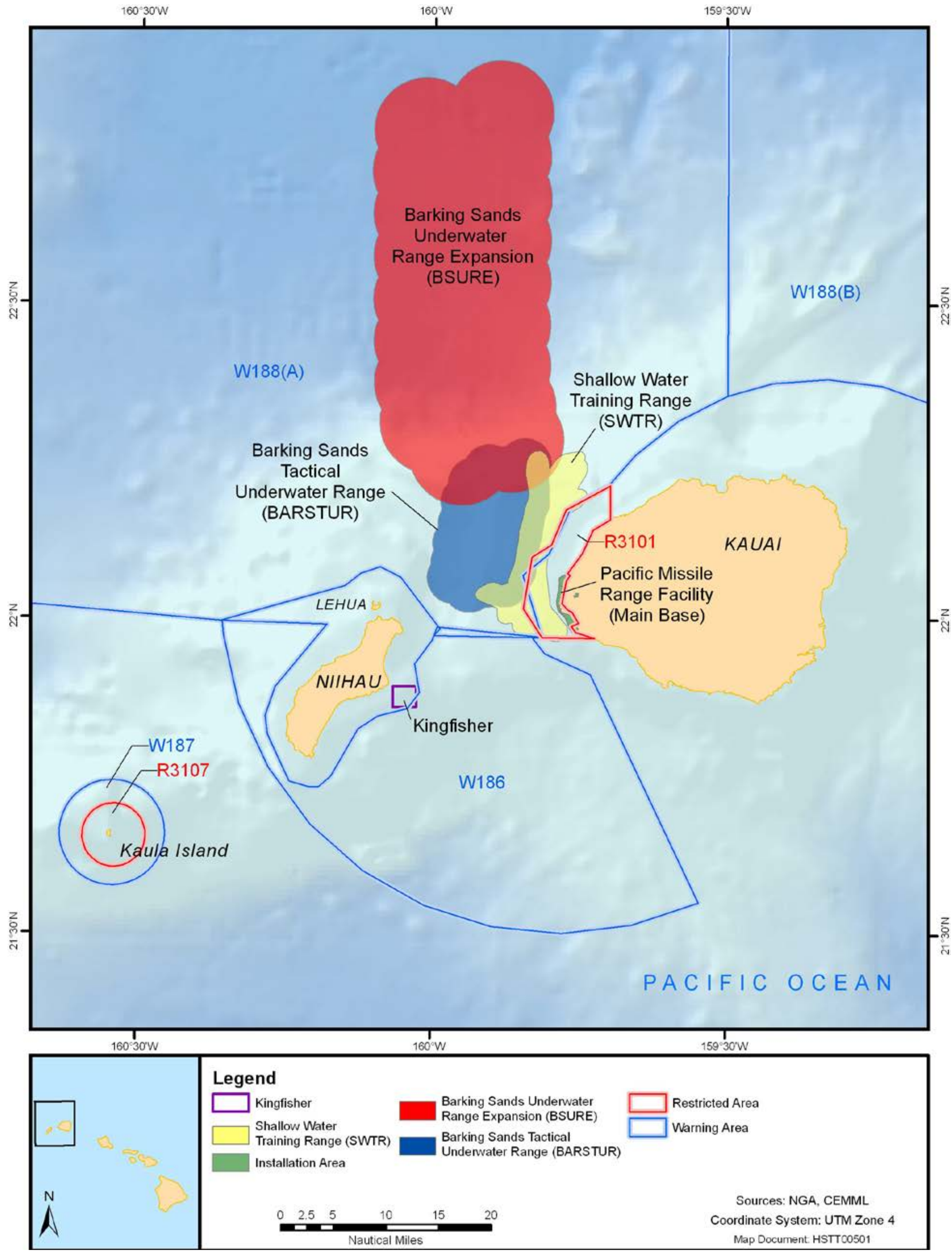


Figure 2.1-3: Navy Training Areas Around Kauai

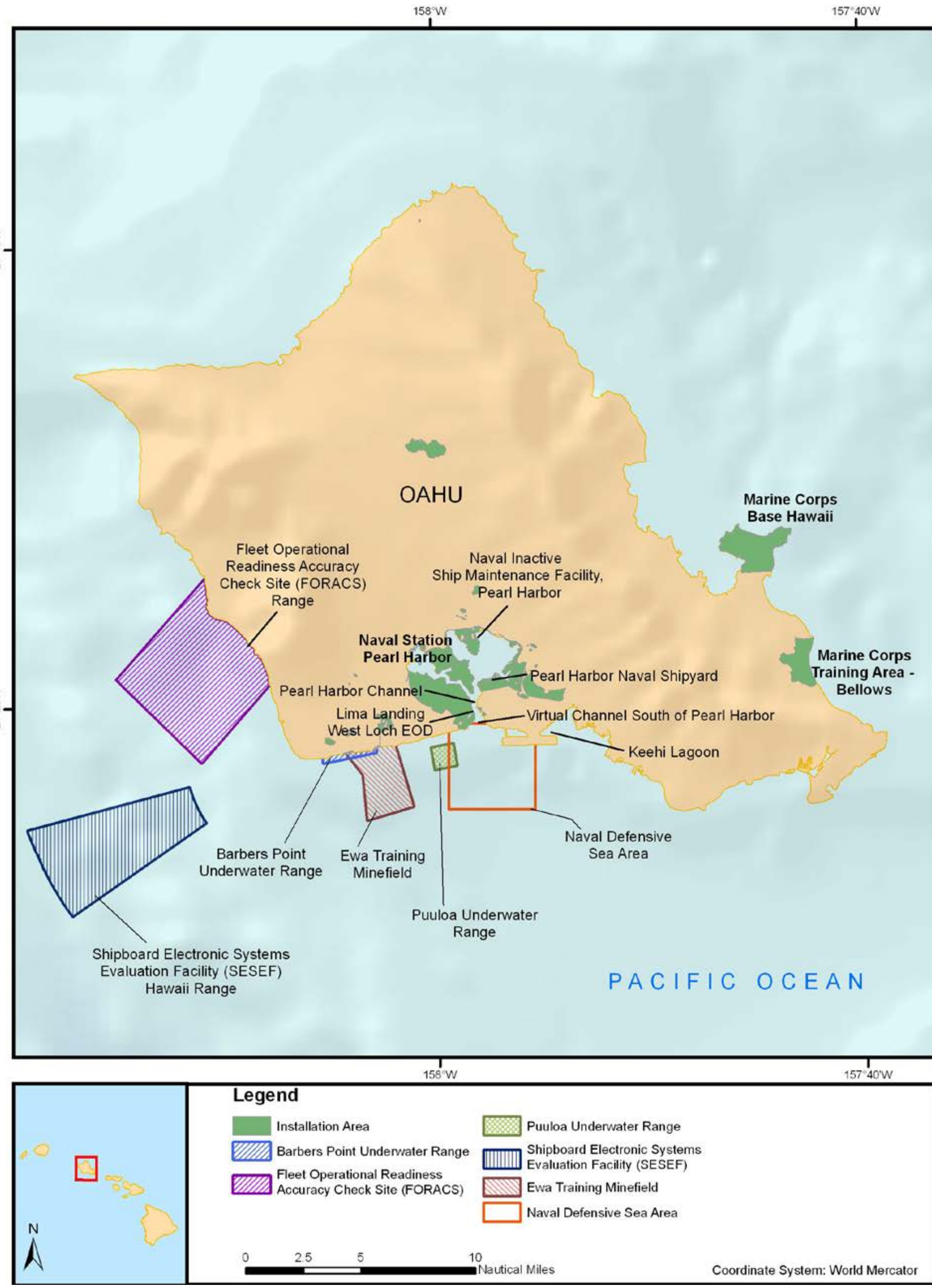


Figure 2.1-4: Oahu Training Locations

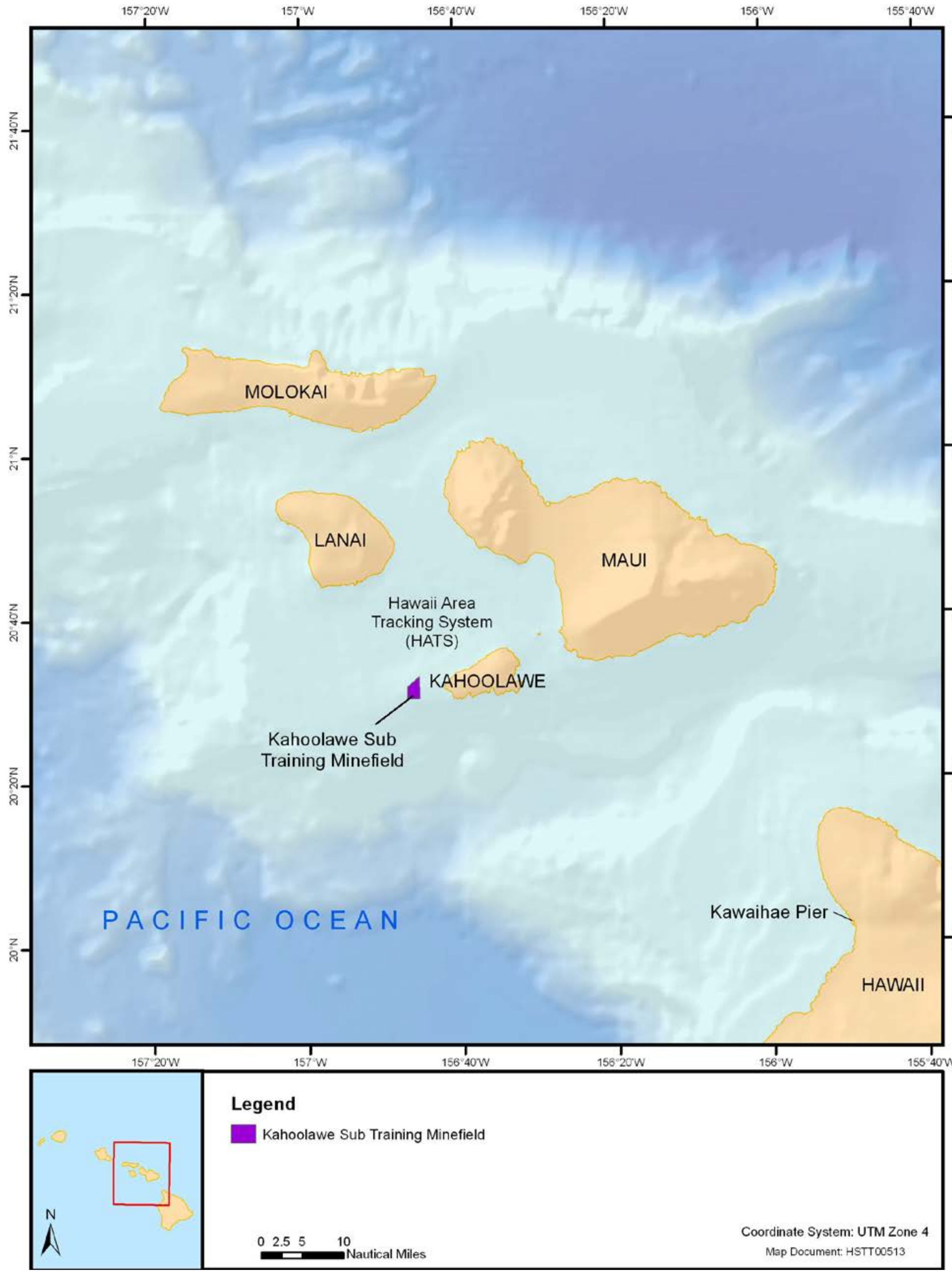


Figure 2.1-5: Maui Training Locations

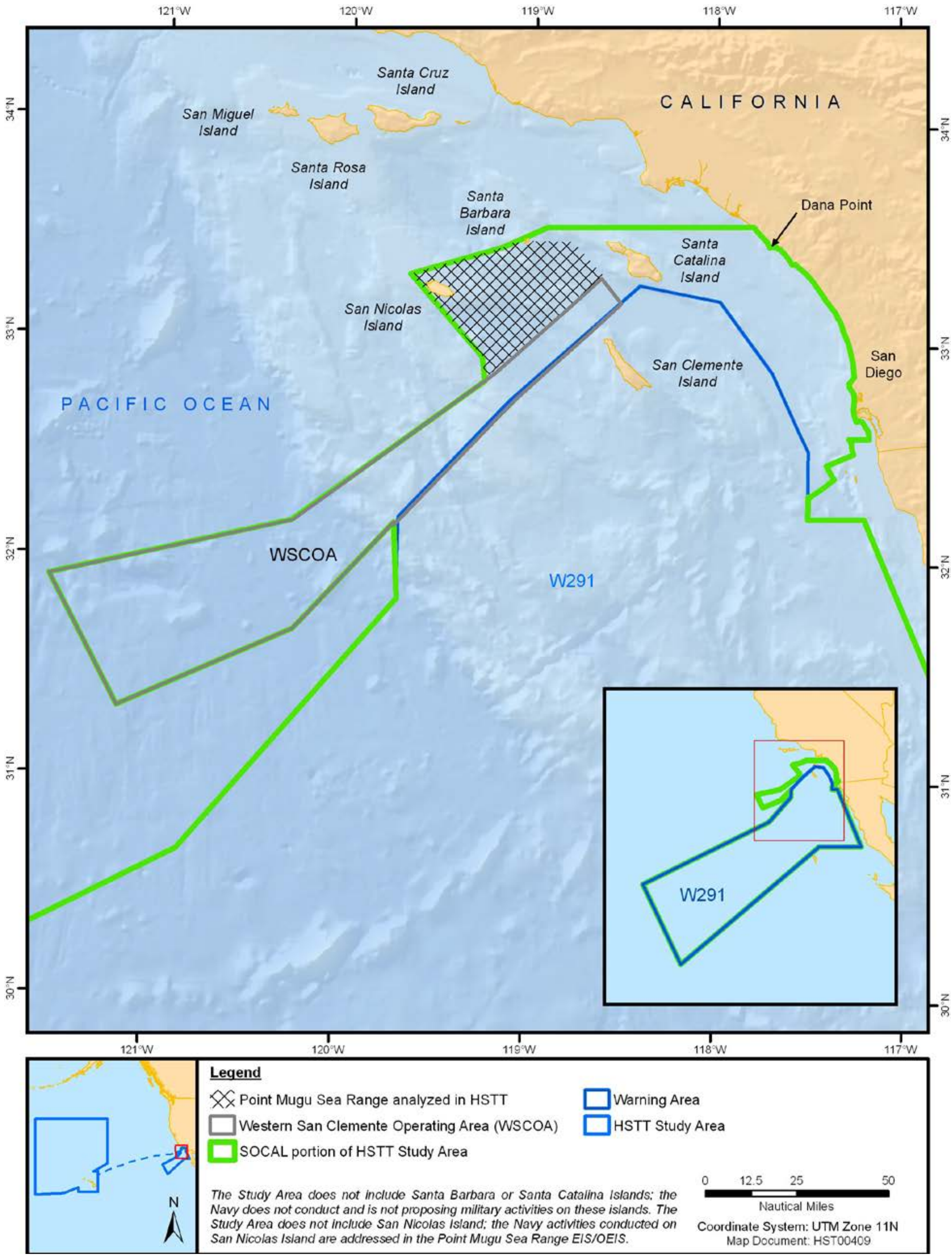


Figure 2.1-6: Southern California Range Complex

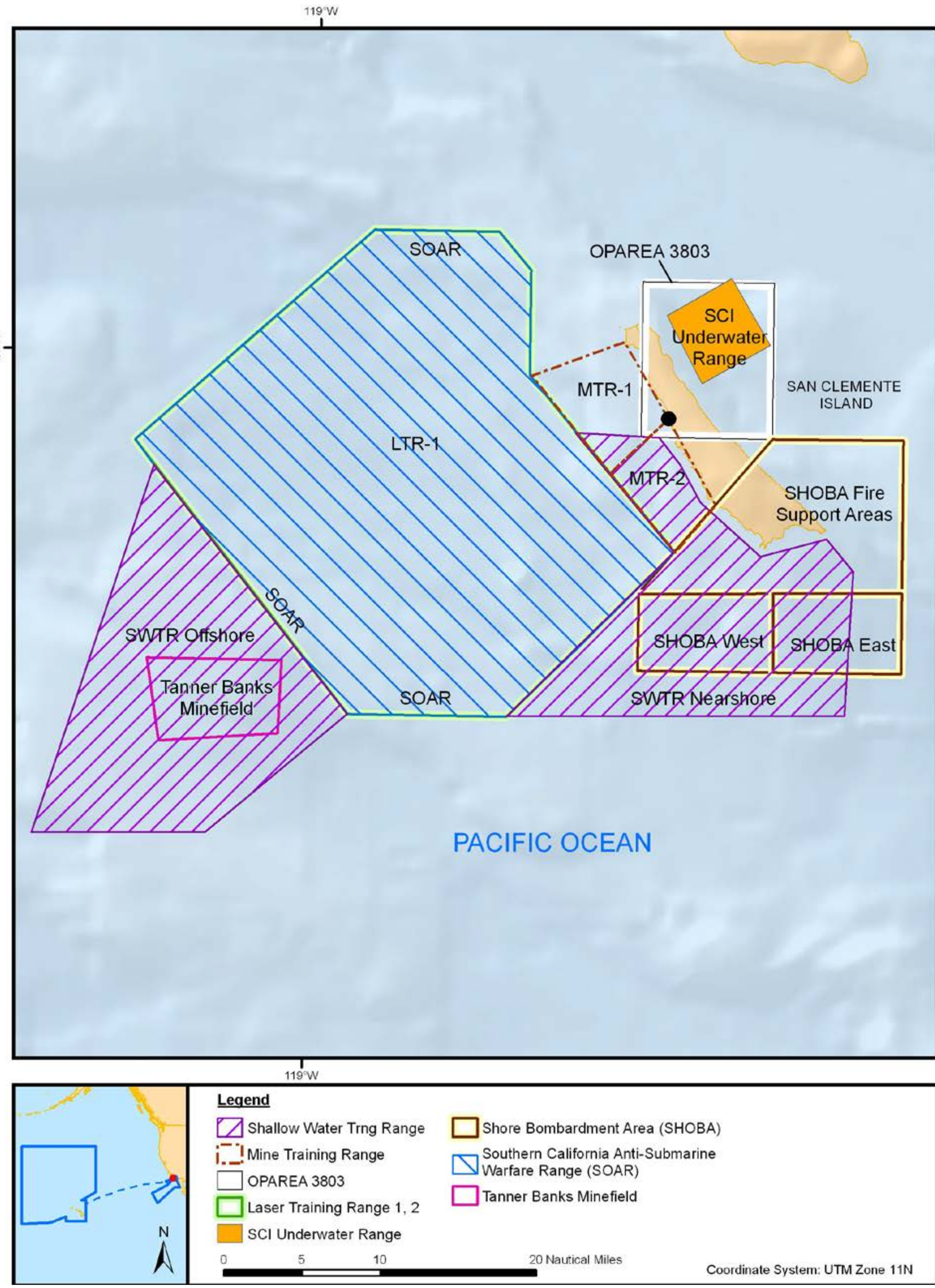


Figure 2.1-7: San Clemente Island Offshore Training Areas

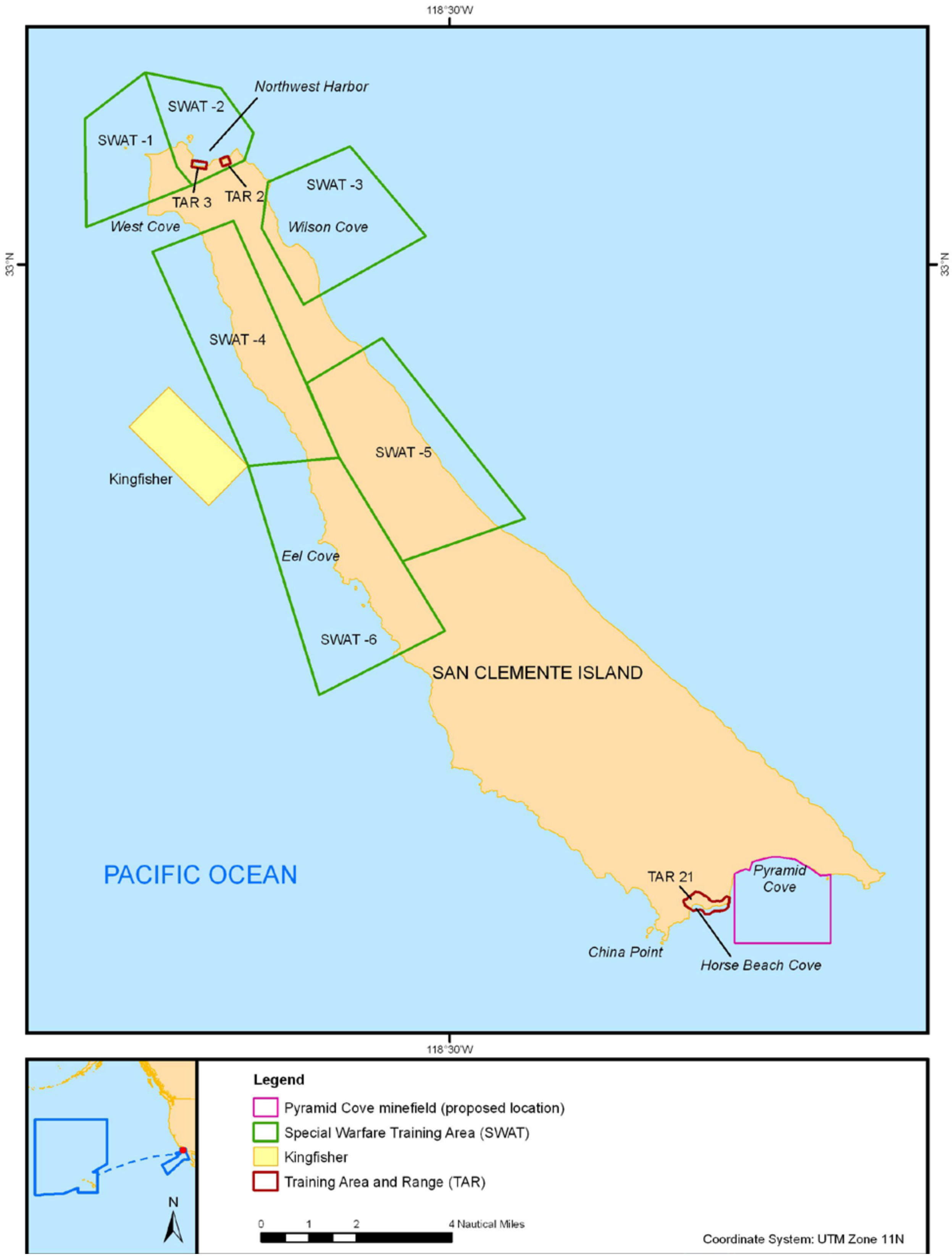


Figure 2.1-8: San Clemente Island Nearshore Training Areas

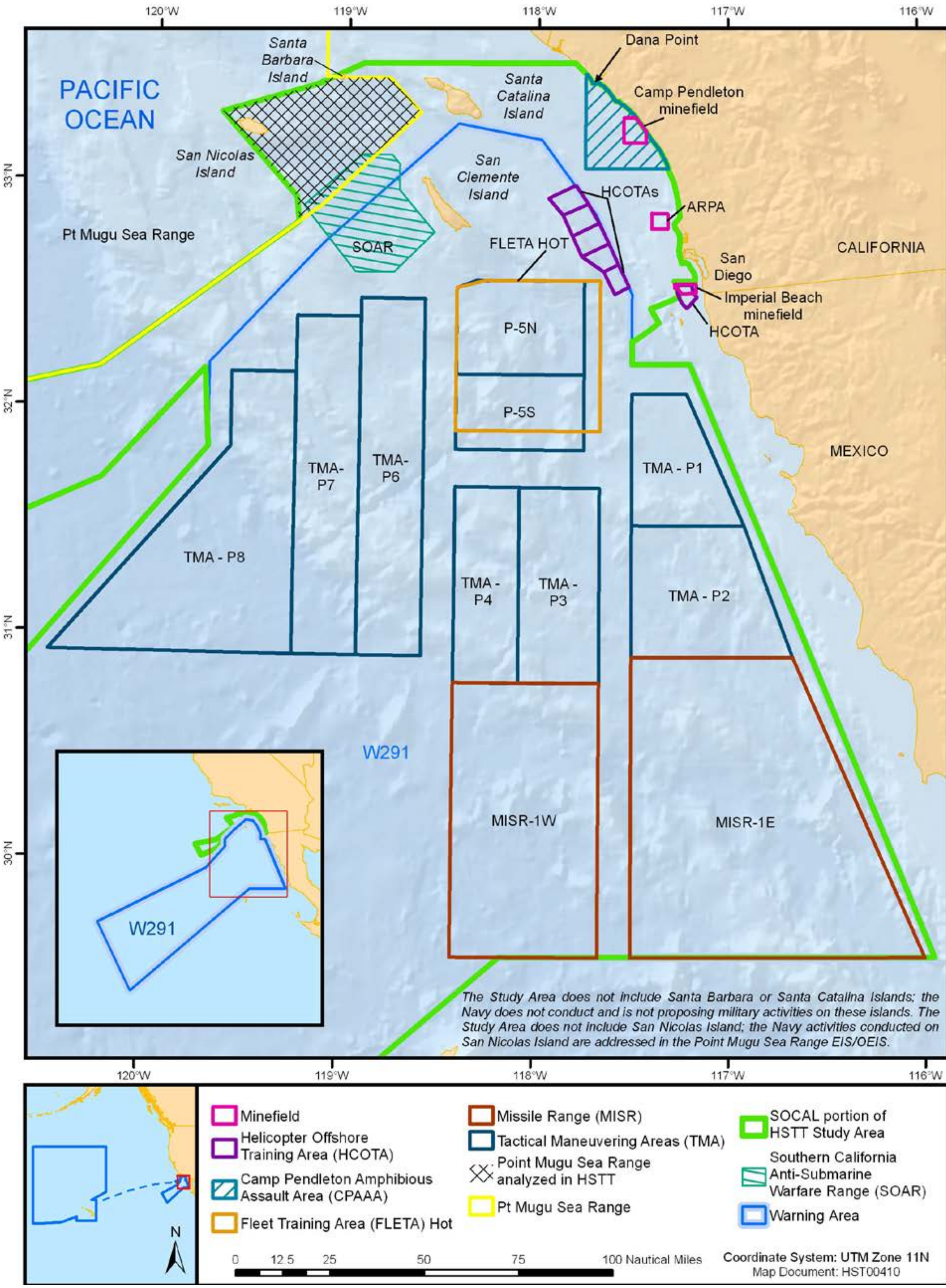


Figure 2.1-9: Southern California Training Areas

2.1.3 SILVER STRAND TRAINING COMPLEX

The SSTC is an integrated set of training areas located on and adjacent to the Silver Strand, a narrow, sandy isthmus separating the San Diego Bay from the Pacific Ocean. It is divided into two non-contiguous areas: SSTC-North and SSTC-South (Figure 2.1-10). The SSTC-North includes 10 oceanside boat training lanes (numbered as Boat Lanes 1-10, ocean anchorage areas (numbered 101 through 178), bayside water training areas (Alpha through Hotel), and the Lilly Ann drop zone. The boat training lanes are each 500 yards (yd.) (457 m) wide stretching 4,000 yd. (3,657 m) seaward and forming a 5,000 yd. long (4,572 m long) contiguous training area. The SSTC-South includes four oceanside boat training lanes (numbered as Boat Lanes 11–14).

The anchorages lie offshore of Coronado in the Pacific Ocean and overlap a portion of Boat Lanes 1–10. The anchorages are each 654 yd. (598 m) in diameter and are grouped together in an area located primarily due west of SSTC-North, east of Zuniga Jetty and the restricted areas on approach to the San Diego Bay entrance.

While there are land ranges in the SSTC, the land activities at SSTC ranges were analyzed in the SSTC EIS (U.S. Department of the Navy 2011) and will not be reanalyzed in this EIS/OEIS.

2.1.4 OCEAN OPERATING AREAS OUTSIDE THE BOUNDS OF EXISTING RANGE COMPLEXES (TRANSIT CORRIDOR)

In addition to the three range complexes that are part of the Study Area, a transit corridor outside the boundaries of the range complexes will also be included as part of the Study Area in the analysis. Although not part of any defined range complex, this transit corridor is important to the Navy in that it provides adequate air, sea, and undersea space in which vessels and aircraft conduct training and some sonar maintenance and testing while en route between Southern California and Hawaii.

The transit corridor, defined by the great circle route (e.g., shortest distance) from San Diego to the center of the HRC, as depicted in Figure 2.1-1, and is generally used by ships transiting between the SOCAL Range Complex and HRC. While in transit, ships and aircraft would, at times, conduct basic and routine unit level training such as gunnery, bombing, and sonar training, as long as the training does not interfere with the primary objective of reaching their intended destination. Ships also conduct sonar maintenance, which includes active sonar transmissions.

Figure 2.1-10: Silver Strand Training Complex

2.1.5 PIERSIDE LOCATIONS AND SAN DIEGO BAY

The Study Area includes select pierside locations where Navy surface ship and submarine sonar maintenance testing occur. For purposes of this EIS/OEIS, pierside locations include channels and routes to and from Navy ports, and facilities associated with Navy ports and shipyards. These locations in the Study Area are located at Navy ports and naval shipyards in San Diego Bay, California and Pearl Harbor, Hawaii (Figure 2.1-11). In addition, some testing activities occur throughout San Diego Bay.

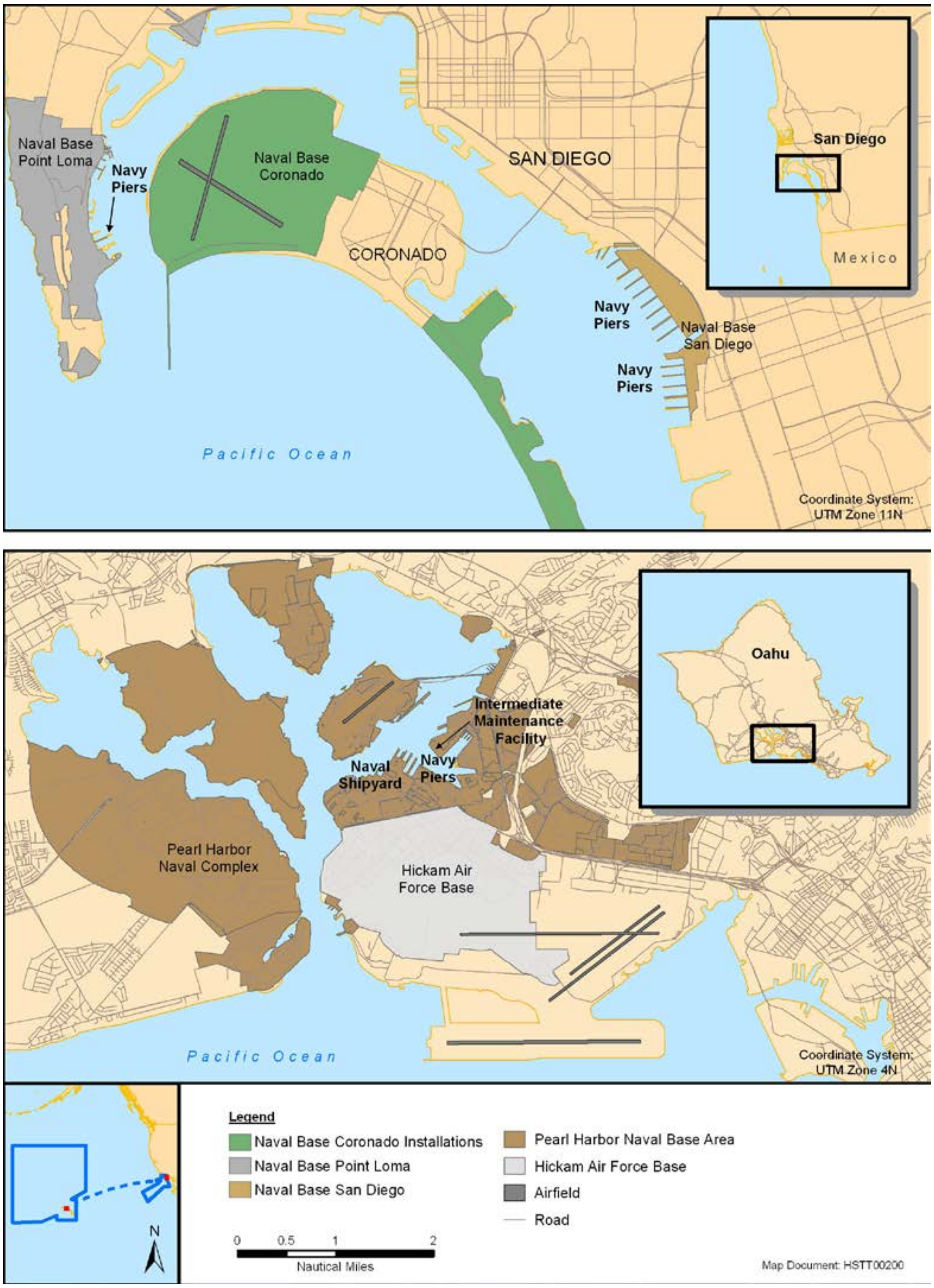


Figure 2.1-11: Navy Piers and Shipyards in San Diego and Pearl Harbor

2.2 PRIMARY MISSION AREAS

The Navy categorizes training activities into functional warfare areas called primary mission areas. Training activities fall into the following eight primary mission areas:

- Anti-Air Warfare
- Amphibious Warfare
- Strike Warfare
- Anti-Surface Warfare
- Anti-Submarine Warfare
- Electronic Warfare
- Mine Warfare
- Naval Special Warfare

Most training activities addressed in this EIS/OEIS are categorized under one of these primary mission areas; those activities that do not fall within one of these areas are in a separate category. Each warfare community (surface, subsurface, aviation, and special warfare) may train in some or all of these primary mission areas. The research and acquisition community also categorizes some, but not all, of its testing activities under these primary mission areas.

The sonar, ordnance, munitions, and targets used in the training and testing activities are described in Section 2.3 (Descriptions of Sonar, Ordnance/Munitions, Targets, and Other Systems Employed in Hawaii-Southern California Training and Testing Events). A short description of individual training and testing events, as well the sonar and ordnance used and military expended materials is provided in Tables 2.4-1 through 2.4-5 (Section 2.4, Proposed Activities). More detailed descriptions of the training and testing activities are provided in Appendix A (Navy Activities Descriptions).

2.2.1 ANTI-AIR WARFARE

The mission of anti-air warfare is to destroy or reduce enemy air and missile threats (including unmanned airborne threats) and serves two purposes: to protect U.S. forces from attacks from the air and to gain air superiority. Anti-air warfare also includes providing U.S. forces with adequate attack warnings, while denying hostile forces the ability to gather intelligence about U.S. forces.

Aircraft conduct anti-air warfare through radar search, detection, identification, and engagement of airborne threats—generally by firing anti-air missiles or cannon fire. Surface ships conduct anti-air warfare through an array of modern anti-aircraft weapon systems such as aircraft detecting radar, naval guns linked to radar-directed fire-control systems, surface-to-air missile systems, and radar-controlled cannons for close-in point defense. Impacts from anti-air warfare activities conducted over land were analyzed in previous documents and remain valid.

Testing of anti-air warfare systems is required to ensure the equipment is fully functional under the conditions in which it will be used. Tests may be conducted on radar and other early-warning detection and tracking systems, new guns or gun rounds, and missiles. Testing of these systems may be conducted on new ships and aircraft and on existing ships and aircraft following maintenance, repair, or modification. For some systems, tests are conducted periodically to assess operability. Additionally, tests may be conducted in support of scientific research to assess new and emerging technologies. Testing events are often integrated into training activities and in most cases the systems are used in the same manner in which they are used for fleet training activities.

2.2.2 AMPHIBIOUS WARFARE

The mission of amphibious warfare is to project military power from the sea to the shore through the use of naval firepower and Marine Corps landing forces. It is used to attack a threat located on land by a military force embarked on ships. Amphibious warfare operations include small unit reconnaissance or raid missions to large-scale amphibious operations involving multiple ships and aircraft combined into a strike group.

Amphibious warfare training ranges from individual, crew, and small unit events to large task force exercises. Individual and crew training include amphibious vehicles and naval gunfire support training. Such training includes shore assaults, boat raids, airfield or port seizures, and reconnaissance. Large-scale amphibious exercises involve ship-to-shore maneuver, naval fire support, such as shore bombardment, and air strike and close air support training. However, only those portions of amphibious warfare training that occur at sea (up to the mean high tide mark) will be analyzed, as no land-based activities are analyzed in this EIS/OEIS. Land impacts were analyzed in previous documents (U.S. Department of the Navy 2008a, b, c; 2011) and remain valid.

Testing of guns, munitions, aircraft, ships, and amphibious boats and vehicles used in amphibious warfare are often integrated into training activities and in most cases the systems are used in the same manner in which they are used for fleet training activities. These tests, as well as full operational evaluations on existing amphibious vessels and vehicles following maintenance, repair, or modernization, may be conducted independently or in conjunction with other amphibious ship and aircraft activities. Testing is performed to ensure effective ship-to-shore coordination and transport of personnel, equipment, and supplies. Tests may also be conducted periodically on other systems, vessels, and aircraft intended for amphibious operations to assess operability and to investigate efficacy of new technologies.

2.2.3 STRIKE WARFARE

The mission of strike warfare is to conduct offensive attacks on land-based targets, such as refineries, power plants, bridges, major roadways, and ground forces to reduce the enemy's ability to wage war. Strike warfare employs weapons by manned and unmanned air, surface, submarine, and Navy special warfare assets in support of extending dominance over enemy territory (power projection).

Strike warfare includes training of fixed-wing attack aircraft pilots and aircrews in the delivery of precision-guided munitions, non-guided munitions, rockets, and other ordnance against land-based targets. Not all strike mission training events involve dropping ordnance and instead the event is simulated with video footage obtained by onboard sensors.

Testing of weapons used in strike warfare is conducted to develop new types of weapons that provide better capabilities and to ensure currently developed weapons perform as designed and deployed. Tests may also be conducted periodically on other systems, vessels, or aircraft intended for strike warfare operations to assess operability and to investigate efficacy of new technologies. Those strike warfare activities that occur over land were analyzed in previous documents. Analyses related to those activities remain valid.

2.2.4 ANTI-SURFACE WARFARE

The mission of anti-surface warfare is to defend against enemy ships or boats. In the conduct of anti-surface warfare, aircraft use cannons, air-launched cruise missiles or other precision-guided munitions; ships employ torpedoes, naval guns, and surface-to-surface missiles; and submarines attack surface ships using torpedoes or submarine-launched, anti-ship cruise missiles.

Anti-surface warfare training includes surface-to-surface gunnery and missile exercises, air-to-surface gunnery and missile exercises, and submarine missile or exercise torpedo launch events.

Testing of weapons used in anti-surface warfare is conducted to develop new technologies and to assess weapon performance and operability with new systems and platforms, such as unmanned systems. Tests include various air-to-surface guns and missiles, surface-to-surface guns and missiles, and bombing tests. Testing events may be integrated into training activities to test aircraft or aircraft systems in the delivery of ordnance on a surface target. In most cases the tested systems are used in the same manner in which they are used for fleet training activities.

2.2.5 Anti-Submarine Warfare

The mission of anti-submarine warfare is to locate, neutralize, and defeat hostile submarine threats to surface forces. Anti-submarine warfare is based on the principle of a layered defense of surveillance and attack aircraft, ships, and submarines all searching for hostile submarines. These forces operate together or independently to gain early warning and detection, and to localize, track, target, and attack hostile submarine threats.

Anti-submarine warfare training addresses basic skills such as detection and classification of submarines, distinguishing between sounds made by enemy submarines and those of friendly submarines, ships, and marine life. More advanced, integrated anti-submarine warfare training exercises are conducted in coordinated, at-sea training events involving submarines, ships, and aircraft. This training integrates the full spectrum of anti-submarine warfare from detecting and tracking a submarine to attacking a target using either exercise torpedoes or simulated weapons.

Testing of anti-submarine warfare systems is conducted to develop new technologies and assess weapon performance and operability with new systems and platforms, such as unmanned systems. Testing uses ships, submarines, and aircraft to demonstrate capabilities of torpedoes, missiles, countermeasure systems, and underwater surveillance and communications systems. Torpedo development, testing, and refinement are critical to successful anti-submarine warfare. At-sea sonar testing ensures systems are fully functional in an open-ocean environment prior to delivery to the fleet for operational use. Anti-submarine warfare systems on fixed wing aircraft and helicopters (including dipping sonar) are tested to evaluate the ability to search and track a submarine or similar target. Sonobuoys deployed from surface vessels and aircraft are tested to verify the integrity and performance of a group, or lot, of sonobuoys in advance of delivery to the fleet for operational use. The sensors and systems on board helicopters and maritime patrol aircraft are tested to ensure that tracking systems perform to specifications and meet operational requirements. Tests may be conducted as part of a large-scale fleet training event involving submarines, ships, fixed-wing aircraft, and helicopters. These integrated training events offer opportunities to conduct research and acquisition activities and to train aircrew in the use of new or newly enhanced systems during a large-scale, complex exercise.

2.2.6 Electronic Warfare

The mission of electronic warfare is to degrade the enemy's ability to use their electronic systems, such as communication systems and radar, to confuse or deny them the ability to defend their forces and assets. Electronic warfare is also used to recognize an emerging threat and counter an enemy's attempt to degrade the electronic capabilities of the Navy.

Typical electronic warfare activities include threat avoidance training, signals analysis for intelligence purposes, and use of airborne and surface electronic jamming devices to defeat tracking and communications systems. Impacts of overland air activities were analyzed in previous documents and remain valid.

Testing of electronic warfare systems is conducted to improve the capabilities of systems and ensure compatibility with new systems. Testing involves the use of aircraft, surface ships, and submarine crews to evaluate the effectiveness of electronic systems. Typical electronic warfare testing activities include the use of airborne and surface electronic jamming devices and chaff and flares to defeat tracking and communications systems. Chaff tests evaluate newly developed or enhanced chaff, chaff dispensing equipment, or modified aircraft systems' use against chaff deployment. Flare tests evaluate deployment performance and crew competency with newly developed or enhanced flares, flare dispensing equipment, or modified aircraft systems' use against flare deployment.

2.2.7 Mine Warfare

The mission of mine warfare is to detect, and avoid or neutralize (disable) mines to protect Navy ships and submarines and to maintain free access to ports and shipping lanes. Mine warfare also includes offensive mine laying to gain control of or deny the enemy access to sea space. Naval mines can be laid by ships (including purpose-built minelayers), submarines or aircraft.

Mine warfare training includes exercises in which ships, aircraft, submarines, underwater vehicles, or marine mammal detection systems search for mines. Personnel train to destroy or disable mines by attaching and detonating underwater explosives to the mine. Other neutralization techniques involve impacting the mine with a bullet-like projectile or intentionally triggering the mine to detonate.

Testing and development of mine warfare systems is conducted to improve sonar, laser, and magnetic detectors intended to hunt, locate, and record the positions of mines for avoidance or subsequent neutralization. Mine warfare testing and development falls into two primary categories: mine detection and classification, and mine countermeasure and neutralization. Mine detection and classification testing involves the use of air, surface, and subsurface vessels and uses sonar, including towed and side scan sonar, mine countermeasure systems, and unmanned vehicles to support mine detection and classification testing. These mine detection systems are generally helicopter-based and are sometimes used in conjunction with a mine neutralization system. Mine countermeasure and neutralization testing includes the use of air, surface, and subsurface units and uses tracking devices, countermeasure and neutralization systems, and general purpose bombs to evaluate the effectiveness of neutralizing mine threats. Most neutralization tests use mine shapes, or non-explosive practice mines, to evaluate a new or enhanced capability. During an airborne neutralization test, a previously located mine is destroyed or rendered nonfunctional using a helicopter based system that may involve the firing of a projectile or the deployment of a towed neutralization system. A small percentage of mine warfare tests require the use of high-explosive mines to evaluate and confirm the ability of the system to neutralize a high-explosive mine under operational conditions. The majority of mine warfare systems are currently deployed by ships and helicopters; however, future mine warfare missions will increasingly rely on unmanned vehicles. Tests may also be conducted in support of scientific research to support these new technologies.

2.2.8 Naval Special Warfare

The mission of naval special warfare is to conduct unconventional warfare, direct action, combat terrorism, special reconnaissance, information warfare, security assistance, counter-drug operations, and recovery of personnel from hostile situations. Naval special warfare operations are highly specialized and require continual and intense training.

Naval special warfare units are required to utilize a combination of specialized training, equipment, and tactics, including insertion and extraction operations using parachutes, submerged vehicles, rubber boats, and helicopters; boat-to-shore and boat-to-boat gunnery; underwater demolition training; reconnaissance; and small arms training. Land impacts were analyzed in previous documents and remain valid.

Testing is conducted on both conventional and unconventional weapons used by naval special warfare units, including testing of submersible vehicles capable of inserting and extracting personnel or payloads into denied areas from strategic distances, active acoustic devices, underwater communications systems, and underwater demolition technologies. Doppler sonar and side scan sonar are tested for their ability to be used during extraction and insertion missions.

2.3 Descriptions of Sonar, Ordnance/Munitions, Targets, and Other Systems Employed in Hawaii-Southern California Training and Testing Events

The Navy uses a variety of sensors, platforms, weapons, and other devices, including ones used to ensure the safety of Sailors and Marines, to meet its mission. Training and testing with these systems may introduce acoustic (sound) energy and expended materials into the environment. The environmental impact of these activities will be analyzed in Chapter 3 of this EIS/OEIS. This section presents and organizes sonar systems, ordnance, munitions, targets, and other systems in a manner intended to facilitate understanding of both the activities that use them and the environmental effects analysis that is later described in Chapter 3 of this EIS/OEIS.

2.3.1 Sonar and Other Acoustic Sources

2.3.1.1 What is Sonar?

Sonar, originally an acronym for “Sound Navigation And Ranging,” is a technique that uses underwater sound to navigate, communicate, or detect underwater objects (the term sonar is also used for the equipment used to generate and receive sound). There are two basic types of sonar: active and passive.

Active sonar emits sound waves that travel through the water, reflect off objects, and return to the receiver. Sonar is used to determine the distance to an underwater object by calculating the speed of sound in water and the time for the sound wave to travel to the object and back. For example, active sonar systems are used to track targets or to aid in navigation of the vessel by identifying known ocean floor features. Some whales, dolphins, and bats use echolocation, a similar technique, to identify their surroundings and to locate prey.

Passive sonar uses listening equipment, such as underwater microphones (hydrophones) and receiving sensors on ships, submarines, aircraft and autonomous vehicles, to pick up underwater sounds. The advantage of passive sonar is that it places no sound in the water, and thus does not reveal the location of the listening vessel. Passive sonar can indicate the presence, character, and direction of ships and submarines; however, passive sonar, as a tool for detecting submarines, is increasingly ineffective as modern submarines become quieter. Passive sonar has no potential acoustic impact on the environment and, therefore, is not discussed further or analyzed within this EIS/OEIS.

All sounds, including sonar, are categorized by frequency. For this EIS/OEIS, active sonar is categorized into four frequency ranges: low-frequency, mid-frequency, high-frequency, and very high-frequency.

- Low-frequency active sonar[3] emits sounds at frequencies less than 1 kilohertz (kHz). Low-frequency active sonar is useful for detecting objects at great distances because low-frequency sounds do not dissipate as rapidly as higher frequency sounds.
- Mid-frequency active sonar emits sound at frequencies from 1 to 10 kHz. Mid-frequency active sonar is the Navy's primary tool for detecting and identifying submarines. Active sonar in this frequency range provides a valuable combination of range and target accuracy.
- High-frequency active sonar emits sound at frequencies greater than 10 kHz, up to 100 kHz. High-frequency sounds dissipate rapidly and have a small effective range; however, high-frequency sounds provide higher resolution of objects and it is useful at detecting and identifying smaller objects such as sea mines.
- Very high-frequency sources are those that operate above 100 kHz but below 200 kHz.

Modern sonar technology includes a variety of sonar sensor and processing systems. In concept, the simplest active sonar emits sound waves, or "pings," sent out in multiple directions and the sound waves then reflect off of the target object in multiple directions (Figure 2.3-1). The sonar source calculates the time it takes for the reflected sound waves to return; this calculation determines the distance to the target object. More sophisticated active sonar systems emit a ping and then rapidly scan or listen to the sound waves in a specific area. This provides both distance to the target and directional information. Even more advanced sonar systems use multiple receivers to listen to echoes from several directions simultaneously and provide efficient detection of both direction and distance. It should be noted that active sonar is rarely used continuously throughout the listed activities. In addition, when sonar is in use, the sonar "pings" occur at intervals, referred to as a duty cycle, and the signals themselves are very short in duration. For example, a sonar that emits a 1-second ping every 10 seconds has a 10 percent duty cycle.

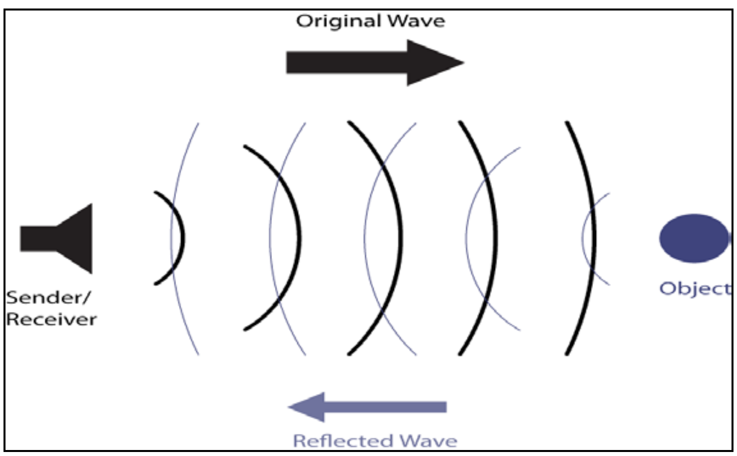


Figure 2.3-1: Principle of Active Sonar

The Navy utilizes sonar systems and other acoustic sensors in support of a variety of mission requirements. Primary uses include detection of and defense against submarines (anti-submarine

[3] Surveillance Towed Array Sensor System (SURTASS) Low-Frequency Active (LFA) sonar, which may be used in the Study Area, is not among the sources analyzed in this document. The potential environmental impacts from use of SURTASS LFA are analyzed in separate analyses under the National Environmental Policy Act.

warfare) and mines (mine warfare), safe navigation and effective communications, and oceanographic surveys. Specific examples of how sonar systems are used for Navy activities are discussed in the following sections.

2.3.1.2 Sonar Systems

Anti-Submarine Warfare. Systems used in anti-submarine warfare include sonar, torpedoes, and acoustic countermeasure devices. These systems are employed from a variety of platforms (surface ships, submarines, helicopters, and fixed-wing aircraft). Surface ships conducting anti-submarine warfare are typically equipped with hull-mounted sonar (passive and active) for the detection of submarines. Helicopters use dipping sonar or sonobuoys (passive and active) to locate submarines (or submarine targets during training and testing exercises). Fixed-wing aircraft deploy both active and passive expendable sonobuoys to assist in detecting and tracking submarines. Submarines are equipped with hull-mounted sonar to detect, localize, and track other submarines and surface ships. Submarines primarily use passive sonar; active sonar is used mostly for navigation. There are also unmanned vehicles currently under development that will be used to deploy anti-submarine warfare systems.

Anti-submarine warfare activities often use mid-frequency (i.e., 1 to 10 kHz) active sonar, though low-frequency and high-frequency active sonar systems are also used for specialized purposes. The Navy is currently developing and testing sonar systems that may utilize lower frequencies and longer duty cycles—albeit at lower source levels—than current systems. However, these new systems would be operational only if they significantly increase the Navy's ability to detect and identify quiet submarine threats.

The types of sonar systems and acoustic sensors used during anti-submarine warfare sonar training and testing exercises include the following:

- **Surface Ship Sonar Systems.** A variety of surface ships operate hull-mounted mid-frequency active sonar during training exercises and testing activities (Figure 2.3-2). Typically, only cruisers, destroyers, and frigates have surface ship sonar systems.

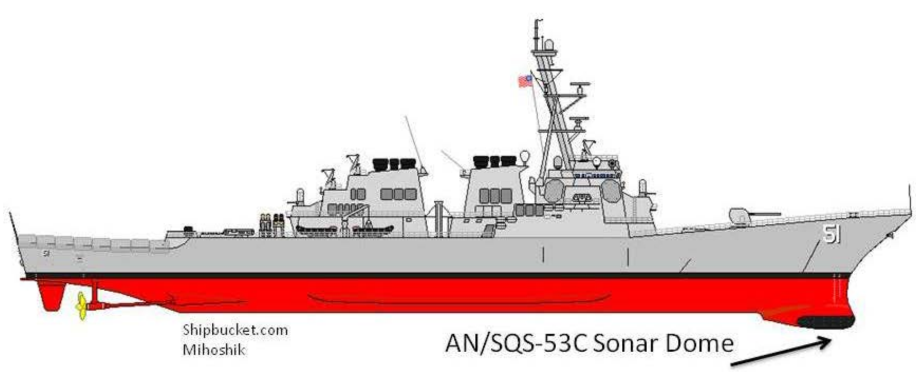


Figure 2.3-2: Guided Missile Destroyer with AN/SQS-53 Sonar

- **Submarine Sonar Systems.** Submarines are equipped with hull-mounted mid-frequency and high-frequency active sonar used to detect and target enemy submarines and surface ships (Figure 2.3-3). A submarine's mission relies on its stealth; therefore, a submarine uses its active sonar sparingly because each sound emission gives away the submarine's location.

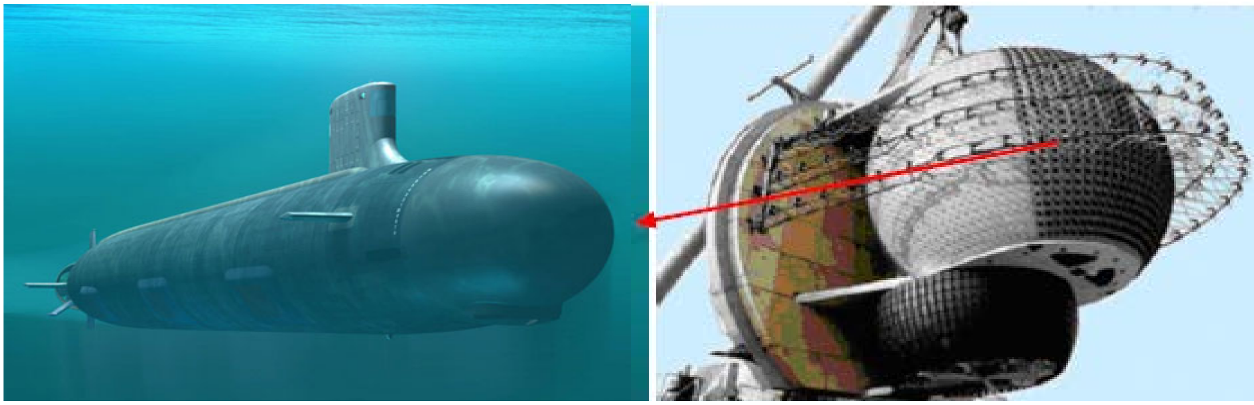


Figure 2.3-3: Submarine AN/BQQ-10 Active Sonar Array

- **Aircraft Sonar Systems.** Aircraft sonar systems include sonobuoys and dipping sonar**.**
  - **Sonobuoys.** Sonobuoys are expendable devices that contain a transmitter and a hydrophone. The sounds collected by the sonobuoy are transmitted back to the aircraft for analysis. Sonobuoys are either active or passive and allow for short- and long-range detection of surface ships and submarines. These systems are deployed by both helicopter and fixed-wing patrol aircraft (Figure 2.3-4).

Figure 2.3-4: Sonobuoys (e.g., AN/SSQ-62)

  - **Dipping Sonar.** Dipping sonar systems include recoverable devices lowered into the water via cable from manned and unmanned helicopters. The sonar detects underwater targets and determines the distance and movement of the target relative to the position of the helicopter (Figure 2.3-5).

Figure 2.3-5: Helicopter Deploys Dipping Sonar

- **Exercise Torpedoes.** Torpedoes are equipped with sonar that helps the torpedoes find their targets. To understand how and when this torpedo sonar is used, the following description is provided. Surface ships, aircraft, and submarines primarily use torpedoes in anti-submarine warfare (Figure 2.3-6). Recoverable, non-explosive torpedoes, categorized as either lightweight or heavyweight, are used during training and testing. Heavyweight torpedoes use a guidance system to operate the torpedo autonomously or remotely through an attached wire (guidance wire). The autonomous guidance systems operate either passively (listening for sounds generated by the target) or actively (pinging to search for the target). Torpedo training in the Study Area is mostly simulated—solid masses that approximate the weight and shape of a torpedo are fired, rather than fully functional torpedoes. Testing in the Study Area mostly uses fully functional exercise torpedoes.

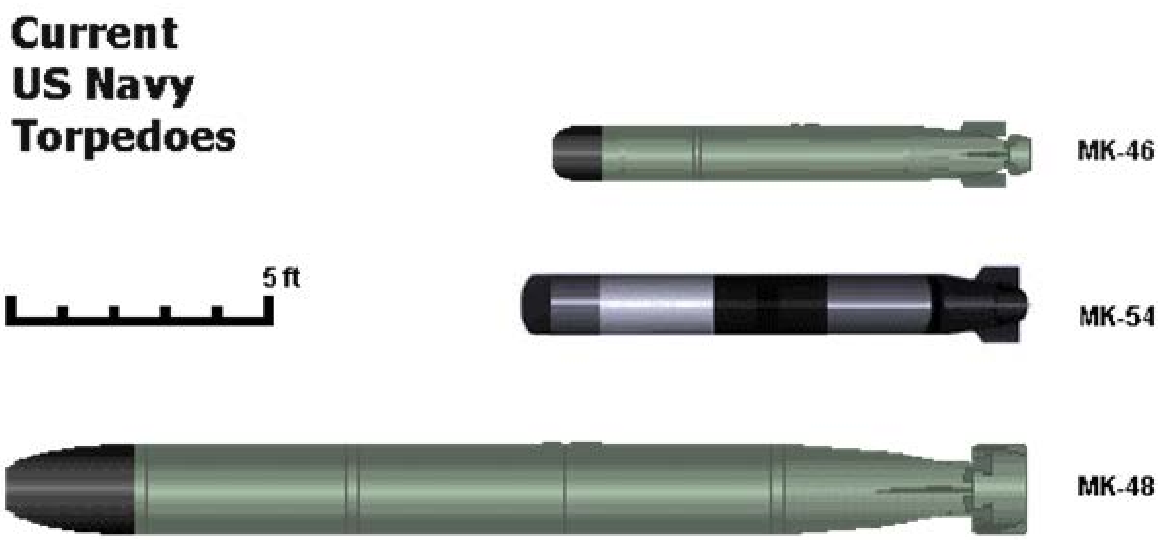


Figure 2.3-6: Navy Torpedoes

- **Acoustic Countermeasures.** Countermeasure devices are towed or free-floating noisemakers that alter the acoustic signature of a Navy ship or submarine, thereby avoiding detection, or act as an alternative target for an incoming threat (e.g., torpedo). Countermeasures are either expendable or recoverable (Figure 2.3-7).

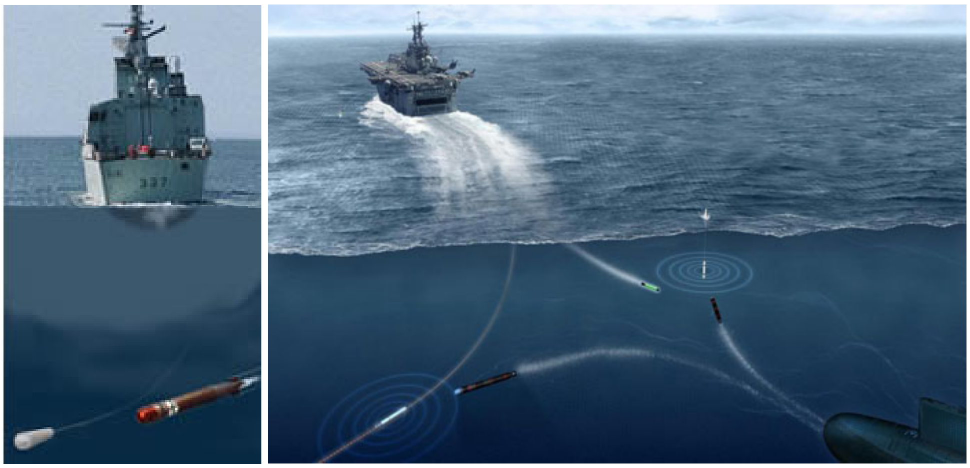


Figure 2.3-7: Acoustic Countermeasures

- **Anti-Submarine Warfare Training Targets.** These targets are equipped with one or more sound producing capabilities that allow the targets to better simulate actual submarines. To understand how and when these sound sources are used, the following description is provided. Anti-submarine warfare training targets (Figure 2.3-8) are autonomous undersea vehicles that are used to simulate target submarines. The training targets are equipped with one or more of the following devices: (1) acoustic projectors emitting sounds to simulate submarine acoustic signatures, (2) echo repeaters to simulate the characteristics of the echo of a sonar signal reflected from a submarine, and (3) magnetic sources that mimic those of a submarine.

Figure 2.3-8: Anti-Submarine Warfare Training Targets

Mine Warfare. Mine warfare training and testing activities use a variety of different sonar systems that are typically high-frequency and very high-frequency. These sonar systems (Figure 2.3-9) are used to detect, locate, and characterize moored and bottom mines. The majority of mine warfare sonar systems can be deployed by more than one platform (i.e., helicopter, unmanned underwater vehicle, submarine, or surface ship) and may be interchangeable among platforms. Surface ships and submarines use sonar to detect mines and objects and minesweeping ships use a specialized variable-depth mine detection and classification high-frequency active sonar system to detect mines.

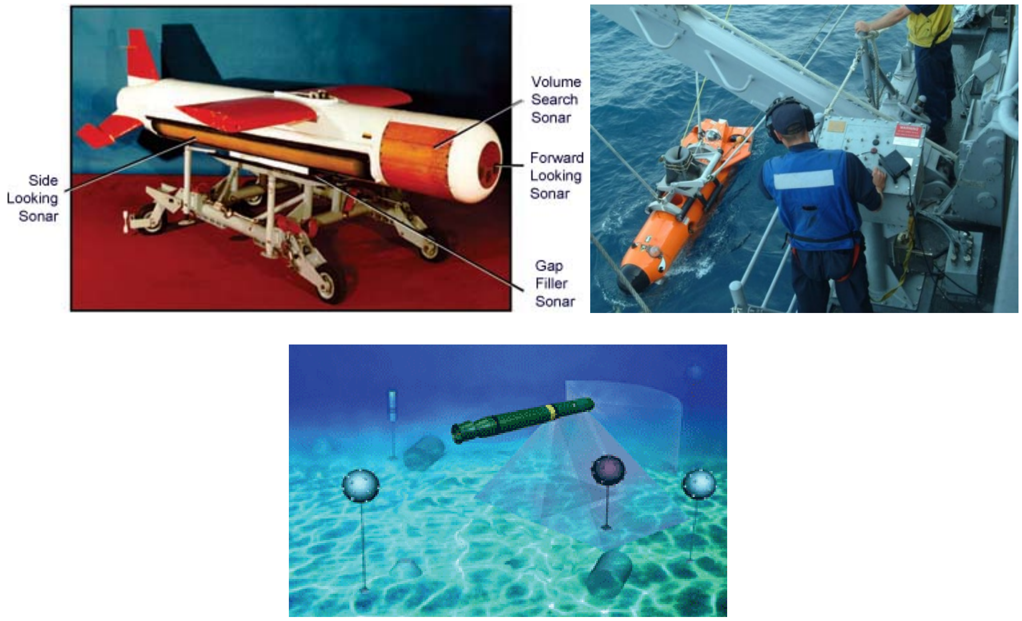


Figure 2.3-9: Mine Warfare Systems

Safety, Navigation, Communications, and Oceanographic Systems. Naval ships, submarines, and unmanned vehicles rely on equipment and instrumentation that uses active sonar during both routine operations and training and testing events. Sonar systems are used to gauge water depth; detect and map objects, navigational hazards, and the ocean floor; and transmit communication signals.

Other Acoustic Sensors. The Navy uses a variety of other acoustic sensors to protect ships anchored or at the pier, as well as shore facilities. These systems, both active and passive, detect potentially hostile swimmers, broadcast warnings to alert Navy divers of potential hazards, and gather information regarding ocean characteristics (ocean currents, wave measurements). They are generally stationary systems in Navy harbors and piers. Navy marine mammals (Atlantic bottlenose dolphins [*Tursiops truncatus*] and California sea lions [*Zalophus californianus*]) are also used to detect hostile swimmers around Navy facilities. A trained animal is deployed under behavioral control of a handler to find an intruding swimmer. Upon finding the 'target' of the search, the animal returns to the boat and alerts the animal handlers and the animals are given a localization marker or leg cuff that they attach to the intruder. Swimmers that have been marked with a leg cuff are reeled-in by security support boat personnel via a line attached to the cuff. In addition, the Navy's research and acquisition community uses various sensors for tracking during testing activities and to collect data for test analysis.

2.3.2 ORDNANCE/MUNITIONS

Most ordnance and munitions used during training and testing events fall into three basic categories: projectiles, missiles, and bombs. Ordnance can be further defined by their net explosive weight, which is the actual weight in pounds of the explosive substance without the packaging, casings, bullets, etc. Net explosive weight is also the trinitrotoluene (TNT) equivalent of energetic material, which is the standard measure of strength of bombs and other explosives. For example, a 2,000-pound (lb.) (907.7 kilogram [kg]) bomb may have anywhere from 600 to 1,000 lb. (272.3 to 453.8 kg) of net explosive weight.

Projectiles. Projectiles are fired during gunnery exercises from a variety of weapons, including pistols and rifles to large-caliber turret mounted guns on the decks of Navy ships. Projectiles can be either high-explosive munitions (e.g., certain cannon shells) or non-explosive practice munitions (e.g., rifle/pistol bullets). Explosive rounds can be fused to either explode on impact or in the air (i.e., just prior to impact). Projectiles are broken down into three basic categories in this EIS/OEIS:

- **Small-Caliber Projectiles.** Includes projectiles up to 0.50 caliber (approximately 0.5-inch [in.] diameter). Small-caliber projectiles (e.g., bullets), are primarily fired from pistols, rifles, and machine guns (Figure 2.3-10). Most small-caliber projectiles are fired during training events for an individual Sailor to become and remain proficient.

Figure 2.3-10: Shipboard Small Arms Training

- **Medium-Caliber Projectiles.** These projectiles are larger than 0.50 caliber, but smaller than 57 millimeter (mm) (approximately 2.25 in. diameter). The most common size medium-caliber projectiles are 20 mm, 25 mm, and 40 mm. Medium-caliber projectiles are fired from machine guns operated by one to two crewmen and mounted on the deck of a ship, wing-mounted guns on aircraft, and fully automated guns mounted on ships for defense against missile attack (Figure 2.3-11). Medium-caliber projectiles also include 40 mm grenades, which can be fired from hand-held grenade launcher or crew-served deck-mounted guns. Medium-caliber projectiles can be non-explosive practice munitions or high-explosive projectiles. High-explosive projectiles are usually fused to detonate on impact; however, advanced high-explosive projectiles can detonate based on time, distance, or proximity to a target.

Figure 2.3-11: Shipboard Medium-Caliber Projectiles

- **Large-Caliber Projectiles.** These include projectiles 57 mm and larger. The largest projectile currently in service has a 5 in. (12.7 centimeter [cm]) diameter (Figure 2.3-12), but larger weapons are under development. The most widely used large-caliber projectiles are 57 mm, 76 mm, and 5 in. The most common 5 in. (12.7 cm) projectile is approximately 26 in. (66 cm) long and weighs 70 lb. (31.7 kg). Large-caliber projectiles are fired exclusively from turret mounted guns located on ship decks and can be used to fire on surface ships and boats, in defense against missiles and aircraft, and against land-based targets. Large-caliber projectiles can be non-explosive practice munitions or high-explosive munitions. High-explosive projectiles can detonate on impact or in the air.

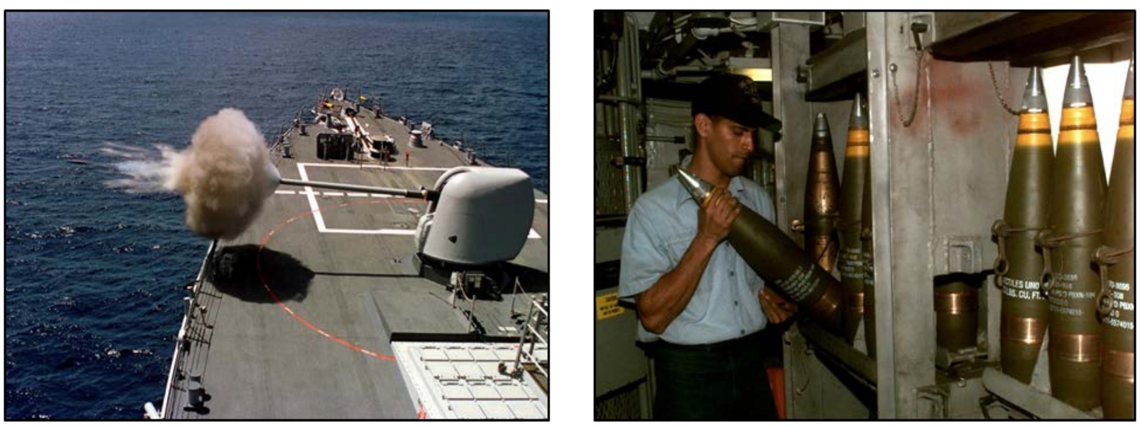


Figure 2.3-12: Large–Caliber Projectile Use

Missiles. Missiles are rocket or jet-propelled munitions used to attack ships, aircraft, and land-based targets, as well as defend ships against other missiles. Guidance systems and advanced fusing technology ensure that missiles reliably impact on or detonate near their intended target. Missiles are categorized according to their intended target, as described below, and can be further classified according to net explosive weight. Rockets are included within the category of missiles.

- **Anti-Air Missiles.** Anti-air missiles are fired from aircraft and ships against enemy aircraft and incoming missiles (Figure 2.3-13). Anti-air missiles are configured to explode near, or on impact with, their intended target. Missiles are the primary ship-based defense against incoming missiles.

Figure 2.3-13: Rolling Airframe Missile (left), Air-to-Air Missile (right)

- **Anti-Surface Missiles.** Anti-surface missiles are fired from aircraft, ships, and submarines against surface ships (Figure 2.3-14). Anti-surface missiles are typically configured to detonate on impact.

Figure 2.3-14: Anti-Surface Missile Fired from MH-60 Helicopter

- **Strike Missiles.** Strike missiles are fired from aircraft, ships, and submarines against land-based targets. Strike missiles are typically configured to detonate on impact, or near their intended target. The AGM-88 High-speed Anti-Radiation Missile, which is used to destroy enemy radar sites, is an example of a strike missile that is used during at-sea training, and is fired at a seaborne target that replicates a land-based radar site.

Bombs. Bombs are unpowered munitions dropped from aircraft on land and water targets. The majority of bombs used during training and testing in the Study Area are non-explosive. However, explosive munitions are occasionally used for proficiency inspections and testing requirements. Bombs are in two categories: general-purpose bombs and subscale practice bombs. Similar to missiles, bombs are further classified according to the net explosive weight of the bomb.

- **General Purpose Bombs.** General-purpose bombs (Figure 2.3-15) consist of precision-guided and unguided full-scale bombs, ranging in size from 250 to 2,000 lb. (113 to 907 kg). Common bomb nomenclature used includes MK 80 series, which is the Navy's standard model; Guided Bomb Units and Joint Direct Attack Munitions, which are precision-guided (including laser-guided) bombs; and the Joint Standoff weapon, which is a long range "glider" precision weapon.

Figure 2.3-15: F/A-18 Bomb Release (Left) and Loading General Purpose Bombs (Right)

- **Subscale Bombs.** Subscale bombs (Figure 2.3-16) are non-explosive practice munitions containing a spotting (smoke) charge to aid in scoring the accuracy of hitting the target during training and testing activities. Common subscale bombs are 25 lb. (11.3 kg) and less and are steel-constructed. Laser guided training rounds are another variation of a subscale practice bomb. They weigh approximately 100 lb. and are cost-effective non-explosive weapons used in training aircrew in laser-guided weapons employment.

Figure 2.3-16: Subscale Bombs for Training

Other Munitions. There are other munitions and ordnance used in naval at-sea training and testing events that do not fit into one of the above categories, and are discussed below.

- **Demolition Charges.** Divers place explosive charges in the marine environment during some training and testing activities. These activities may include the use of timed charges, in which the charge is placed, a timer is started, and the charge detonates at the set time. Munitions of up to 60 lb. (27 kg) blocks of C-4 plastic explosive with the necessary detonators and cords are used to support mine neutralization, demolition, and other warfare activities. All demolition charges are further classified according to the net explosive weight of the charge.

- **Anti-Swimmer Grenades.** Maritime security forces use hand grenades to defend against enemy scuba divers.

- **Torpedoes.** Explosive torpedoes are required in some training and testing events. Torpedoes are described as either lightweight or heavyweight and are further categorized according to the net explosive weight.

- **Extended Echo Ranging Sonobuoys.** Extended Echo Ranging sonobuoys include Improved Extended Echo Ranging sonobuoys and mini sound-source seeker sonobuoys that use explosive charges as the active sound source instead of electrically-produced sounds.

2.3.3 TARGETS

Training and testing require an assortment of realistic and challenging targets. Targets vary from items as simple and ordinary as an empty steel drum, used for small-caliber weapons training from the deck of a ship, to sophisticated, unmanned aerial drones used in air defense training. For this EIS/OEIS, targets are organized by warfare area.

- **Anti-Air Warfare Targets.** Anti-air warfare targets, tow target systems, and aerial targets are used in training and testing events that involve detection, tracking, defending against, and attacking enemy missiles and aircraft. Aerial towed target systems include textile (nylon banner) and rigid (fiberglass shapes) towed targets used for gunnery events. Aerial targets include expendable rocket-powered missiles and recoverable radio-controlled drones used for gunnery and missile exercises (Figure 2.3-17). Parachute flares are used as air-to-air missile targets. Manned high-performance aircraft may be used as targets—to test ship and aircraft defensive systems and procedures—without the actual firing of munitions.

Figure 2.3-17: Anti-Air Warfare Targets

- **Anti-Surface Warfare Targets.** Stationary and towed targets are used as anti-surface warfare targets during gunnery events. Targets include floating steel drums, inflatable shapes or target balloons (e.g., Killer Tomato™, see Figure 2.3-18), fiberglass catamarans, and towed sleds. Remote-controlled, high-speed targets, such as jet skis and motorboats, are also used (Figure 2.3-19).

Figure 2.3-18: Deploying a "Killer Tomato™" Floating Target

Figure 2.3-19: Ship Deployable Surface Target (Left) and High-Speed Maneuverable Seaborne Target (Right)

- **Anti-Submarine Warfare Targets.** Anti-submarine warfare uses multiple types of targets including the following:
    - **Submarines.** Submarines may act as tracking and detection targets during training and testing events.
    - **Motorized Autonomous Targets.** Motorized autonomous targets simulate the acoustic and magnetic characteristics of a submarine, providing realism for exercises when a submarine is not available. These mobile targets resemble torpedoes, with some models designed for recovery and reuse, while other models are expendable.
    - **Stationary Artificial Targets.** Stationary targets either resemble submarine hulls or are simulated systems with acoustic properties of enemy submarines. These targets either rest on the sea floor or are suspended at varying depths in the water column.

2.3.4 Defensive Countermeasures

Naval forces depend on effective defensive countermeasures to protect against missile and torpedo attack. Defensive countermeasures are devices designed to confuse, distract, and confound precision guided munitions. Defensive countermeasures are in three basic categories:

- **Chaff.** Chaff consists of reflective, aluminum-coated glass fibers used to obscure ships and aircraft from radar guided systems. Chaff fibers, which are stored in canisters, are either dispensed from aircraft or fired into the air from the decks of surface ships when an attack is imminent. The glass fibers create a radar cloud which acts to mask the position of the ship or aircraft.
- **Flares.** Flares are pyrotechnic devices used to defend against heat-seeking missiles, where the missile seeks out the heat signature from the flare rather than the aircraft's engines. Similar to chaff, flares are also dispensed from aircraft and fired from ships.
- **Acoustic Countermeasures.** Acoustic countermeasures are described above in Section 2.3.1.2 (Sonar Systems). Acoustic countermeasures are either released from ships and submarines or towed at a distance behind the ship.

2.3.5 MINE WARFARE SYSTEMS

Mine warfare systems are in two broad categories: mine detection and mine neutralization.

Mine Detection Systems. Mine detection systems are used to locate, classify, and map suspected mines. Once located, the mines can either be neutralized or avoided. These systems are specialized to either locate mines on the surface, in the water column, or on the sea floor.

- **Towed or Hull-Mounted Mine Detection Systems.** These detection systems use acoustic and laser or video sensors to locate and classify suspect mines (Figure 2.3-20). Helicopters, ships, and unmanned vehicles are used for towed systems, which can rapidly assess large areas.

Figure 2.3-20: Towed Mine Detection System

- **Unmanned/Remotely Operated Vehicles.** These vehicles use acoustic and video or lasers to locate and classify mines. Unmanned/remotely operated vehicles provide mine warfare capabilities in nearshore littoral areas, surf zones, ports, and channels.
- **Airborne Laser Mine Detection Systems.** Airborne laser detection systems work in concert with neutralization systems (Figure 2.3-21). The detection system initially locates mines and a neutralization system is then used to relocate and neutralize the mine.

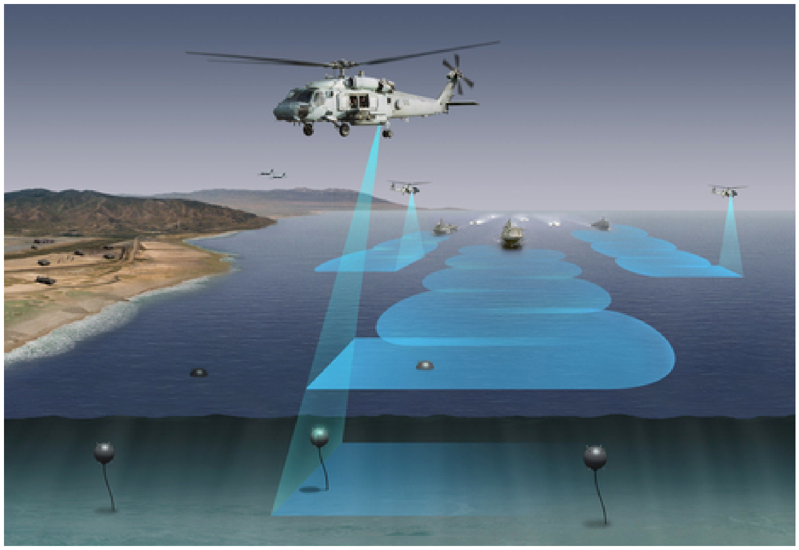


Figure 2.3-21: Airborne Laser Mine Detection System in Operation

- **Marine Mammal System.** Navy personnel and Navy marine mammals work together to detect specified underwater objects. The Navy deploys trained bottlenose dolphins and California sea lions as part of the marine mammal mine-hunting and object-recovery system.

Mine Neutralization Systems. These systems disrupt, disable, or detonate mines to clear ports and shipping lanes, as well as littoral, surf, and beach areas in support of naval amphibious operations. Mine neutralization systems can clear individual mines or a large number of mines quickly.

- **Towed Influence Mine Sweep Systems.** These systems use towed equipment that mimic a particular ship's magnetic and acoustic signature triggering the mine and causing it to explode (Figure 2.3-22).

Figure 2.3-22: Organic and Surface Influence Sweep

- **Towed Mechanical Mine Sweeping Systems.** These systems tow a sweep wire to snag the line that attaches a moored mine to its anchor and then uses a series of cables and cutters to sever those lines. Once these lines are cut, the mines float to the surface where Sailors can neutralize the mines.
- **Unmanned/Remotely Operated Mine Neutralization Systems.** Surface ships and helicopters operate these systems, which place explosive charges near or directly against mines to destroy the mine (Figure 2.3-23).
- **Projectiles.** Small- and medium-caliber projectiles, fired from surface ships or hovering helicopters, are used to neutralize floating and near-surface mine.
- **Diver Emplaced Explosive Charges.** Operating from small craft, divers emplace explosive charges near or on mines to destroy the mine or disrupt its ability to function.

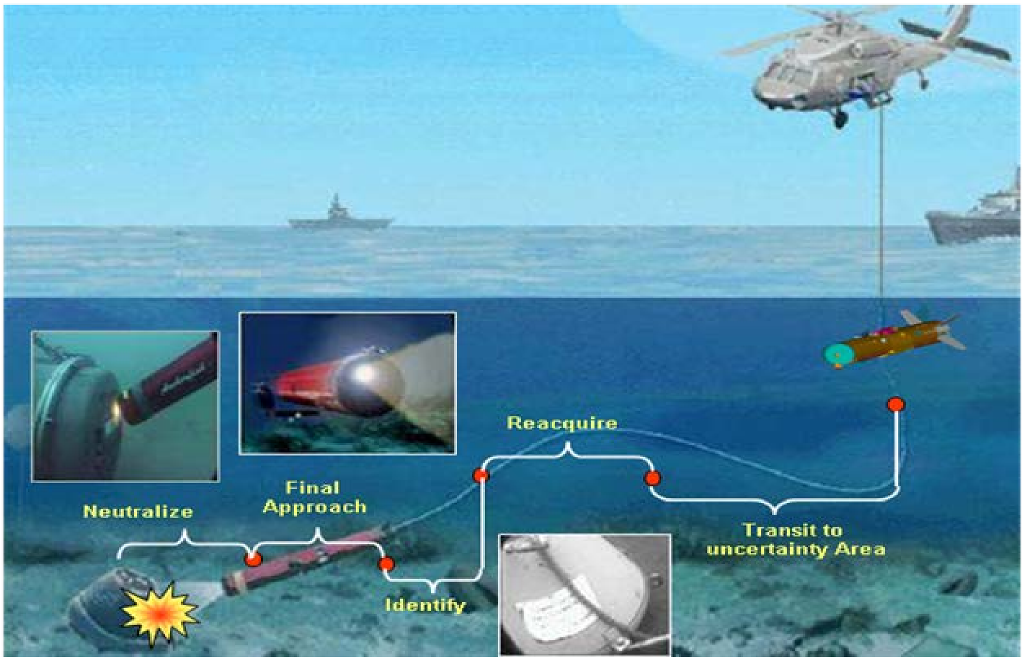


Figure 2.3-23: Airborne Mine Neutralization System

2.3.6 Military Expended Materials

Navy training and testing events may introduce or expend various items, such as non-explosive munitions and targets into the marine environment, as a direct result of using these items for their intended purpose. In addition to the items described below, some accessory materials—related to the carriage or release of these items—may be released. These materials, referred to as military expended materials, are not recovered, and potentially result in environmental impacts that are analyzed in detail in Chapter 3 (Affected Environment and Environmental Consequences) of this EIS/OEIS.

Military expended materials analyzed in this document include, but are not limited to, the following:

- **Sonobuoys.** Sonobuoys consist of parachutes and the sonobuoys themselves.
- **Torpedo Launch Accessories.** Torpedoes are usually recovered; however, materials such as parachutes used with air-dropped torpedoes, guidance wire used with submarine-launched

torpedoes, and ballast weights are expended. Explosive filled torpedoes expend torpedo fragments.

- **Projectiles and Bombs.** Projectiles, bombs, or fragments from explosive projectiles and bombs are expended during training and testing exercises. These items are primarily constructed of lead (most small-caliber projectiles) or steel (medium- and large-caliber projectiles and all bombs).
- **Missiles and Rockets.** Non-explosive missiles and missile fragments from explosive missile are expended during training and testing events. Propellant, and any explosive material involved, is consumed during firing and detonation. Rockets are similar to missiles, and both non-explosive and fragments may be expended.
- **Countermeasures.** Countermeasures (acoustic, chaff, flares) are expended as a result of training exercises, with the exception of towed acoustic countermeasures.
- **Targets.** Some targets are designed to be expended; other targets, such as aerial drones and remote-controlled boats, are recovered for re-use. Targets struck with ordnance will result in target fragments.

2.3.7 Classification of Acoustic and Explosive Sources

In order to better organize and facilitate the analysis of approximately 300 individual sources of underwater acoustic sound or explosive energy, a series of source classifications, or source bins, were developed. The use of source classification bins provides the following benefits:

- provides the ability for new sensors or munitions to be covered under existing regulatory authorizations, as long as those sources fall within the parameters of a “bin”;
- simplifies the source utilization data collection and reporting requirements anticipated under the MMPA;
- ensures a conservative approach to all impacts estimates, as all sources within a given class are modeled as the loudest source (lowest frequency, highest source level, longest duty cycle, or largest net explosive weight) within that bin; which
- allows analysis to be conducted in a more efficient manner, without any compromise of analytical results; and
- provides a framework to support the reallocation of source usage (hours/count) between different source bins, as long as the total numbers of takes remain within the overall analyzed and authorized limits. This flexibility is required to support evolving Navy training and testing requirements, which are linked to real world events.

There are two primary types of source classes: impulsive and non-impulsive. A description of each source classification is provided in Table 2.3-1 and Table 2.3-2. Impulsive bins are based on the net explosive weight of the munitions or explosive devices or the source level for air and water guns. Non-impulsive acoustic sources are grouped into bins based on the frequency,[4] source level,[5] and when warranted, the application in which the source would be used. The following factors further describe the considerations associated with the development of non-impulsive source bins:

---

[4] Bins are based on the typical center frequency of the source. Although harmonics may be present, those harmonics would be several dB lower than the primary frequency.

[5] Source decibel levels are expressed in terms of sound pressure level (SPL) and are values given in dB referenced to one microPascal (µPa) at one meter.

- Frequency of the non-impulsive source:
  - Low-frequency sources operate below 1 kHz
  - Mid-frequency sources operate at and above 1 kHz, up to and including 10 kHz
  - High-frequency sources operate above 10 kHz, up to and including 100 kHz
  - Very high-frequency sources operate above 100 kHz but below 200 kHz

- Source level of the non-impulsive source:
  - Greater than 160 decibels (dB), but less than 180 dB
  - Equal to 180 dB and up to 200 dB
  - Greater than 200 dB

- Application in which the source would be used:
  - How a sensor is employed supports how the sensor's acoustic emissions are analyzed.
  - Factors considered include pulse length (time source is on); beam pattern (whether sound is emitted as a narrow, focused beam or, as with most explosives, in all directions); and duty cycle (how often or how many times a transmission occurs in a given time period during an event).

Table 2.3-1: Non-impulsive Acoustic Source Classes Analyzed

Source Class Category	Source Class (Bin)	Description
Low-Frequency (LF): Sources that produce low-frequency (less than 1 kHz) signals	LF4	Low-frequency sources equal to 180 dB and up to 200 dB
	LF5	Low-frequency sources less than 180 dB
	LF6	Low-frequency sonars currently in development (e.g., anti-submarine warfare sonars associated with the Littoral Combat Ship)
Mid-Frequency (MF): Tactical and non-tactical sources that produce mid-frequency (1–10 kHz) signals	MF1	Hull-mounted surface ship sonars (e.g., AN/SQS-53C and AN/SQS-61)
	MF1K	Kingfisher mode associated with MF1 sonars
	MF2	Hull-mounted surface ship sonars (e.g., AN/SQS-56)
	MF2K	Kingfisher mode associated with MF2 sonars
	MF3	Hull-mounted submarine sonars (e.g., AN/BQQ-10)
	MF4	Helicopter-deployed dipping sonars (e.g., AN/AQS-22 and AN/AQS-13)
	MF5	Active acoustic sonobuoys (e.g., DICASS)
	MF6	Active underwater sound signal devices (e.g., MK 84)
	MF8	Active sources (greater than 200 dB) not otherwise binned
	MF9	Active sources (equal to 180 dB and up to 200 dB) not otherwise binned
	MF10	Active sources (greater than 160 dB, but less than 180 dB) not otherwise binned
	MF11	Hull-mounted surface ship sonars with an active duty cycle greater than 80%
	MF12	High duty cycle – variable depth sonar

Table 2.3-1: Non-impulsive Acoustic Source Classes Analyzed (continued)

Source Class Category	Source Class (Bin)	Description
High-Frequency (HF) and Very High-Frequency (VHF): Tactical and non-tactical sources that produce high-frequency (greater than 10 kHz but less than 200 kHz) signals	HF1	Hull-mounted submarine sonars (e.g., AN/BQQ-10)
	HF2	High Frequency Marine Mammal Monitoring System
	HF3	Other hull-mounted submarine sonars (classified)
	HF4	Mine detection, classification, and neutralization sonar (e.g., AN/SQS-20)
	HF5	Active sources (greater than 200 dB) not otherwise binned
	HF6	Active sources (equal to 180 dB and up to 200 dB) not otherwise binned
	HF7	Active sources (greater than 160 dB, but less than 180 dB) not otherwise binned
	HF8	Hull-mounted surface ship sonars (e.g., AN/SQS-61)
Anti-Submarine Warfare (ASW): Tactical sources such as active sonobuoys and acoustic countermeasures systems used during the conduct of anti-submarine warfare training and testing activities	ASW1	Mid-frequency Deep Water Active Distributed System
	ASW2	Mid-frequency Multistatic Active Coherent sonobuoy (e.g., AN/SSQ-125)
	ASW3	Mid-frequency towed active acoustic countermeasure systems (e.g., AN/SLQ-25)
	ASW4	Mid-frequency expendable active acoustic device countermeasures (e.g., MK 3)
Torpedoes (TORP): Source classes associated with the active acoustic signals produced by torpedoes	TORP1	Lightweight torpedo (e.g., MK 46, MK 54, or Anti-Torpedo Torpedo)
	TORP2	Heavyweight torpedo (e.g., MK 48)
Doppler Sonars (DS): Sonars that use the Doppler effect to aid in navigation or collect oceanographic information	DS1	Low-frequency Doppler sonar (e.g., Webb Tomography Source)
Forward Looking Sonar (FLS): Forward or upward looking object avoidance sonars	FLS2–FLS3	High-frequency sources with short pulse lengths, narrow beam widths, and focused beam patterns used for navigation and safety of ship
Acoustic Modems (M): Systems used to transmit data acoustically through the water	M3	Mid-frequency acoustic modems (greater than 190 dB)
Swimmer Detection Sonars (SD): Systems used to detect divers and submerged swimmers	SD1–SD2	High-frequency sources with short pulse lengths, used for the detection of swimmers and other objects for the purpose of port security
Airguns (AG): Underwater airguns are used during swimmer defense and diver deterrent training and testing activities	AG	Up to 60 cubic inch airguns (e.g., Sercel Mini-G)
Synthetic Aperture Sonars (SAS): Sonars in which active acoustic signals are post-processed to form high-resolution images of the seafloor	SAS1	MF SAS systems
	SAS2	HF SAS systems
	SAS3	VHF SAS systems

Table 2.3-2: Explosive Source Classes Analyzed

Source Class (Bin)	Representative Munitions	Net Explosive Weight[1] (lb.)
E1	Medium-caliber projectiles	0.1–0.25
E2	Medium-caliber projectiles	0.26–0.5
E3	Large-caliber projectiles	>0.5–2.5
E4	Improved extended echo ranging sonobuoy	>2.5–5.0
E5	5 in. projectiles	>5–10
E6	15 lb. shaped charge	>10–20
E7	40 demo block/shaped charge	>20–60
E8	250 lb. bomb	>60–100
E9	500 lb. bomb	>100–250
E10	1,000 lb. bomb	>250–500
E11	650 lb. mine	>500–650
E12	2,000 lb. bomb	>650–1,000
E13	1,200 lb. HBX[2] charge	>1,000–1,740

[1] Net Explosive Weight refers to the amount of explosives; the actual weight of a munition may be larger due to other components.
[2] HBX: High Blast Explosive family of binary explosives composed of Royal Demolition Explosive (RDX) (explosive nitroamine), TNT, powdered aluminum, and D-2 wax with calcium chloride

2.3.7.1 Sources Qualitatively Analyzed

There are in-water active acoustic sources with narrow beam widths, downward directed transmissions, short pulse lengths, frequencies above known hearing ranges, low source levels, or some combination of these factors, that are not anticipated to result in takes of protected species and, therefore, are not required to be quantitatively analyzed. These sources will be categorized as *de minimis* sources and will be qualitatively analyzed to determine the appropriate determinations under NEPA, the MMPA, and the ESA. When used during routine training and testing activities, and in a typical environment, *de minimis* sources generally meet one or more of the following criteria:

- Acoustic source classes listed in Table 2.3-3 (actual source parameters listed in the classified bin list)
- Acoustic sources that transmit primarily above 200 kHz
- Sources operated with source levels of 160 decibels (dB referenced to 1µPa) or less

The types of sources with source levels less than 160 dB are typically hand held sonars, range pingers, transponders, and acoustic communication devices. Assuming spherical spreading for a 160 dB source, the sound will attenuate to less than 140 dB within 10 m, and less than 120 dB within 100 m of the source. Using the behavioral risk function equation:

$$R = \frac{1 - \left(\frac{L-B}{K}\right)^{-A}}{1 - \left(\frac{L-B}{K}\right)^{-2A}}$$

R=risk (0-1.0)
L=received level (RL) in dB (140 dB)
B=basement RL in dB (120 dB)
K=RL increment above basement with 50 percent risk (45 dB)
A=risk transition sharpness

For odontocetes, pinnipeds, manatees, sea otters, and polar bears, A = 10, therefore, R = 0.0003, or 0.03 percent risk. For mysticetes, A = 8, therefore, R = 0.0015, or 0.15 percent risk.

Therefore:

- For all marine mammals subject to a behavioral risk function, these sources will not significantly increase the number of potential exposures as determined by the effects criteria.
- For beaked whales, the range to 140 dB behavioral threshold from a 160 dB source is 10 m. The likelihood of any potential behavioral effect is low because of the small affected area and the relative low density of beaked whales.
- For harbor porpoises, there will be a 100 m zone from the source to 120 dB behavioral threshold. Based on the above discussion and the extremely short propagation ranges to 120 dB, the potential for exposures that would result in changes to behavioral patterns to an extent where those patterns are abandoned or significantly altered is unlikely.
- For sea turtles, the behavioral threshold of 175 dB is above the 160 dB source level, and therefore no behavioral effect would be expected.
- Additionally, for all of the above calculations, absorption of sound in water is not a consideration, but would increase the actual transmission losses and further reduce the low potential for exposures.

2.3.7.2 Source Classes Qualitatively Analyzed

An entire source bin, or some sources from a bin, may be excluded from quantitative analysis (Table 2.3-3) within the scope of this EIS/OEIS if one or more of the following criteria are met:

- The source is expected to result in responses which are short term and inconsequential based on system acoustic characteristics (i.e., short pulse length, narrow beamwidth, downward directed beam, etc.) and manner of system operation.
- The sources are determined to meet the criteria specified in Section 2.3.7.1 (Sources Qualitatively Analyzed) or Table 2.3-3.
- Bins contain sources needed for safe operation and navigation.

Sources that meet these criteria are qualitatively analyzed in Table 2.3-3 to determine the appropriate determinations under NEPA, MMPA, and ESA.

Table 2.3-3: Source Classes Excluded from Quantitative Analysis

Source Class Category	Source Class	Justification
Doppler Sonars/Speed Logs Navigation equipment, downward focused, narrow beamwidth, high-frequency/very high-frequency spectrum utilizing very short pulse length pulses.	DS2, DS3, DS4	Marine species are expected to exhibit no more than short-term and inconsequential responses to the sonar, profiler, or pinger given their characteristics (e.g., narrow, downward-directed beam), which is focused directly beneath the platform. Such reactions are not considered to constitute "taking" and, therefore, no additional quantitative modeling is required for marine species that might encounter these sound sources.
Fathometers High-frequency sources used to determine water depth	FA1 – FA4	Marine mammals are expected to exhibit no more than short-term and inconsequential responses to the sonar, profiler, or pinger given their characteristics (e.g., narrow downward-directed beam). Such reactions are not considered to constitute "taking" and, therefore, no additional quantitative modeling is required for marine species that might encounter these sound sources. Fathometers use a downward-directed, narrowly focused beam directly below the vessel (typically much less than 30 degrees), using a short pulse length (less than 10 milliseconds). Use of fathometers is required for safe operation of Navy vessels.
Hand-held Sonars High-frequency sonar devices used by Navy divers for object location	HHS1	Hand-held sonars generate very high frequency sound at low power levels, short pulse lengths, and narrow beam widths. Because output from these sound sources would attenuate to below any current threshold for marine species at a very short range, and they are under positive control of the diver on which direction the sonar is pointed, marine species reactions are not likely. No additional quantitative modeling is required for marine species that might encounter these sound sources.
Acoustic Releases Systems that transmit active acoustic signals to release a bottom-mounted object from its housing in order to retrieve the device at the surface	R1, R2, R3	Acoustic releases operate at mid- and high-frequencies. Since these types of devices are only used to retrieve bottom mounted devices, they typically transmit only a single ping. Marine species are expected to exhibit no more than short-term and inconsequential responses to these sound sources given that any sound emitted is extremely short in duration. Such reactions are not considered to constitute "taking" and, therefore, no additional quantitative modeling is required for marine species that might encounter these sound sources.
Imaging Sonars High-frequency or very high-frequency, very short pulse lengths, narrow bandwidths. IMS1 is a side scan sonar (HF/VHF, narrow beams, downward directed). IMS2 is a downward looking source, narrow beam, and operates above 180 kHz (basically a fathometer).	IMS1, IMS2	These side scan sonars operate in a very high-frequency range (over 120 kHz) relative to marine mammal hearing (Richardson et al. 1995; Southall et al. 2007). The frequency range from these side scan sonars is beyond the hearing range of mysticetes (baleen whales) pinnipeds, manatees, and sea turtles and, therefore, not expected to affect these species in the Study Area. The frequency range from these side scan sonars falls within the upper end of the odontocete (toothed whale) hearing spectrum (Richardson et al. 1995), which means they are not perceived as loud acoustic signals with frequencies below 120 kHz by these animals. Therefore, marine species may be less likely to react to these types of systems in a biologically significant way. Further, in addition to spreading loss for acoustic propagation in the water column, high-frequency acoustic energies are more quickly absorbed through the water column than sounds with lower frequencies (Urick 1983). Additionally, these systems are generally operated in the vicinity of the sea floor, thus reducing the sound potential of exposure even more. Marine species are expected to exhibit no more than short-term and inconsequential responses to the imaging sonar given their characteristics (e.g., narrow, downward-directed beam and short pulse length [generally 20 milliseconds]). Such reactions are not considered to constitute "taking" and, therefore, no additional quantitative modeling is required for marine species that might encounter these sound sources

Table 2.3-3: Source Classes Excluded from Quantitative Analysis (continued)

Source Class Category	Source Class	Description
High Frequency Acoustic Modems and Tracking Pingers	M2, P1, P2, P3, P4	Acoustic modems and tracking pingers operate at frequencies between 2 and 170 kHz, have low duty cycles (single pings in some cases), short pulse lengths (typically 20 milliseconds), and relatively low source levels. Marine species are expected to exhibit no more than short-term and inconsequential responses to these systems given the characteristics as described above. Such reactions are not considered to constitute "taking" and, therefore, no additional quantitative modeling is required for animals that might encounter these sound sources.
Side Scan Sonars Sonars that use active acoustic signals to produce high-resolution images of the seafloor	SSS1, SSS2, SSS3	Marine species are expected to exhibit no more than short-term and inconsequential responses to these systems given their characteristics such as a downward-directed beam and use of short pulse lengths (less than 20 milliseconds). Such reactions are not considered to constitute "taking" and, therefore, no additional quantitative modeling is required for marine species that might encounter these sound sources.
Small Impulsive Sources	Sources with explosive weights less than 0.1 lb. net explosive weight (less than bin E1)	Quantitative modeling in multiple locations has validated that these low level impulsive sources are expected to cause no more than short-term and inconsequential responses in marine species due to the low explosive weight and corresponding very small zone of influence associated with these types of sources.

2.4 PROPOSED ACTIVITIES

The Navy has been conducting military readiness activities in the Study Area for decades. The tempo and types of training and testing activities have fluctuated because of the introduction of new technologies, the evolving nature of international events, advances in warfighting doctrine and procedures, and force structure (organization of ships, weapons, and Sailors) changes. Such developments influenced the frequency, duration, intensity, and location of required training and testing activities. As discussed in Chapter 1 (Purpose and Need), training and testing activities were analyzed in the Tactical Theater Training Assessment Program Phase I documents, specifically in the environmental planning documents for HRC, SOCAL Range Complex, and SSTC. This EIS/OEIS (Phase II) accounts for those factors that cause training and testing fluctuations and has refined its proposed activities in two ways. First, training and testing activities have evolved to meet changes to military readiness requirements. Second, this EIS/OEIS includes additional geographic areas where training and testing activities historically occur.

2.4.1 HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING PROPOSED TRAINING ACTIVITIES

The training activities proposed by the Navy are described in Table 2.4-1. The table is organized according to primary mission areas and includes the activity name and a short description. Appendix A (Navy Activities Descriptions) has more detailed descriptions of the activities.

Table 2.4-1: Typical Training Activities in the Study Area

Activity Name	Activity Description
Anti-Air Warfare (AAW)	
Air Combat Maneuver (ACM)	Aircrews engage in flight maneuvers designed to gain a tactical advantage during combat.
Air Defense Exercise (ADEX)	Aircrew and ship crews conduct defensive measures against threat aircraft or missiles.
Gunnery Exercise (Air-to-Air) (GUNEX [A-A])	Aircrews defend against threat aircraft with cannons (machine gun).
Missile Exercise (Air-to-Air) (MISSILEX [A-A])	Aircrews defend against threat aircraft with missiles.
Gunnery Exercise (Surface-to-Air) (GUNEX [S-A])	Surface ship crews defend against threat aircraft or missiles with guns.
Missile Exercise (Surface-to-Air) (MISSILEX [S-A])	Surface ship crews defend against threat missiles and aircraft with missiles.
Missile Exercise-Man-portable Air Defense System (MISSILEX–MANPADS)	Marines employ the man-portable air defense systems (MANPADS), a shoulder fired surface to air missile, against threat missiles or aircraft.
Amphibious Warfare (AMW)	
Naval Surface Fire Support Exercise-Land Based Target (FIREX [Land])	Surface ship crews use large-caliber guns to fire on land-based targets in support of forces ashore.
Naval Surface Fire Support Exercise-at Sea (FIREX at Sea)	Surface ship crews use large-caliber guns to support forces ashore; however, the land target is simulated at sea. Rounds impact the water and are scored by passive acoustic hydrophones located at or near the target area.
Amphibious Assault	Forces move ashore from ships at sea for the immediate execution of inland objectives.
Amphibious Assault – Battalion Landing	Similar to amphibious assault, but with a much larger force and of longer duration.
Amphibious Raid	Small unit forces move swiftly from ships at sea for a specific short-term mission. Raids are quick operations with as few Marines as possible.
Expeditionary Fires Exercise/ Supporting Arms Coordination Exercise (EFEX/SACEX)	Marine Corps field training in integration of close air support, naval gunfire, artillery, and mortars.
Humanitarian Assistance Operations	Military units evacuate noncombatants from hostile or unsafe areas or provide humanitarian assistance in times of disaster.

Table 2.4-1: Typical Training Activities in the Study Area (continued)

Activity Name	Activity Description
Strike Warfare (STW)[1]	
Bombing Exercise Air-to-Ground (BOMBEX A-G)	Fixed-wing aircraft drop non-explosive bombs against a land target.
Gunnery Exercise Air-to-Ground (GUNEX A-G)	Helicopter crews fire guns at stationary land targets.
Anti-Surface Warfare (ASUW)	
Maritime Security Operations (MSO)	Helicopter and surface ship crews conduct a suite of Maritime Security Operations (e.g., Vessel Search, Board, and Seizure; Maritime Interdiction Operations; Force Protection; and Anti-Piracy Operation).
Gunnery Exercise Surface-to-Surface (Ship) (GUNEX-S-S [Ship])	Ship crews engage surface targets with ship's small-, medium-, and large-caliber guns.
Gunnery Exercise Surface-to-Surface (Boat) (GUNEX-S-S [Boat])	Small boat crews engage surface targets with small- and medium-caliber weapons.
Missile Exercise (Surface-to-Surface) (MISSILEX [S-S])	Surface ship crews defend against threat missiles and other surface ships with missiles.
Gunnery Exercise (Air-to-Surface) (GUNEX [A-S])	Fixed-wing and helicopter aircrews, including embarked personnel, use small- and medium-caliber guns to engage surface targets.
Missile Exercise (Air-to-Surface) (MISSILEX [A-S])	Fixed-wing and helicopter aircrews fire both precision-guided missiles and unguided rockets against surface targets.
Bombing Exercise (Air-to-Surface) (BOMBEX [A-S])	Fixed-wing aircrews deliver bombs against surface targets.
Laser Targeting	Fixed-winged, helicopter, and ship crews illuminate enemy targets with lasers.
Sinking Exercise (SINKEX)	Aircraft, ship, and submarine crews deliver ordnance on a seaborne target, usually a deactivated ship, which is deliberately sunk using multiple weapon systems.
Anti-Submarine Warfare (ASW)	
Tracking Exercise/Torpedo Exercise-Submarine (TRACKEX/TORPEX-Sub)	Submarine crews search, detect, and track submarines and surface ships. Exercise torpedoes may be used during this event.
Tracking Exercise/Torpedo Exercise-Surface (TRACKEX/TORPEX-Surface)	Surface ship crews search, track, and detect submarines. Exercise torpedoes may be used during this event.

[1] Only the in-water impacts of strike warfare activities are analyzed in this EIS/OEIS. Land impacts were analyzed in previous documents.

Table 2.4-1: Typical Training Activities in the Study Area (continued)

Activity Name	Activity Description
Anti-Submarine Warfare (ASW) (continued)	
Tracking Exercise/Torpedo Exercise-Helicopter (TRACKEX/TORPEX-Helo)	Helicopter crews search, track, and detect submarines. Exercise torpedoes may be used during this event.
Tracking Exercise/Torpedo Exercise-Maritime Patrol Aircraft (TRACKEX/TORPEX-MPA)	Maritime patrol aircraft crews search, detect, and track submarines. Recoverable air launched torpedoes may be employed against submarine targets.
Tracking Exercise-Maritime Patrol Aircraft Extended Echo Ranging Sonobuoys	Maritime patrol aircraft crews search, detect and track submarines using explosive source sonobuoys or multistatic active coherent system.
Kilo Dip-Helicopter	Helicopter crews briefly deploy their dipping Acoustic Sources to ensure the system's operational status.
Submarine Command Course (SCC) Operations	Train prospective submarine Commanding Officers to operate against surface, air, and subsurface threats.
Electronic Warfare (EW)	
Electronic Warfare Operations (EW OPS)	Aircraft, surface ship, and submarine crews attempt to control portions of the electromagnetic spectrum used by enemy systems to degrade or deny the enemy's ability to take defensive actions.
Counter Targeting-Flare Exercise (FLAREX)	Fixed-winged aircraft and helicopters crews defend against an attack by deploying flares to disrupt threat infrared missile guidance systems.
Counter Targeting Chaff Exercise (CHAFFEX)	Surface ships, fixed-winged aircraft, and helicopter crews defend against an attack by deploying chaff, a radar reflective material, which disrupt threat targeting and missile guidance radars.
Mine Warfare (MIW)	
Mine Countermeasure Exercise-Sonar-Ship Sonar	Surface ship crews detect and avoid mines while navigating restricted areas or channels using active sonar.
Mine Countermeasure Exercise-Surface (SMCMEX)	MCM-class ship crews detect, locate, identify, and avoid mines while navigating restricted areas or channels using active sonar.
Mine Neutralization-Explosive Ordnance Disposal (EOD)	Personnel disable threat mines. Explosive charges may be used.
Mine Countermeasure (MCM) -Towed Mine Neutralization	Ship crews and helicopter aircrews tow systems (e.g., Organic and Surface Influence Sweep, MK 104/105) through the water that are designed to disable and/or trigger mines.
Airborne Mine Countermeasure (MCM)-Mine Detection	Helicopter aircrews detect mines using towed and laser mine detection systems (e.g., AN/AQS-20, Airborne Laser Mine Detection System).
Mine Countermeasure (MCM)-Mine Neutralization	Ship crews or helicopter aircrews disable mines by firing small- and medium-caliber projectiles.
Mine Neutralization-Remotely Operated Vehicle	Helicopter aircrews disable mines using remotely operated underwater vehicles.

Table 2.4-1: Typical Training Activities in the Study Area (continued)

Activity Name	Activity Description
Mine Warfare (MIW) (continued)	
Mine Laying	Fixed-winged aircraft and submarine crews drop/launch non-explosive mine shapes.
Marine Mammal System	Navy personnel and Navy marine mammals work together to detect and neutralize specified underwater objects.
Shock Wave Generator	Navy divers place a small charge on a simulated underwater mine.
Surf Zone Test Detachment/ Equipment Test and Evaluation	Navy personnel test and evaluate the effectiveness of new detection and neutralization equipment designated for surf conditions.
Submarine Mine Exercise	Submarine crews practice detecting mines in a designated area.
Civilian Port Defense	Civilian Port Defense exercises are naval mine warfare activities conducted at various ports and harbors, in support of maritime homeland defense/security.
Naval Special Warfare (NSW)	
Personnel Insertion/Extraction-Submarine	Military personnel train for covert insertion and extraction into target areas using submarines.
Personnel Insertion/Extraction-Non-submarine	Military personnel train for covert insertion and extraction into target areas using helicopters, fixed-wing aircraft (insertion only), or small boats.
Underwater Demolition Multiple Charge – Mat Weave and Obstacle Loading	Navy personnel train to construct, place, and safely detonate multiple charges laid in a pattern for underwater obstacle clearance.
Underwater Demolition Qualification/Certification	Navy divers conduct training and certification in placing underwater demolition charges.
Major Training Events	
Composite Training Unit Exercise (COMPTUEX)	Intermediate level exercise designed to create a cohesive Strike Group prior to deployment or Joint Task Force Exercise. Typically seven surface ships, helicopters, maritime patrol aircraft, two submarines, and various unmanned vehicles. Marine mammal systems may be used during a COMPTUEX.
Joint Task Force Exercise (JTFEX)/Sustainment Exercise (SUSTAINEX)	Final fleet exercise prior to deployment of the Strike Group. Serves as a ready-to-deploy certification for all units involved. Typically nine surface ships, helicopters, maritime patrol aircraft, two submarines, and various unmanned vehicles.
Rim of the Pacific (RIMPAC) Exercise	A biennial multinational training exercise in which navies from Pacific Rim nations and the United Kingdom assemble in Pearl Harbor, Hawaii to conduct training throughout the Hawaiian Islands in a number of warfare areas. Marine mammal systems may be used during a RIMPAC. Components of RIMPAC such as certain mine warfare training may be conducted in the SOCAL Range Complex.

Table 2.4-1: Typical Training Activities in the Study Area (continued)

Activity Name	Activity Description
Major Training Events (continued)	
Multi-Strike Group Exercise	A 10-day exercise in which up to three strike groups would conduct training exercises simultaneously.
Integrated Anti-Submarine Warfare Course (IAC)	Multiple ships, aircraft and submarines integrate the use of their sensors, including sonobuoys, to search, detect, and track threat submarines. IAC is an intermediate level training event and can occur in conjunction with other major exercises.
Group Sail	Multiple ships and helicopters integrate the use of sensors, including sonobuoys, to search, detect, and track a threat submarine. Group sails are not dedicated ASW events and involve multiple warfare areas.
Undersea Warfare Exercise (USWEX)	Elements of ASW Tracking Exercises combine in this exercise of multiple air, surface and subsurface units, over a period of several days. Sonobuoys released from aircraft. Active and passive sonar used.
Ship ASW Readiness and Evaluation Measuring (SHAREM)	This exercise will typically involve multiple ships, submarines, and aircraft in several coordinated events over a period of a week or less. The Navy uses this exercise to collect and analyze high-quality data to quantitatively “assess” surface ship ASW readiness and effectiveness.
Other Training Activities	
Precision Anchoring	Releasing of anchors in designated locations.
Small Boat Attack	For this activity, one or two small boats or personal watercraft conduct attack activities on units afloat.
Offshore Petroleum Discharge System (OPDS)	This activity trains personnel in the transfer of petroleum (though only sea water is used during training) from ship to shore.
Elevated Causeway System (ELCAS)	A temporary pier is constructed off the beach. Supporting pilings are driven into the sand and then later removed.
Submarine Navigation	Submarine crews locate underwater objects and ships while transiting out of port.
Submarine Under Ice Certification	Submarine crews train to operate under ice. Ice conditions are simulated during training and certification events.
Salvage Operations	Navy divers train to tow disabled ships, repair damaged ships, remove sunken ships, and conduct deep ocean recovery.
Surface Ship Sonar Maintenance	Pier side and at-sea maintenance of sonar systems.
Submarine Sonar Maintenance	Pier side and at-sea maintenance of sonar systems

2.4.2 Proposed Testing Activities

The Navy's research and acquisition community engages in a broad spectrum of testing activities in support of the fleet. These activities include, but are not limited to, basic and applied scientific research and technology development; testing, evaluation, and maintenance of systems (e.g., missiles, radar, and sonar) and platforms (e.g., surface ships, submarines, and aircraft); and acquisition of systems and platforms to support Navy missions and give a technological edge over adversaries.

The individual commands within the research and acquisition community included in this EIS/OEIS are Naval Air Systems Command, Naval Sea Systems Command, Space and Naval Warfare Systems Command, the Office of Naval Research, and the Naval Research Laboratory.

The Navy operates in an ever-changing strategic, tactical, and funding and time-constrained environment. Testing activities occur in response to emerging science or fleet operational needs. For example, future Navy experiments to develop a better understanding of ocean currents may be designed based on advancements made by non-government researchers not yet published in the scientific literature. Similarly, future but yet unknown Navy operations within a specific geographic area may require development of modified Navy assets to address local conditions. Such modifications must be tested in the field to ensure they meet fleet needs and requirements. Accordingly, generic descriptions of some of these activities are the best that can be articulated in a long-term, comprehensive document, like this EIS/OEIS.

Some testing activities are similar to training activities conducted by the fleet. For example, both the fleet and the research and acquisition community fire torpedoes. While the firing of a torpedo might look identical to an observer, the difference is in the purpose of the firing. The fleet might fire the torpedo to practice the procedures for such a firing, whereas the research and acquisition community might be assessing a new torpedo guidance technology or to ensure that the torpedo meets performance specifications and operational requirements. These differences may result in different analysis and potential mitigations for the activity.

2.4.2.1 Naval Air Systems Command Testing Activities

Naval Air Systems Command testing activities generally fall in the primary mission areas used by the fleets. Naval Air Systems Command activities include, but are not limited to, the testing of new aircraft platforms, weapons, and systems before those platforms, weapons and systems are delivered to the fleet. In addition to the testing of new platforms, weapons, and systems, Naval Air Systems Command also conducts lot acceptance testing of weapons and systems, such as sonobuoys.

The majority of testing and development activities conducted by Naval Air Systems Command are similar to fleet training activities, and many platforms (e.g., the MH-60 helicopter) and systems (e.g., the projectile-based mine clearance system) currently being tested are already being used by the fleet or will ultimately be integrated into fleet training activities. However, some testing and development may be conducted in different locations and in a different manner than the fleet and therefore, though the potential environmental effects may be the same, the analysis for those events may differ. Training with systems and platforms delivered to the fleet within the timeframe of this document are analyzed in the training sections of this EIS/OEIS. This section only addresses Naval Air Systems Command's testing activities, which are described in Table 2.4-2.

Table 2.4-2: Typical Naval Air Systems Command Testing Activities in the Study Area

Activity Name	Activity Description
Anti-Air Warfare (AAW)	
Air Combat Maneuver (ACM) Test	This event is identical to the air combat maneuver training event. Test event involving two or more aircraft, each engaged in continuous proactive and reactive changes in aircraft attitude, altitude, and airspeed. No weapons are fired during air combat maneuver tests activities.
Air Platform/Vehicle Test	Testing performed to quantify the flying qualities, handling, airworthiness, stability, controllability, and integrity of an air platform or vehicle. No weapons are released during an air platform/vehicle test. In-flight refueling capabilities are tested.
Air Platform Weapons Integration Test	Testing performed to quantify the compatibility of weapons with the aircraft from which they would be launched or released. Mostly non-explosive weapons or shapes are used, but some tests may require the use of high explosive weapons.
Intelligence, Surveillance, and Reconnaissance Test	Test to evaluate communications capabilities of fixed-wing and rotary wing aircraft, including unmanned systems that can carry cameras, sensors, communications equipment, or other payloads. New systems are tested at sea to ensure proper communications between aircraft and ships.
Anti-Surface Warfare (ASUW)	
Air-to-Surface Missile Test	This event is similar to the training event missile exercise (air-to-surface). Test may involve both fixed wing and rotary wing aircraft launching missiles at surface maritime targets to evaluate the weapon system or as part of another systems integration test.
Air-to-Surface Gunnery Test	This event is similar to the training event gunnery exercise (air to surface). Strike fighter and helicopter aircrews evaluate new or enhanced aircraft guns against surface maritime targets to test that the gun, gun ammunition, or associated systems meet required specifications or to train aircrew in the operation of a new or enhanced weapon system.
Rocket Test	Rocket tests evaluate the integration, accuracy, performance, and safe separation of laser-guided and unguided 2.75-inch rockets fired from a hovering or forward flying helicopter or from a fixed wing strike aircraft.
Laser Targeting Test	Aircrew use laser targeting devices integrated into aircraft or weapon systems to evaluate targeting accuracy and precision and to train aircrew in the use of newly developed or enhanced laser targeting devices. Lasers are designed to illuminate designated targets for engagement with laser-guided weapons.
Electronic Warfare (EW)	
Electronic Systems Evaluation	Test that evaluates the effectiveness of electronic systems to control, deny, or monitor critical portions of the electromagnetic spectrum. In general, electronic warfare testing will assess the performance of three types of electronic warfare systems: electronic attack, electronic protect, and electronic support.
Anti-Submarine Warfare (ASW)	
Anti-Submarine Warfare Torpedo Test	This event is similar to the training event torpedo exercise. The test evaluates anti-submarine warfare systems onboard rotary wing and fixed wing aircraft and the ability to search for, detect, classify, localize, track, and attack a submarine or similar target at various altitudes.

Table 2.4-2: Typical Naval Air Systems Command Testing Activities in the Study Area (continued)

Activity Name	Activity Description
Anti-Submarine Warfare (ASW) (continued)	
Kilo Dip	A kilo dip is the operational term used to describe a functional check of a helicopter deployed dipping sonar system. The sonar system is briefly activated to ensure all systems are functional. A kilo dip is simply a precursor to more comprehensive testing.
Sonobuoy Lot Acceptance Test	Sonobuoys are deployed from surface vessels and aircraft to verify the integrity and performance of a lot, or group, of sonobuoys in advance of delivery to the fleet for operational use.
Anti-Submarine Warfare Tracking Test – Helicopter	This event is similar to the training event ASW tracking exercise (helicopter). The test evaluates the sensors and systems used to detect and track submarines and to ensure that helicopter systems used to deploy the tracking systems perform to specifications.
Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft	This event is similar to the training event tracking exercise/torpedo exercise–maritime patrol aircraft. The test evaluates the sensors and systems used by maritime patrol aircraft to detect and track submarines and to ensure that aircraft systems used to deploy the tracking systems perform to specifications and meet operational requirements.
Mine Warfare (MIW)	
Airborne Mine Neutralization System Test (AMNS)	Airborne mine neutralization tests of the Airborne Mine Neutralization System evaluate the system's ability to detect and destroy mines. The Airborne Mine Neutralization System uses up to four unmanned underwater vehicles equipped with high-frequency sonar, video cameras, and explosive neutralizers.
Airborne Towed Minehunting Sonar System Test	Tests of the Airborne Towed Minehunting Sonar System to evaluate the search capabilities of this towed, mine hunting, detection, and classification system. The sonar on the Airborne Towed Minehunting Sonar System identifies mine-like objects in the deeper parts of the water column.
Airborne Towed Minesweeping System Test	Tests of the Organic Airborne and Surface Influence Sweep (OASIS) would be conducted by a helicopter to evaluate the functionality of Organic Airborne and Surface Influence Sweep and the helicopter at sea. The Organic Airborne and Surface Influence Sweep is towed from a forward flying helicopter and works by emitting an electromagnetic field and mechanically generated underwater sound to simulate the presence of a ship. The sound and electromagnetic signature cause nearby mines to explode.
Airborne Laser-Based Mine Detection System Test – ALMDS	An airborne mine hunting test of the AN/AES-1 Airborne Laser Mine Detection System, or "ALMDS" evaluates the system's ability to detect, classify, and fix the location of floating and near-surface, moored mines. The system uses a laser to locate mines and may operate in conjunction with an airborne projectile-based mine detection system to neutralize mines.
Airborne Projectile-Based Mine Clearance System Test	A helicopter uses a laser-based detection system to search for mines and to fix mine locations for neutralization with an airborne projectile-based mine clearance system. The system neutralizes mines by firing a small- or medium-caliber non-explosive, supercavitating projectile from a hovering helicopter.

Table 2.4-2: Typical Naval Air Systems Command Testing Activities in the Study Area (continued)

Activity Name	Activity Description
Other Testing Activities	
Test and Evaluation – Catapult Launch	Tests evaluate the function of aircraft carrier catapults at sea following enhancements, modifications, or repairs to catapult launch systems. This includes aircraft catapult launch tests. No weapons or other expendable materials would be released.
Air Platform Shipboard Integration Test	Tests evaluate the compatibility of aircraft and aircraft systems with ships and shipboard systems. Tests involve physical operations and verify and evaluate communications and tactical data links. This test function also includes an assessment of carrier-shipboard suitability, and hazards of electromagnetic radiation to personnel, ordnance, and fuels.
Shipboard Electronic Systems Evaluation	Tests measure ship antenna radiation patterns and test communication systems with a variety of aircraft.

2.4.2.2 Naval Sea Systems Command Testing Events

Naval Sea Systems Command testing activities (Table 2.4-3) are aligned with its mission of new ship construction, life cycle support, and other weapon systems development and testing. Each major category of Naval Sea Systems Command activities is described below.

2.4.2.3 New Ship Construction Activities

Ship construction activities include pierside testing of ship systems, tests to determine how the ship performs at sea (sea trials), and developmental and operational test and evaluation programs for new technologies and systems. Pierside and at-sea testing of systems aboard a ship may include sonar, acoustic countermeasures, radars, and radio equipment. In this EIS/OEIS, pierside testing at Navy contractor shipyards consists only of sonar systems. During sea trials, each new ship propulsion engine is operated at full power and subjected to high-speed runs and steering tests. At-sea test firing of shipboard weapon systems, including guns, torpedoes, and missiles, are also conducted.

2.4.2.4 Life Cycle Activities

Testing activities are conducted throughout the life of a Navy ship to verify performance and mission capabilities. Sonar system testing occurs pierside during maintenance, repair, and overhaul availabilities, and at sea immediately following most major overhaul periods. A Combat System Ship Qualification Trial is conducted for new ships and for ships that have undergone modification or overhaul of their combat systems.

Radar cross signature testing of surface ships is conducted on new vessels and periodically throughout a ship's life to measure how detectable the ship is to radar. Additionally, electromagnetic measurements of off-board electromagnetic signature are conducted for submarines, ships, and surface craft periodically.

2.4.2.5 Other Naval Sea Systems Command Testing Activities

Numerous test activities and technical evaluations, in support of Naval Sea Systems Command's systems development mission, often occur in conjunction with fleet activities within the Study Area. Tests within this category include, but are not limited to, anti-surface warfare, anti-submarine warfare, and mine warfare tests using torpedoes, sonobuoys, and mine detection and neutralization systems.

Unique Naval Sea Systems Command planned testing includes a kinetic energy weapon, which uses electromagnetic energy to propel a round at a target, and alternative electromagnetic or directed energy devices. In addition, areas of potential increased future equipment and systems testing are swimmer detection systems, lasers, new radars, unmanned vehicles, and chemical-biological detectors.

Table 2.4-3: Typical Naval Sea Systems Command Testing Activities in the Study Area

Activity Name		Activity Description
New Ship Construction		
Surface Combatant Sea Trials	Pierside Sonar Testing	Tests ship's sonar systems pierside to ensure proper operation.
	Propulsion Testing	Ship is run at high speeds in various formations (e.g., straight-line and reciprocal paths).
	Gun Testing	Gun systems are tested using non-explosive rounds.
	Missile Testing	Explosive and non-explosive missiles are fired at target drones to test the launching system.
	Decoy Testing	Includes testing of the MK 36 Decoy Launching system
	Surface Warfare Testing	Ships defend against surface targets with large-caliber guns.
	Anti-Submarine Warfare Testing	Ships demonstrate capability of countermeasure systems and underwater surveillance and communications systems.
Other Ship Class Sea Trials	Propulsion Testing	Ship is run at high speeds in various formations (e.g., straight-line and reciprocal paths). ("Other Ship" indicates class of vessels without hull-mounted sonar. Example ship classes include LCS, MLP, and T-AKE.)
	Gun Testing – Small Caliber	Gun systems are tested using non-explosive rounds.
Mission Package Testing	Anti-Submarine Warfare	Ships and their supporting platforms (e.g., helicopters, unmanned aerial vehicles) detect, localize, and prosecute submarines.
	Surface Warfare	Ships defense against surface targets with small-, medium-, and large-caliber guns and medium range missiles.
	Mine Countermeasures	Ships conduct mine countermeasure operations.
Post-Homeporting Testing (all classes)		Tests all ship systems, including navigation and propulsion systems.

Table 2.4-3: Typical Naval Sea Systems Command Testing Activities in the Study Area (continued)

Activity Name		Activity Description
Life Cycle Activities		
Ship Signature Testing		Tests ship and submarine radars and electromagnetic signatures.
Surface Ship Sonar Testing/ Maintenance (in OPAREAs and Ports)		Pierside and at-sea testing of surface ship systems occurs periodically following major maintenance periods and for routine maintenance.
Submarine Sonar Testing/ Maintenance (in OPAREAs and Ports)		Pierside and at-sea testing of submarine systems occurs periodically following major maintenance periods and for routine maintenance.
Combat System Ship Qualification Trial (CSSQT)	In-port Maintenance Period	Each combat system is tested to ensure they are functioning in a technically acceptable manner and are operationally ready to support at-sea Combat System Ship Qualification Trials.
	Air Defense (AD)	Tests the ship's capability to detect, identify, track, and successfully engage live and simulated targets.
	Surface Warfare (SUW)	Tests shipboard sensors capabilities to detect and track surface targets, relay the data to the gun weapon system, and engage targets.
	Undersea Warfare (USW)	Tests ships ability to track and engage undersea targets.
Anti-Surface Warfare (ASUW)/Anti-Submarine Warfare (ASW) Testing		
Missile Testing		Missile testing includes various missiles fired from submarines and surface combatants.
Kinetic Energy Weapon Testing		A kinetic energy weapon uses stored energy released in a burst to accelerate a non-explosive projectile.
Electronic Warfare Testing		Testing will include radiation of military and commercial radar and communication systems (or simulators).
Torpedo (Non-explosive) Testing		Air, surface, or submarine crews employ non-explosive torpedoes against submarines or surface vessels. All torpedoes are recovered.
Torpedo (Explosive) Testing		Air, surface, or submarine crews employ high-explosive torpedoes against artificial targets or deactivated ships.
Countermeasure Testing		Various acoustic systems (e.g., towed arrays and surface ship torpedo defense systems) are employed to detect, localize, track, and neutralize incoming weapons.
Pierside Sonar Testing		Pierside testing to ensure systems are fully functional in a controlled pierside environment prior to at-sea test activities.
At-sea Sonar Testing		At-sea testing to ensure systems are fully functional in an open ocean environment.

Table 2.4-3: Typical Naval Sea Systems Command Testing Activities in the Study Area (continued)

Activity Name	Activity Description
Mine Warfare (MIW) Testing	
Mine Detection and Classification Testing	Air, surface, and subsurface vessels detect and classify mines and mine-like objects.
Mine Countermeasure/Neutralization Testing	Air, surface, and subsurface vessels neutralize threat mines that would otherwise restrict passage through an area.
Pierside Systems Health Checks	Mine warfare systems are tested in pierside locations to ensure acoustic and electromagnetic sensors are fully functional prior to at-sea test activities.
Shipboard Protection Systems and Swimmer Defense Testing	
Pierside Integrated Swimmer Defense	Swimmer defense testing ensures that systems can effectively detect, characterize, verify, and engage swimmer/diver threats in harbor environments.
Shipboard Protection Systems Testing	Loudhailers and small caliber munitions are used to protect a ship against small boat threats.
Chemical/Biological Simulant Testing	Chemical/biological agent simulants are deployed against surface ships.
Unmanned Vehicle Testing	
Underwater Deployed Unmanned Aerial System Testing	Unmanned aerial systems are launched by submarines and special operations forces while submerged.
Unmanned Vehicle Development and Payload Testing	Vehicle development involves the production and upgrade of new unmanned platforms on which to attach various payloads used for different purposes.
Other Testing Activities	
Special Warfare	Special warfare includes testing of submersibles capable of inserting and extracting personnel or payloads into denied areas from strategic distances.
Acoustic Communications Testing	Acoustic modems, submarines, and surface vessels transmit signals to communicate.

2.4.2.6 Space and Naval Warfare Systems Command Testing Events

Space and Naval Warfare Systems Command (SPAWAR) is the information dominance systems command for the U.S. Navy. The mission of SPAWAR is to acquire, develop, deliver, and sustain decision superiority for the warfighter at the right time and for the right cost. SPAWAR Systems Center Pacific is the research and development part of SPAWAR focused on developing and transitioning technologies in the area of command, control, communications, computers, intelligence, surveillance, and reconnaissance. SPAWAR Systems Center Pacific conducts research, development, test, and evaluation projects to support emerging technologies for intelligence, surveillance, and reconnaissance; anti-terrorism and force protection; mine countermeasures; anti-submarine warfare; oceanographic research; remote sensing; and communications. These activities include, but are not limited to, the testing of unmanned undersea and surface vehicles; a wide variety of intelligence, surveillance, and reconnaissance sensor systems; underwater surveillance technologies; and underwater communications.

While Table 2.4-4 describes the typical and anticipated Space and Naval Warfare Systems Command and Space and Naval Warfare Systems Center Pacific test and evaluation activities to be conducted in the Study Area, unforeseen emergent Navy requirements may influence actual testing activities. Activities that would occur under Space and Naval Warfare Systems Command testing events have been identified to the extent practicable throughout this EIS/OEIS.

Table 2.4-4: Typical Space and Naval Warfare Systems Command Testing Activities in the Study Area

Activity Name	Activity Description
SPAWAR Research, Development, Test, and Evaluation (RDT&E)	
Autonomous Undersea Vehicle (AUV) Anti-Terrorism/Force Protection (AT/FP) Mine Countermeasures	Autonomous undersea vehicle shallow water mine countermeasure testing is focused on the testing of unmanned undersea vehicles with mine hunting sensors in marine environments in and around rocky outcroppings. Anti-terrorism/force protection mine countermeasures testing is focused on mine countermeasure missions in confined areas between piers and pilings.
Autonomous Undersea Vehicle (AUV) Underwater Communications	This testing is focused on providing two-way networked communications below the ocean surface while maintaining mission profile.
Fixed System Underwater Communications	Fixed underwater communications systems testing is focused on testing stationary or free floating equipment that provides two-way networked communications below the ocean surface while maintaining mission profile.
Autonomous Undersea Vehicle (AUV) Autonomous Oceanographic Research and Meteorology and Oceanography (METOC)	The research is comprised of ocean gliders and autonomous undersea vehicles. Gliders are portable, long-endurance buoyancy driven vehicles that provide a means to sample and characterize ocean water properties. Autonomous undersea vehicles are larger, shorter endurance vehicles.
Fixed Autonomous Oceanographic Research and Meteorology and Oceanography (METOC)	The goal of these systems is to develop, integrate, and demonstrate deployable autonomous undersea technologies that improve the Navy's capability to conduct effective anti-submarine warfare and intelligence, surveillance, and reconnaissance operations in littoral waters.
Passive Mobile Intelligence, Surveillance, and Reconnaissance Sensor Systems	These systems use passive arrays hosted by surface and subsurface vehicles and vessels for conducting submarine detection and tracking experiments and demonstrations.
Fixed Intelligence, Surveillance, and Reconnaissance Sensor Systems	These systems use stationary fixed arrays for conducting submarine detection and tracking experiments and demonstrations.
Anti-Terrorism/Force Protection (AT/FP) Fixed Sensor Systems	These systems use stationary fixed arrays for providing protection of Navy assets from underwater threats.

2.4.2.7 Office of Naval Research and Naval Research Laboratory Testing Events

As the Navy's Science and Technology provider, Office of Naval Research and the Naval Research Laboratory provide technology solutions for Navy and Marine Corps training and operational needs. The Office of Naval Research's mission, defined by law, is to plan, foster, and encourage scientific research in recognition of its paramount importance as related to the maintenance of future naval power, and the preservation of national security. Further, the Office of Naval Research manages the Navy's basic, applied, and advanced research to foster transition from science and technology to higher levels of research, development, test and evaluation. The Ocean Battlespace Sensing Department explores science and technology in the areas of oceanographic and meteorological observations, modeling, and prediction in the battlespace environment; submarine detection and classification (anti-submarine warfare); and mine warfare applications for detecting and neutralizing mines in both the ocean and littoral environment. The Office of Naval Research events include: research, development, test, and evaluation activities; surface processes acoustic communications experiments; shallow water acoustic communications experiments; sediment acoustics experiments; shallow water acoustic propagation experiments; and long range acoustic propagation experiments. Office of Naval Research testing is shown in Table 2.4-5; however, because of the unpredictable nature of scientific discoveries, this description is provided as an example only. The Office of Naval Research will strive to predict acoustic activity and account for that activity within the classifications described in Section 2.3.1 (Sonar and Other Acoustic Sources).

Table 2.4-5: Typical Office of Naval Research Testing Activity in the Study Area

Activity Name	Activity Description
Office of Naval Research RDT&E	
Kauai Acoustic Communications Experiment (Coastal)	The primary purpose of the Kauai Acoustic Communications Experiment is to collect acoustic and environmental data appropriate for studying the coupling of oceanography, acoustics, and underwater communications.

2.5 ALTERNATIVES DEVELOPMENT

The identification, consideration, and analysis of alternatives are important aspects of the NEPA process and contribute to the goal of objective decision-making. The Council on Environmental Quality requires and provides guidance on the development of alternatives. The regulations require the decision maker to consider the environmental effects of the proposed action and a range of alternatives (including the No Action Alternative) to the proposed action (40 C.F.R. § 1502.14). The range of alternatives (including the No Action Alternative) include reasonable alternatives, which must be rigorously and objectively explored, as well as other alternatives that were considered but eliminated from detailed study. To be reasonable, an alternative must meet the stated purpose of and need for the proposed action. An EIS must explore all reasonable mitigation measures for a proposed action. The purpose of including a No Action Alternative in environmental impact analyses is to ensure that agencies compare the potential impacts of the proposed action to the potential impacts of maintaining the status quo.

The Navy developed the alternatives considered in this EIS/OEIS after careful assessment by subject matter experts, including military units and commands that utilize the ranges, military range management professionals, and Navy environmental managers and scientists.

2.5.1 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

Alternatives eliminated from further consideration are described in Section 2.5.1.1 (Alternative Training and Testing Locations) through Section 2.5.1.3 (Simulated Training and Testing). The Navy determined that these alternatives did not meet the purpose of and need for the Proposed Action after a thorough consideration of each.

2.5.1.1 Alternative Training and Testing Locations

The Navy's use of training ranges has evolved over the decades because these geographic areas allow the entire spectrum of training and testing to occur. While some unit level training and some testing activities may require only one training element (air space, sea space, or undersea space), more advanced training and testing events may require a combination of air, surface, and undersea space as well as access to land ranges. The ability to utilize the diverse and multi-dimensional capabilities of each range complex allows the Navy to develop and maintain high levels of readiness. No other locations match the attributes found in the range complexes within the Study Area, which are as follows:

- Proximity of range complexes either in Hawaii or in the southwestern United States to each other.
- Proximity to the homeport regions of San Diego and Hawaii, and the Navy commands, ships, submarines, schools, and aircraft units and Marine Corps forces stationed there.
- Proximity to shore-based facilities and infrastructure, and the logistical support provided for testing activities.
- Proximity to military families, in light of the readiness benefits derived from minimizing the length of time Sailors and Marines spend deployed away from home.
- Presence of unique training ranges, which include instrumented deep-water ranges in Hawaii and Southern California that offer training capabilities not available elsewhere in the Pacific, and ranges that offer both actual and simulated shore gunnery training for Navy ships.
- Environmental conditions (bathymetry, topography, and weather) found in the Study Area that maximize the training realism and testing effectiveness.

The uniquely interrelated nature of the component parts to the range complexes located within the Study Area provides the training and testing support needed for complex military activities. There is no other series of integrated ranges in the Pacific Ocean that affords this level of operational support and comprehensive integration for range activities. There are no other potential locations where land ranges, OPAREAs, undersea terrain and ranges, and military airspace combine to provide the venues necessary for the training and testing realism and effectiveness required to train and certify naval forces for combat operations.

2.5.1.2 Reduced Training and Testing

Title 10 Section 5062 of the U.S. Code provides: "The Navy shall be organized, trained, and equipped primarily for prompt and sustained combat incident to operations at sea." Reduction or cessation of training and testing would prevent the Navy from meeting its Title 10 requirements and adequately preparing naval forces for operations at sea ranging from disaster relief to armed conflict.

2.5.1.3 Mitigations Including Temporal or Geographic Constraints within the Study Area

Alternatives considered under the NEPA process may include mitigation measures. This assumes however, that appropriate mitigations can be developed before a detailed analysis of the impacts from the alternatives and compliance with other federal laws occurs. Analysis of military training and testing activities involves compliance with several federal laws including the MMPA and the ESA. These laws require that the Navy complete complex and lengthy permitting processes, which include applying the best available science to develop mitigations. The best available science is reviewed and identified during the course of the permitting and NEPA/EO 12114 processes. Consequently, in order to allow for potential mitigation measures to be more fully developed as part of the detailed NEPA/EO 12114 analysis and further refined and informed by applicable permitting processes, the Navy did not identify and carry forward for analysis any separate alternatives with pre-determined geographic or temporal restrictions. Rather, Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of this EIS/OEIS contains a detailed discussion of potential mitigation measures that were evaluated. Based on the analysis in Chapter 5, the MMPA and the ESA permitting processes, and other required regulatory consultations, practical science-based mitigation measures, including temporal or geographic constraints within the Study Area, may be implemented under either action alternative as well as the No Action Alternative.

2.5.1.4 Simulated Training and Testing

The Navy currently uses computer simulation for training and testing whenever possible (e.g., command and control exercises are conducted without operational forces); however, there are significant limitations and its use cannot completely substitute for live training or testing. Therefore, simulation as an alternative that replaces training and testing in the field does not meet the purpose of and need for the Proposed Action and has been eliminated from detailed study.

2.5.1.4.1 Simulated Training

The Navy continues to research new ways to provide realistic training through simulation, but there are limits to the realism that technology can presently provide. Unlike live training, computer-based training does not provide the requisite level of realism necessary to attain combat readiness. Simulation cannot replicate the inherent high-stress environment and complexity of the coordination needed to combine multiple military assets and personnel into a single fighting unit. Most notably, simulation cannot mimic dynamic environments involving numerous forces or accurately model the behavior of sound in complex training media such as the marine environment.

Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments. Moreover, it is imperative that crews achieve competence and gain confidence in their ability to use their equipment.

Sonar operators must train regularly and frequently to develop and maintain the skills necessary to master the process of identifying underwater threats in the complex subsurface environment. Sole reliance on simulation would deny service members the ability to develop battle-ready proficiency in the employment of active sonar in the following specific areas:

- Bottom bounce and other environmental conditions. Sound hitting the ocean floor (bottom bounce) reacts differently depending on the bottom type and depth. Likewise, sound passing through changing currents, eddies, or across changes in ocean temperature, pressure, or salinity is also affected. Both of these are extremely complex and difficult to simulate, and both are common in actual sonar operations.
- Mutual sonar interference. When multiple sonar sources are operating in the vicinity of each other, interference due to similarities in frequency can occur. Again, this is a complex variable that must be recognized by sonar operators, but is difficult to simulate with any degree of fidelity.
- Interplay between ship and submarine target. Ship crews, from the sonar operator to the ship's Captain, must react to the changing tactical situation with a real, thinking adversary (a Navy submarine for training purposes). Training in actual conditions with actual submarine targets provides a challenge that cannot be duplicated through simulation.

- Interplay between anti-submarine warfare teams in the strike group. Similar to the interplay required between ships and submarine targets, a ship's crew must react to all changes in the tactical situation, including changes from cooperating ships, submarines, and aircraft.

Computer simulation can provide familiarity and complement live training; however, it cannot provide the fidelity and level of training necessary to prepare naval forces for deployment. Therefore, the alternative of substituting simulation for live training fails to meet the purpose of and need for the Proposed Action and was eliminated from detailed study.

2.5.1.4.2 Simulated Testing

As described in Section 1.4.3, the Navy conducts testing activities to collect scientific data; investigate, develop, and evaluate new technologies; and to support the acquisition and life cycle management of platforms and systems used by the warfighters. Throughout the life cycle of platforms and systems, from performing basic research to procurement of the platform or system, the Navy uses a number of different testing methods, including computer simulation, when appropriate. The Navy cannot use or rely exclusively on simulation when performing a number of specific testing activities, including collection of scientific data; verifying contractual requirements; and assessing performance criteria, specifications, and operational capabilities.

The Navy collects scientific data that can only be obtained from direct measurements of the marine environment to support scientific research associated with the development of new platforms and systems. A full understanding of how waves in the ocean move, for example, can only be fully understood by collecting information on waves. This type of direct scientific observation and measurement of the environment is vital to developing simulation capabilities by faithfully replicating environmental conditions.

As the acquisition authority for the Navy, the Systems Commands are responsible for administering large contracts for the Navy's procurement of platforms and systems. These contracts include performance criteria and specifications that must be verified to assure that the Navy accepts platforms and systems that support the warfighter's needs. Although simulation is a key component in platform and systems development, it does not adequately provide information on how a system will perform or whether it will be able to meet performance and other specification requirements because of the complexity of the technologies in development and the marine environments in which they will operate. For this reason, at some point in the development process, platforms and systems must undergo at-sea or in-flight testing. For example, a new jet airplane design can be tested in a wind tunnel that simulates flight to assess elements like maneuverability, but eventually a prototype must be constructed and flown to confirm the wind tunnel data.

Furthermore, the Navy is required by law to operationally test major platforms, systems, and components of these platforms and systems in realistic combat conditions before full-scale production can occur. Under Title 10 of the United States Code, this operational testing cannot be based exclusively on computer modeling or simulation. At-sea testing provides the critical information on operability and supportability needed by the Navy to make decisions on the procurement of platforms and systems, ensuring that what is purchased performs as expected and that tax dollars are not wasted. This testing requirement is also critical to protecting the warfighters who depend on these technologies to execute their mission with minimal risk to themselves.

This alternative—substitution of simulation for live testing—fails to meet the purpose of and need for the Proposed Action and was therefore eliminated from detailed study.

2.5.2 Alternatives Carried Forward

Three alternatives are analyzed in this EIS/OEIS.

- **No Action Alternative:** Baseline training and testing activities, as defined by existing Navy environmental planning documents, including the HRC EIS/OEIS, the SOCAL Range Complex EIS/OEIS, and the SSTC EIS. The baseline testing activities also include those testing events that have historically occurred in the Study Area and have been subject to previous analyses pursuant to NEPA/EO 12114.
- **Alternative 1:** Overall expansion of the Study Area plus adjustments to types and levels of activities, from the baseline as necessary to support current and planned Navy training and testing requirements. This Alternative considers:
    - analysis of areas where Navy training and testing would continue as in the past, but were not considered in previous environmental analyses. This Alternative would not expand the area where the Navy trains and tests, but would simply expand the area that is to be analyzed.
    - mission requirements associated with force structure changes, including those resulting from the development, testing, and ultimate introduction of new platforms (vessels and aircraft) and weapon systems into the fleet.
- **Alternative 2 (Preferred Alternative):** Consists of Alternative 1 plus the establishment of new range capabilities, modifications of existing capabilities, and adjustments to type and levels of training and testing.

Each of the alternatives is discussed in Sections 2.6 (No Action Alternative: Current Military Readiness within the Hawaii-Southern California Training and Testing Study Area) through 2.8 (Alternative 2: Includes Alternative 1 Plus Increased Tempo of Training and Testing Activities).

2.6 No Action Alternative: Current Military Readiness within the Hawaii-Southern California Training and Testing Study Area

The Council on Environmental Quality regulations require that a range of alternatives to the proposed action, including a No Action Alternative, be developed for analysis. The No Action Alternative serves as a baseline description from which to compare the potential impacts of the proposed action. The Council on Environmental Quality provides two interpretations of the No Action Alternative, depending on the proposed action. One interpretation would mean the proposed activity would not take place, and the resulting environmental effects from taking no action would be compared with the effects of taking the proposed action. For example, this interpretation would be used if the proposed action was the construction of a facility. The second interpretation, which applies to this EIS/OEIS, allows the No Action Alternative to be thought of in terms of continuing the present course of action until that action is changed. The No Action Alternative for this EIS/OEIS would continue currently conducted training and testing activities (baseline activities) and force structure (personnel, weapons and assets) requirements as defined by existing Navy environmental planning documents described in Section 2.5.2 (Alternatives Carried Forward).

The No Action Alternative represents those training and testing activities and events as set forth in previously completed Navy environmental planning documents. However, the No Action Alternative would fail to meet the purpose of and need for the Proposed Action because it would not allow the Navy to meet current and future training and testing requirements necessary to achieve and maintain fleet readiness.

For example, the baseline activities do not account for changes in force structure (personnel, weapons, and assets) requirements, the introduction of new or upgraded weapons and platforms, or the training and testing required for proficiency with these systems.

2.7 Alternative 1: Expansion of Study Area Plus Adjustments to the Baseline and Additional Weapons, Platforms, and Systems

Alternative 1 would consist of the No Action Alternative, plus the expansion of Study Area boundaries and adjustments to location, type, and tempo of training and testing activities, which includes the addition of platforms and systems.

- **Expansion of the Overall Study Area Boundaries:** The overall Study Area boundaries for Alternative 1 would be expanded to the area depicted in Figure 2.7-1 and described in Section 2.1 (Description of the Hawaii-Southern California Training and Testing Study Area). This EIS/OEIS contains analyses of areas where Navy training and testing would continue as in the past, but were not considered in previous environmental analyses. This is not an expansion of where the Navy trains and tests, but is simply an expansion of the area to be analyzed. Previous EIS/OEISs were developed for a single range complex. This EIS/OEIS is combining all the ranges into one document, which allows for additional areas to be analyzed, including:
    - **Expansion of the Western Boundary of the Study Area:** The Temporary OPAREA that makes up a significant portion of the HRC is defined on its western boundary by the 179th meridian. So that the Study Area would coincide with the demarcation between U.S. Navy 7th Fleet and 3rd Fleet areas of responsibility, the western boundary of the Study Area would extend 60 nm beyond the Temporary OPAREA, to the International Date Line (180th meridian) (Figure 2.7-1).
    - **Transit Corridor:** Another area not previously analyzed is the open ocean between Southern California and Hawaii. Within this area, U.S. Navy vessels frequently transit and, during those transits, conduct limited training and testing. The Navy will analyze these activities along this transit corridor in this EIS/OEIS.
    - **Navy Piers and Shipyards:** The Navy tests sonar systems at Navy piers and shipyards. These pierside maintenance testing activities located in Hawaii and Southern California would be included in this EIS/OEIS.
    - **San Diego Bay:** Ships berthed at Naval Base San Diego transit the San Diego Bay to and from the naval base. During these transits, some sonar maintenance testing would occur. In addition, some testing activities occur throughout San Diego Bay.
- **Adjustments to Locations and Tempo of Training and Testing Activities:** This alternative also includes changes to training and testing requirements necessary to accommodate the following:
    - Force structure changes, which include the relocation of ships, aircraft, and personnel. Training and testing requirements must adapt to meet the needs of these new forces.
    - Development and introduction of ships, aircraft, and weapon systems.
    - Current training and testing activities not addressed in previous environmental documents.

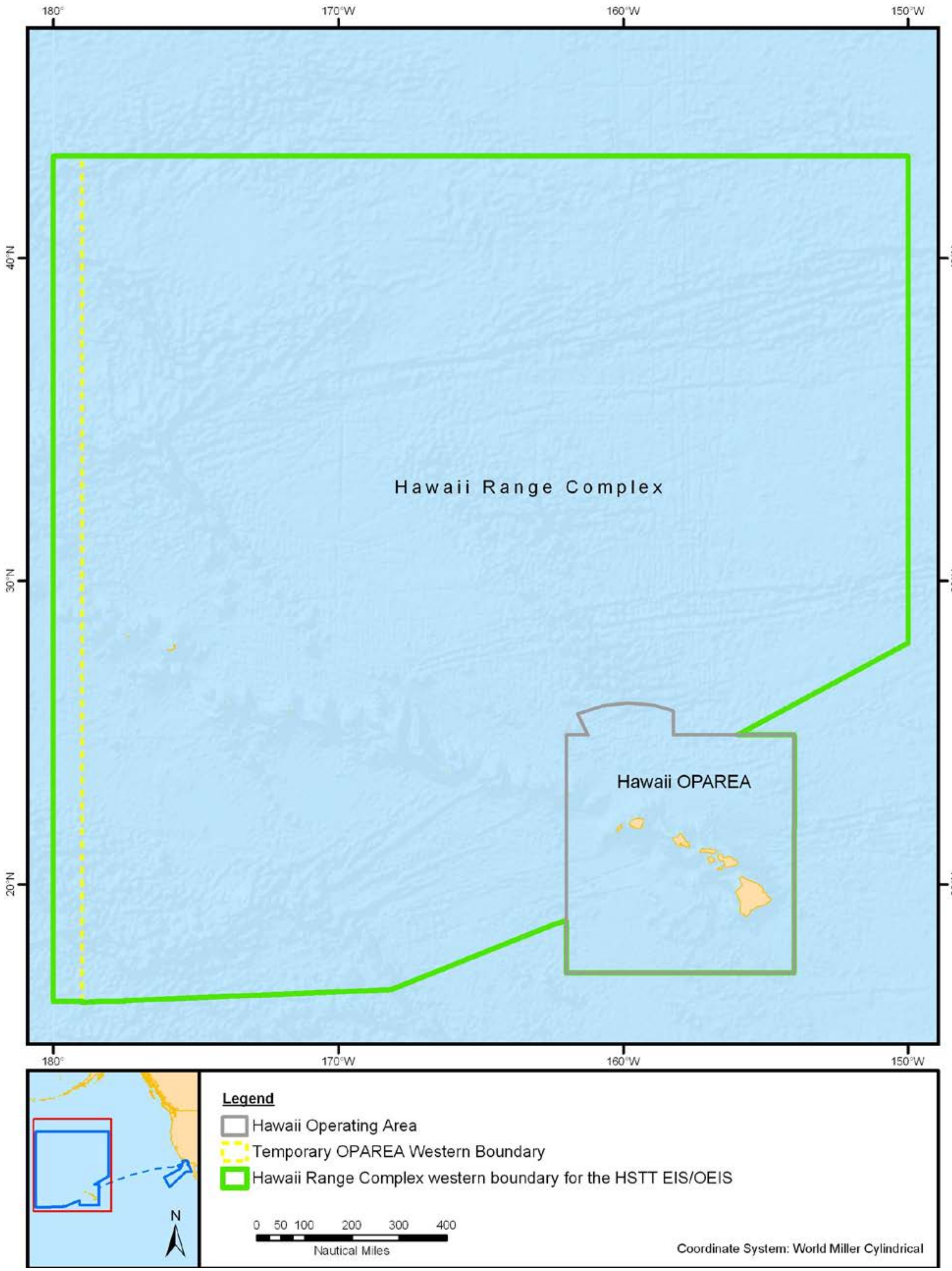


Figure 2.7-1: Proposed Expansion of the Western Boundary of the Study Area

Alternative 1 reflects adjustments to the baseline activities which are necessary to support all current and proposed Navy at-sea training and testing activities. Locations identified within Tables 2.8-1 through 2.8-5 represent the areas where events are typically scheduled to be conducted. Generally, the range complex or testing range is identified but, for some activities, smaller areas within the range are identified. Events could occur outside of the specifically identified areas if environmental conditions are not favorable on a range, the range is unavailable due to other units training or testing or it poses a risk to civilian or commercial users, or to meet fleet readiness requirements.

2.7.1 Proposed Adjustments to Baseline Training Activities

The proposed adjustments to baseline levels and types of training categorized by primary mission areas are as follows:

2.7.1.1 Anti-Air Warfare

- Utilize different targets in the conduct of anti-air warfare events, such as LUU-2 illumination flares and the BQM-34 Firebee high performance aerial target in missile exercises.
- Utilize new weapons in the conduct of anti-air warfare, such as the 57 mm (2.24 in.) (large-caliber) gun system and rolling airframe missile system installed on the Littoral Combat Ship.

2.7.1.2 Amphibious Warfare

- Reduction in number of naval surface fire support at-sea exercises conducted in the HRC.

2.7.1.3 Strike Warfare

- There are no substantive adjustments to strike warfare training events that would require additional analysis.

2.7.1.4 Anti-Surface Warfare

- Support anti-surface warfare gunnery, bombing, and missile requirements by adjusting number of events and the amount of high explosive rounds used. Increased use of high-explosive munitions is needed for specific certification requirements and when non-explosive practice munitions are out of stock.
- Utilize new weapons during anti-surface warfare events, such as the 57 mm (2.24 in.) turret mounted gun on the Littoral Combat Ship, the upgraded 20 mm (0.79 in.) close-in weapon system which allows for its use in defending against surface craft, the 30 mm (1.18 in.) gun, and new precision-guided missiles/rockets currently under development.

2.7.1.5 Anti-Submarine Warfare

- Support anti-submarine warfare requirement by adjusting number of events conducted and the amount of acoustic sensors used during those events.
- Account for the introduction of planned anti-submarine warfare sensors being made available.
- Adding new anti-submarine warfare events such as surface ship defense system training.

2.7.1.6 Electronic Warfare

- There are no substantive adjustments to electronic warfare training events that would require additional analysis.

2.7.1.7 Mine Warfare

- Support mine warfare requirements by adjusting number of events conducted and the amount of time acoustic sensors are used during those events.
- Account for the introduction and use of planned mine warfare sensors, neutralizers, and platforms, especially unmanned and remotely operated vehicles.
- Adjust the number of high explosive mine neutralization events to align with revised mission training requirements.
- Expand areas in the SOCAL Range Complex, to include new mine training ranges for mine warfare events.

2.7.1.8 Naval Special Warfare

- There are no substantive adjustments to naval special warfare training events that would require additional analysis.

2.7.1.9 Other Training

- Conduct homeland security and anti-terrorism/force protection training events in various ports and harbors.

2.7.2 Proposed Adjustments to Baseline Testing Activities

2.7.2.1 New Ship Construction

- Conduct ship trials on new platforms described in Section 2.7.3.
- Conduct testing on new Littoral Combat Ship Mission Packages: anti-submarine warfare, surface warfare, and mine countermeasures. See Section 2.7.3.2 (Ships) discussion of the Littoral Combat Ship for more information.

2.7.2.2 Life Cycle Activities

- Increase the number of Combat System Ship Qualification Trials.

2.7.2.3 Anti-Air Warfare

- Increase in air platform weapons integration tests conducted in the Hawaii OPAREA.

2.7.2.4 Anti-Surface Warfare

- Increase number of events conducted.
- Increase flexibility of locations used during testing.
- Use newly developed and future anti-surface warfare sensors.
- Decrease in air-to-surface missile tests and in the use of explosive missiles in the SOCAL OPAREA.
- Increase in air-to-surface gunnery tests using small- and medium-caliber rounds in the SOCAL OPAREA and the addition of explosive rounds.
- Increase in the number of 69.85 mm (2.75 in.) rocket tests in the SOCAL OPAREA and the addition of explosive rockets.

2.7.2.5 Anti-Submarine Warfare

- Increase in anti-submarine warfare torpedo tests in the Southern California OPAREA.
- Use newly developed and future anti-submarine warfare sensors.
- Increase in anti-submarine warfare tracking test–helicopter events conducted in the Hawaii and SOCAL OPAREAs.
- Addition of high-altitude torpedo and sonobuoy testing.

2.7.2.6 Mine Warfare Testing

- No change in mine warfare testing events is anticipated under Alternative 1.

2.7.2.7 Shipboard Protection Systems and Swimmer Defense Testing

- Reduce number of events for pierside integrated swimmer defense.

2.7.2.8 Unmanned Vehicle Testing

- No change in unmanned vehicle testing events is anticipated under Alternative 1.

2.7.2.9 Other Testing

- Addition of special warfare test events.
- Testing of unmanned undersea vehicle mine countermeasures.
- Anti-terrorism/force protection mine countermeasures testing.
- Anti-terrorism/force protection underwater surveillance systems testing.
- Testing of underwater communication systems.
- Development and demonstration of technologies that improve the Navy's fixed intelligence, surveillance, and reconnaissance sensor systems.
- Test and evaluation of passive mobile intelligence, surveillance, and reconnaissance sensor systems.
- Testing of autonomous undersea vehicles such as gliders.

2.7.3 Proposed Platforms and Systems

The following is a representative list of additional platforms, weapons and systems analyzed. The ships and aircraft will not be an addition to the fleet but rather replace older ships and aircraft that are decommissioned and removed from the inventory. Information regarding Navy platforms and systems can be found on the Navy Fact File website: http://www.navy.mil/navydata/fact.asp.

2.7.3.1 Aircraft

F-35 Joint Strike Fighter

The F-35 Joint Strike Fighter Lightning II aircraft will complement the Navy's F/A-18E/F. The F-35 is projected to make up about one-third of the Navy's strike fighter inventory by 2020. The Marine Corps will have a variant of the F-35 with a short takeoff, vertical landing capability that is planned to replace the AV-8B and F/A-18C/D aircraft. The Navy variant for aircraft carrier use is scheduled for delivery in 2015; the Marine Corps variant is scheduled for initial operating capability in 2012. The F-35 will operate similarly to the aircraft it replaces or complements. It will operate in the same areas and will be used in the same training exercises such as air-to-surface and air-to-air missile exercises, bombing exercises, and any other exercises where fixed-wing aircraft are used in training. No new activities will result from the introduction of the F-35.

EA-18G Airborne Electronic Attack Aircraft

The EA-18G is replacing the aging fleet of EA-6Bs providing a capability to detect, identify, locate, and suppress hostile emitters. It will operate similarly to the EA-6B, and in the same training areas, but will provide greater speed and altitude capabilities. No new activities will result from the introduction of the EA-18G.

E-2D Airborne Early Warning

The E-2D Advanced Hawkeye is the carrier-based Airborne Early Warning aircraft follow on variant of the E-2C Hawkeye. The E-2D will operate similarly to the E-2C, in the same training areas, with an increased on-station time as the new aircraft will include an in-flight refueling capability. Fleet integration is expected in 2015.

2.7.3.2 Ships

CVN-21 Aircraft Carrier (Gerald R. Ford Class)

The CVN-21 Program is designing the replacement for the Nimitz class carriers. The new aircraft carriers' capabilities will be similar to those of the carriers they will replace, and it will train in the same OPAREAs as the predecessor aircraft carriers. The first aircraft carrier (CVN 78) is expected to be delivered in 2015. No new activities will result from the introduction of the CVN 21 class of aircraft carriers.

DDG 1000 Multi-Mission Destroyer (Zumwalt Class)

Developed under the DD(X) destroyer program, Zumwalt (DDG 1000) is the lead ship of a class of next-generation multi-mission destroyers tailored for land attack and littoral dominance. The DDG 1000 will operate similarly to the existing Arleigh Burke class of destroyers; however, it will provide greater capability in the near-shore sea space and will train more in that environment. Its onboard weapons and systems will include a 155 mm advanced gun system to replace the 5 in. gun system on current destroyers. This gun system will fire a new projectile at greater distances. See Section 2.7.3.6 (Munitions) for a description of the Long Range Land Attack Projectile.

The DDG 1000 will also be equipped with two new sonar systems; the AN/SQS-60 hull-mounted mid-frequency sonar, and the AN/SQS-61 hull-mounted high-frequency sonar.

The first ship of this class is expected to be delivered in 2016. This class will join the fleets and conduct training alongside existing DDG classes of ships. The introduction of DDG 1000 class would require an increase in training allowances for exercises currently being conducted by existing DDG class ships.

Littoral Combat Ship

The Littoral Combat Ship is a fast, agile, mission-focused platform designed for operation in nearshore environments yet capable of open-ocean operation. These ships are capable of speeds in excess of 40 knots. As a focused-mission ship, the Littoral Combat Ship is equipped to perform one primary mission at any given time; however the mission orientation can be changed by changing out its mission packages. Mission packages are supported by special detachments that will deploy manned and unmanned vehicles and sensors in support of mine, undersea, and surface warfare missions. The first Littoral Combat Ships were delivered to the fleet in 2008 and 2010. Some Littoral Combat Ships will be homeported in San Diego and will train primarily in the Navy's existing near-shore OPAREAs.

Joint High Speed Vessel

The Joint High Speed Vessel will be capable of transporting personnel, equipment, and supplies 1,200 nm at an average speed of 35 knots. It will be able to transport company-sized units with their vehicles, or reconfigure to become a troop transport for an infantry battalion. The Joint High Speed Vessel, while performing a variety of lift and support missions, will be a non-combatant vessel that operates in permissive environments or in higher threat environments under the protection of combatant vessels and other joint forces.

Amphibious Combat Vehicle

The Marine Corps is developing a vehicle to replace the Amphibious Assault Vehicle. The Amphibious Combat Vehicle will be the expected replacement, which the Marine Corps hopes to introduce to the Fleet Marine Force by 2020. The Amphibious Combat Vehicle will have the capability of transporting Marines from naval ships located beyond the horizon to shore and further inland.

2.7.3.3 Unmanned Vehicles and Systems

2.7.3.3.1 Unmanned Undersea Vehicles

In addition to unmanned undersea vehicles that are currently in service, new ones will be developed and enter fleet service that will support several high-priority missions including: (1) intelligence, surveillance, and reconnaissance; (2) mine countermeasures; (3) anti-submarine warfare; (4) oceanography; (5) communication/navigation network nodes; (6) payload delivery; (7) information operations; and (8) time critical strike.

Sea Maverick Unmanned Undersea Vehicle

Sea Maverick is a fully autonomous underwater vehicle specifically designed to minimize impacts to the environment. It uses no active sonar, and has an advanced propeller system that is encased to prevent damage to sea beds and other marine life.

2.7.3.3.2 Unmanned Surface Vehicles

Unmanned surface vehicles are primarily autonomous systems designed to augment current and future platforms to help deter maritime threats. They will employ a variety of sensors designed to extend the reach of manned ships.

Spartan Unmanned Surface Vehicle

The Spartan is an unmanned surface vehicle with a dipping sonar system that will be supported by the Littoral Combat Ship. It will train in areas where current sonar training is conducted on Navy ranges.

Sea Horse Unmanned Surface Vehicle

The Sea Horse is an unmanned surface vehicle designed to provide force protection capabilities in harbors and bays.

2.7.3.3.3 Unmanned Aerial Systems

Unmanned aerial systems include aerial systems that operate as intelligence, search, and reconnaissance sensors or as armed combat air systems.

MQ-8B Fire Scout

The Fire Scout Vertical Take-Off and Landing Tactical Aerial Vehicle system is designed to operate from air-capable ships with initial deployment on a Guided Missile Frigate, followed by final integration and test on board the Littoral Combat Ship. This unmanned aerial system is capable of providing radio voice communications relay and has a baseline payload that includes electro-optical/infrared sensors and a laser designator that enables the system to find tactical targets, track and designate targets, accurately provide targeting data to strike platforms, and perform battle damage assessment. There is current testing to place a weapon system on the Fire Scout.

MQ-4C Triton Unmanned Aerial System

The MQ-4C Triton unmanned aircraft is a complementary system to the P-8A aircraft, providing maritime reconnaissance support to the Navy. It will be equipped with electro-optical/infrared sensors, can remain on station for 30 hours, and fly at approximately 60,000 ft. (18,288 m).

2.7.3.4 Missiles/Rockets/Bombs

Joint Air-to-Ground Missile

The joint air-to-ground missile is a possible replacement or upgrade to existing air-to-ground weapons currently in use. In addition to having a longer operating range than existing weapons, the joint air-to-ground missile could include a multi-mode seeker, with a combination of semi-active laser, passive infrared, and radar. The MH-60 helicopter and F/A-18 jet are Navy aircraft platforms from which this new missile would be fired.

AGM-154 Joint Standoff Weapon

The Joint Standoff Weapon is a missile able to be launched at increased standoff distances, using global positioning system and inertial navigation for guidance. All Joint Standoff Weapon variants share a common body but can be configured for use against area targets or bunker penetration. This would be integrated into strike warfare exercises as well as exercises where the use of this type of missile is required.

MK 54 Vertical Launch Anti-Submarine Rocket Missile

The Navy has designated the MK 54 torpedo to replace the MK 46 torpedo for rapid employment by surface ships. The missile is a rocket-propelled, three-stage weapon that is deployed on ships equipped with the MK 41 Vertical Launching System. Once entering the water, the MK 54 torpedo will operate similarly to the MK 46 that it replaces.

MK 54 Torpedo, High Altitude Anti-submarine Warfare Capability

The high-altitude anti-submarine warfare capability is a low-cost, self-contained air launch accessory kit that enables the MK 54 torpedo to be launched at high altitude. The torpedo then glides to its normal launch altitude close to the surface, and jettisons the air launch accessory kit prior to water entry at a pre-determined location. Once in the water, the MK 54 torpedo will operate similarly to the MK 46 that it replaces.

Guided Rocket Systems

Guided rocket systems include the low cost guided imaging rocket (a guided infrared 2.75 in. [7 cm] rocket system) and the advanced precision kill weapon system (a laser-guided 2.75 in. [7 cm] rocket). The MH-60 helicopter is one platform expected to be equipped with these rockets.

2.7.3.5 Guns

Kinetic Energy Weapon

The electromagnetic kinetic energy weapon uses electrical energy to accelerate projectiles to supersonic velocities. This weapon will be operated from ships, firing projectiles toward land targets. Kinetic energy weapons do not require powders or explosives to fire the round and could have ranges as great as 300 mi. (483 km). At-sea demonstration is planned for 2016.

2.7.3.6 Munitions

Long Range Land Attack Projectile

The Long Range Land Attack Projectile is part of a family of 155 mm (6 in.) projectiles designed to be fired from the Advanced Gun System for the Navy's next-generation DDG 1000 destroyer. The Long Range Land Attack Projectile allows the DDG 1000 class to provide precision fire support to Marine Corps and Army forces from a safe distance offshore. This capability would be integrated into amphibious and strike warfare exercises.

2.7.3.7 Other Systems

High Altitude Anti-Submarine Warfare

High altitude anti-submarine warfare integrates new and modifies existing sensors to enhance the sonobuoy capability to conduct anti-submarine warfare at high altitude. Sonobuoy modifications include integrating global positioning system for precise sonobuoy positional information and a digital uplink/downlink for radio frequency interference management. New sensors include a meteorological sensing device (dropsonde) for sensing atmospheric conditions from the aircraft altitude to the surface.

New Sonobuoys

New sonobuoys will be initially tested and ultimately used in training throughout the Study Area. These sonobuoys will operate similarly to existing systems, but will provide greater capabilities through improved processing. The key aspects of these new sonobuoys involve the active sound source. Both impulse (explosive) and non-impulse source sonobuoys will be tested.

Littoral Combat Ship Anti-Submarine Warfare Module

The anti-submarine warfare module provides a littoral anti-submarine warfare capability that includes active sonar. An increase to unit level and joint surface ship anti-submarine warfare exercises would be expected upon introduction to the fleets, and training would continue on existing Navy ranges.

Littoral Combat Ship Mine Countermeasure Module

The mine countermeasure module brings together several systems to support bottom mapping, mine detection, mine neutralization, and mine clearance. An increase to surface ship mine warfare training is expected upon introduction to the fleets. This module would include mine-detecting sonar and lasers, and neutralization techniques that involve underwater detonations.

Littoral Combat Ship Surface Warfare Module

The surface warfare module is designed to enable the Littoral Combat Ship to combat small, fast boat threats to the fleet. This module would include guns and missiles. An increase to anti-surface warfare training would be expected upon introduction to the fleets.

High Duty Cycle Sonar

High Duty Cycle Sonar technology provides improved detection performance and improved detection and classification decision time. This technology will be implemented as an alteration to the existing AN/SQQ-89A(V)15 surface ship combat system.

Littoral Combat Ship Variable Depth Sonar

The variable depth sonar system is a mid-frequency sonar system that will be towed by the Littoral Combat Ship and integrated into the Littoral Combat Ship anti-submarine warfare mission package.

SQS-60 and SQS-61 Sonar

The AN/SQS-60 and 61 are integrated hull-mounted sonar components of the DDG 1000 Zumwalt class destroyer. The SQS-60 is a mid-frequency active sonar and the SQS-61 is a high-frequency active sonar, both of which would be operated similarly to the current AN/SQS 53 and 56 sonar.

Klein 5000 Sonar

This is a high-frequency side scan sonar system for detecting and classifying bottom objects and moored mine shapes.

Submarine Communications at Speed and Depth

Using expendable buoys, the Communications at Speed and Depth system allows acoustic two-way networked communications with submarines. Initial operating capability is planned for 2012.

Littoral Battlespace Sensing, Fusion and Integration Program

The Littoral Battlespace Sensing, Fusion and Integration program is the Navy's principal Intelligence Preparation of the Environment enabler. This capability is comprised of ocean gliders and autonomous undersea vehicles. Gliders are two-man-portable, long-endurance (weeks to months), buoyancy driven vehicles that provide a low-cost, semi-autonomous, and highly persistent means to sample and characterize the ocean water column properties at spatial and temporal resolutions not otherwise possible using survey vessels or tactical units alone. Autonomous undersea vehicles s are larger, shorter endurance (hours to days), conventionally powered (typically electric motor) vehicles that will increase the spatial extent and resolution of the bathymetry, imagery data, conductivity, temperature and depth data, and optical data collected by existing ships.

2.7.4 Proposed New Activities

Alternative 1 includes some activities that were not analyzed in previous documents. New activities being considered within this analysis are as follows:

- The use of new and existing unmanned vehicles and their acoustic sensors, in support of homeland security and anti-terrorism/force protection. This type of training is critical in protecting our nation's military and civilian harbors, ports, and shipping lanes.
- Surface-to-surface missile exercises. These events, which were previously analyzed as part of Sinking Exercises, will now also be analyzed as a stand-alone event.
- Mission package testing, which includes anti-submarine warfare, surface warfare, and mine countermeasures would be conducted.
- The Navy would conduct testing of a kinetic energy weapon.
- Requirement to conduct at-sea mine laying.
- Navy divers conducting mine-neutralization, without the use of explosives.
- Coordinated, unit level training with airborne mine countermeasures with multiple aircraft crews training as a team.

2.8 Alternative 2: Includes Alternative 1 Plus Increased Tempo of Training and Testing Activities

Alternative 2 is the Preferred Alternative. Alternative 2 consists of all activities that would occur under Alternative 1 plus the establishment of new range capabilities, as well as modifications of existing capabilities; adjustments to type and tempo of training and testing; and the establishment of additional locations to conduct activities between the range complexes.

This alternative allows for potential budget increases, strategic necessity, and future training and testing requirements. Tables 2.8-1 through 2.8-5 provide a summary of the training and testing activities to be analyzed under the No Action Alternative, Alternative 1, and Alternative 2. Cells under the "Ordnance" column are shaded gray if that activity includes the use of high explosive ordnance.

2.8.1 Proposed Adjustments to Alternative 1 Training Activities

The proposed adjustments to Alternative 1 levels and types of training are as follows:

- Introduction of surface ships with a kinetic energy weapon capability, and training with this new weapon system.
- Introduction of Broad Area Maritime Surveillance Unmanned Aerial Vehicles and their use during Maritime Patrol Aircraft anti-submarine warfare training events.
- Hydrophone modification, upgrade, and replacement at underwater tracking ranges at PMRF.

2.8.2 Proposed Adjustments to Alternative 1 Testing Activities

The proposed adjustments to Alternative 1 levels and types of testing are detailed below.

2.8.2.1 New Ship Construction

- Increase number of Mission Package test events.

- Increase post-homeporting testing based on additional ships constructed.

2.8.2.2 Life Cycle Activities

- Increase number of ship signature test events.

2.8.2.3 Anti-Surface Warfare/Anti-Submarine Warfare

- Increase number of events conducted.
- Increase number of kinetic energy weapon tests conducted on vessels at-sea (e.g., on DDG 1000 vessels).
- Increase flexibility in conducting all missile testing in either location identified.
- Increase flexibility in conducting all at-sea sonar testing in either location identified.

2.8.2.4 Mine Warfare Testing

- Increase number of events conducted.

2.8.2.5 Shipboard Protection Systems and Swimmer Defense Testing

- Increase number of events conducted.
- Increase flexibility in conducting all chemical simulant testing in either location identified.

2.8.2.6 Unmanned Vehicle Testing

- Increase number of events conducted.
- Testing of MQ-4C Triton unmanned aerial systems.
- Increase flexibility in conducting all underwater deployed unmanned aerial vehicle testing in either location identified.

2.8.2.7 Other Testing

- Introduction of MQ-4C Triton Unmanned Aerial Vehicles and their use during Maritime Patrol Aircraft Anti-Submarine Warfare testing events.
- Increase number of events conducted overall, with a 10 percent increase in the tempo of all proposed Naval Air Systems Command testing activities. Increase flexibility in conducting all at-sea explosive testing in either location identified.

Table 2.8-1: Baseline and Proposed Training Activities

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Anti-Air Warfare									
Air Combat Maneuver (ACM)	814	None	HRC: Warning Areas: 188, 189, 190, 192, 193, 194	814	None	HRC: Warning Areas: 188, 189, 190, 192, 193, 194	814	None	HRC: Warning Areas: 188, 189, 190, 192, 193, 194
	3,970	None	SOCAL: Warning Area 291 (TMAs)	3,970	None	SOCAL: Warning Area 291 (TMAs)	3,970	None	SOCAL: Warning Area 291 (TMAs)
Air Defense Exercise (ADEX)	N/A	N/A	HRC: Warning Areas: 188, 189, 190, 192, 193, 194	185	None	HRC: Warning Areas: 188, 189, 190, 192, 193, 194	185	None	HRC: Warning Areas: 188, 189, 190, 192, 193, 194
	550	None	SOCAL: Warning Area 291	550	None	SOCAL: Warning Area 291	550	None	SOCAL: Warning Area 291
Gunnery Exercise (Air-to-Air) – medium-caliber (GUNEX [A-A]) – medium-caliber	N/A	N/A	SOCAL: Warning Area 291	3	3,000 rounds	SOCAL: Warning Area 291	3	3,000 rounds	SOCAL: Warning Area 291
Missile Exercise (Air-to-Air) (MISSILEX [A-A])	24	96 missiles (48 HE)	HRC: Warning Area 188	27	105 missiles (53 HE)	HRC: Warning Area 188	27	105 missiles (53 HE)	HRC: Warning Area 188
	13	52 missiles (26 HE)	SOCAL: Warning Area 291,SOAR, FLETA Hot, MISRs	25	52 missiles (26 HE)	SOCAL: Warning Area 291, SOAR, FLETA Hot, MISRs	25	52 missiles (26 HE)	SOCAL: Warning Area 291, SOAR, FLETA Hot, MISRs

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California [Range Complex], TMA = Tactical Maneuvering Area, HE = High Explosive, SOAR = Southern California Anti-submarine Warfare Range, FLETA = Fleet Training Area, MISR = Missile Range, N/A = Not Analyzed (this event was not analyzed as part of the baseline)

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Anti-Air Warfare (continued)									
Gunnery Exercise (Surface-to-Air) – Large-caliber (GUNEX [S-A]) – Large-caliber	46	550 rounds	HRC: Warning Areas 188, 192, Mela South	50	400 HE rounds	HRC: Warning Areas 188, 192, Mela South	50	400 HE rounds	HRC: Warning Areas 188, 192, Mela South
	160	1,900 rounds	SOCAL: Warning Area 291	160	1,300 rounds	SOCAL: Warning Area 291	160	1,300 rounds	SOCAL: Warning Area 291
Gunnery Exercise (Surface-to-Air) – Medium-caliber (GUNEX [S-A]) – Medium-caliber	62	87,000 rounds	HRC: Warning Areas 188, 192, Mela South	70	140,000 rounds	HRC: Warning Areas 188, 192, Mela South	70	140,000 rounds	HRC: Warning Areas 188, 192, Mela South
	190	266,000 rounds	SOCAL: Warning Area 291	190	380,000 rounds	SOCAL: Warning Area 291	190	380,000 rounds	SOCAL: Warning Area 291
Missile Exercise (Surface-to-Air) (MISSILEX [S-A])	26	26 HE missiles	HRC: Warning Area 188	30	30 HE missiles	HRC: Warning Area 188	30	30 HE missiles	HRC: Warning Area 188
	6	6 HE missiles	SOCAL: Warning Area 291	20	20 HE missiles	SOCAL: Warning Area 291	20	20 HE missiles	SOCAL: Warning Area 291
Missile Exercise-Man-portable Air Defense System (MISSILEX–MANPADS)	4	68 HE missiles	SOCAL: SHOBA	4	68 HE missiles	SOCAL: SHOBA	4	68 HE missiles	SOCAL: SHOBA

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California [Range Complex], HE = High Explosive, SHOBA = Shore Bombardment Area

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Amphibious Warfare (AMW)									
Naval Surface Fire Support Exercise-Land-Based Target (FIREX [Land])	52	8,500 rounds (all rounds land ashore)	SOCAL: SHOBA	52	8,500 rounds (all rounds land ashore)	SOCAL: SHOBA	52	8,500 rounds (all rounds land ashore)	SOCAL: SHOBA
Naval Surface Fire Support Exercise – at Sea (FIREX at Sea)	28	950 NEPM rounds; 1,000 HE rounds	HRC: Warning Area-188 (including BSURE, BARSTUR)	12	1,000 NEPM rounds; 840 HE rounds	HRC: Warning Area-188 (including BSURE, BARSTUR)	12	1,000 NEPM rounds; 840 HE rounds	HRC: Warning Area-188 (including BSURE, BARSTUR)
Amphibious Assault	12	None	HRC-PMRF (Main Base), MCBH, MCTAB	12	None	HRC-PMRF (Main Base), MCBH, MCTAB	12	None	HRC-PMRF (Main Base), MCBH, MCTAB
	18	None	SSTC Boat Lanes 11-14	18	None	SSTC Boat Lanes 11-14	18	None	SSTC Boat Lanes 11-14
Amphibious Assault – Battalion Landing	2	None	SOCAL: SHOBA, SWTR Nearshore, Eel Cove, West Cove, Wilson Cove	2	None	SOCAL: SHOBA, SWTR Nearshore, Eel Cove, West Cove, Wilson Cove	2	None	SOCAL: SHOBA, SWTR Nearshore, Eel Cove, West Cove, Wilson Cove

Notes: NEPM = Non-explosive Practice Munition, HE = High Explosive, SOCAL = Southern California [Range Complex], SHOBA = Shore Bombardment Area, HRC = Hawaii Range Complex, PMRF = Pacific Missile Range Facility, BSURE = Barking Sands Underwater Range Extension, BARSTUR = Barking Sands Tactical Underwater Range, MCBH = Marine Corps Base Hawaii, MCTAB = Marine Corps Training Area Bellows, SSTC = Silver Strand Training Complex, SWTR = Shallow Water Training Range

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Amphibious Warfare (AMW) (continued)									
Amphibious Raid	2,342	None	SOCAL: West, Cove, Horse Beach Cove, NW Harbor, CPAAA	2,342	None	SOCAL: West, Cove, Horse Beach Cove, NW Harbor, CPAAA	2,342	None	SOCAL: West, Cove, Horse Beach Cove, NW Harbor, CPAAA
	84	None	SSTC Boat Lanes 1-8, 11-14; Bravo, Delta I, II, III, Echo, Fox, Golf, Hotel	84	None	SSTC Boat Lanes 1-8, 11-14; Bravo, Delta I, II, III, Echo, Fox, Golf, Hotel	84	None	SSTC Boat Lanes 1-8, 11-14; Bravo, Delta I, II, III, Echo, Fox, Golf, Hotel
Expeditionary Fires Exercise/ Supporting Arms Coordination Exercise (EFEX/SACEX)	8	1,240 NEPM rounds; all landing ashore	SOCAL: San Clemente Island, SHOBA, SWTR Nearshore	8	1,045 rounds; all landing ashore	SOCAL: San Clemente Island, SHOBA, SWTR Nearshore	8	1,045 rounds; all landing ashore	SOCAL: San Clemente Island, SHOBA, SWTR Nearshore
Humanitarian Assistance Operations	2	None	HRC-PMRF (Main Base), Niihau, MCBH, MCTAB	2	None	HRC-PMRF (Main Base), Niihau, MCBH, MCTAB	2	None	HRC-PMRF (Main Base), Niihau, MCBH, MCTAB

Notes: HRC = Hawaii Range Complex, PMRF = Pacific Missile Range Facility, MCBH = Marine Corps Base Hawaii, MCTAB = Marine Corps Training Area Bellows, SOCAL = Southern California [Range Complex], CPAAA = Camp Pendleton Amphibious Assault Area, SSTC = Silver Strand Training Complex, NEPM = Non-explosive Practice Munition, SHOBA = Shore Bombardment Area, SWTR = Shallow Water Training Range, N/A = Not Analyzed (this event was not analyzed as part of the baseline)

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Strike Warfare (STW)									
Bombing Exercise (Air-to-Ground) (BOMBEX A-G)	60	275 bombs (No HE)	HRC: Kaula Island	60	275 bombs (No HE)	HRC: Kaula Island	60	275 bombs (No HE)	HRC: Kaula Island
Gunnery Exercise (Air-to-Ground) (GUNEX A-G)	18	15,000 small- and medium-caliber rounds	HRC: Kaula Island	307	60,000 small- and medium-caliber rounds	HRC: Kaula Island	307	60,000 small- and medium-caliber rounds	HRC: Kaula Island
Anti-Surface Warfare (ASUW)									
Maritime Security Operations (MSO)	66	None	Hawaii OPAREA	70	None	Hawaii OPAREA	70	None	Hawaii OPAREA
	90	None	SOCAL: W-291, OPAREA 3803, SOAR	150	None	SOCAL: W-291, OPAREA 3803, SOAR	150	None	SOCAL: W-291, OPAREA 3803, SOAR
	42	None	SSTC Boat Lanes 1-10	42	None	SSTC Boat Lanes 1-10	42	None	SSTC Boat Lanes 1-10
Gunnery Exercise (Surface-to-Surface) Ship – Small-caliber (GUNEX [S-S] – Ship) Small-caliber	N/A	N/A	HRC: Warning Areas -188, 191, 192, 193, 194, 196, Mela South	60	318,000 rounds	HRC: Warning Areas -188, 191, 192, 193, 194, 196, Mela South	60	318,000 rounds	HRC: Warning Areas -188, 191, 192, 193, 194, 196, Mela South
	50	265,000 rounds	SOCAL: Warning Area-291, SHOBA, SOAR	350	1,855,000 rounds	SOCAL: Warning Area-291, SHOBA, SOAR	350	1,855,000 rounds	SOCAL: Warning Area-291, SHOBA, SOAR
	N/A	N/A	HSTT Transit Corridor	16	84,000 rounds	HSTT Transit Corridor	16	84,000 rounds	HSTT Transit Corridor

Notes: HRC = Hawaii Range Complex, HE = High Explosive, OPAREA = Operating Area, SOCAL = Southern California [Range Complex], SHOBA = Shore Bombardment Area, SOAR = Southern California Anti-submarine Warfare Range, SSTC = Silver Strand Training Complex, HSTT = Hawaii-Southern California Training and Testing, N/A (Not Analyzed). This event was not analyzed as part of the baseline.

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Anti-Surface Warfare (ASUW) (continued)									
Gunnery Exercise (Surface-to-Surface) Ship – Medium-caliber (GUNEX [S-S] – Ship) Medium-caliber	31	6,200 rounds (3,100 HE)	HRC: Warning Areas -188, 191, 192, 193, 194, 196, Mela South	44	4,800 rounds (440 HE)	HRC: Warning Areas -188, 191, 192, 193, 194, 196, Mela South	44	4,800 rounds (440 HE)	HRC: Warning Areas -188, 191, 192, 193, 194, 196, Mela South
	150	30,000 rounds (15,000 HE)	SOCAL: Warning Area-291, SHOBA, SOAR	164	20,800 rounds (1,640 HE)	SOCAL: Warning Area-291, SHOBA, SOAR	164	20,800 rounds (1,640 HE)	SOCAL: Warning Area-291, SHOBA, SOAR
	N/A	N/A	HSTT Transit Corridor	32	6,400 rounds (320 HE)	HSTT Transit Corridor	32	6,400 rounds (320 HE)	HSTT Transit Corridor
Gunnery Exercise (Surface-to-Surface) Ship – Large-caliber (GUNEX [S-S] – Ship) Large-caliber	60	12,000 rounds (6,000 HE)	HRC: Warning Areas -188, 191, 192, 193, 194, 196, Mela South	60	1,000 rounds (934 HE)	HRC: Warning Areas -188, 191, 192, 193, 194, 196, Mela South	60	1,000 rounds (934 HE)	HRC: Warning Areas -188, 191, 192, 193, 194, 196, Mela South
	150	30,000 rounds (15,000 HE)	SOCAL: Warning Area-291, SHOBA, SOAR	190	8,500 rounds (4,204 HE)	SOCAL: Warning Area-291, SHOBA, SOAR	190	8,500 rounds (4,204 HE)	SOCAL: Warning Area-291, SHOBA, SOAR
	N/A	N/A	HSTT Transit Corridor	16	400 rounds (20 HE)	HSTT Transit Corridor	16	400 rounds (20 HE)	HSTT Transit Corridor

Notes: HE = High Explosive, HRC = Hawaii Range Complex, SOCAL = Southern California [Range Complex], SOAR = Southern California Anti-submarine Warfare Range, SHOBA = Shore Bombardment Area, HSTT = Hawaii-Southern California Training and Testing, N/A = Not Analyzed (this event was not analyzed as part of the baseline)

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Anti-Surface Warfare (ASUW) (continued)									
Gunnery Exercise (Surface-to-Surface) Boat – Small-caliber (GUNEX [S-S] – Boat) Small-caliber	200	600,000	SOCAL: Warning Area-291, SHOBA	200	600,000	SOCAL: Warning Area-291, SHOBA	200	600,000	SOCAL: Warning Area-291, SHOBA
Gunnery Exercise (Surface-to-Surface) Boat – Medium-caliber (GUNEX [S-S] – Boat)-Medium-caliber	N/A	N/A	HRC: OPAREA, Warning Area-188	10	100 HE rounds 100 HE grenades 200 NEPM rounds	HRC: OPAREA, Warning Area-188	10	100 HE rounds 100 HE grenades 200 NEPM rounds	HRC: OPAREA, Warning Area-188
	N/A	N/A	SOCAL: Warning Area-291, SHOBA	14	140 HE rounds 140 HE grenades 240 NEPM rounds	SOCAL: Warning Area-291, SHOBA	14	140 HE rounds 140 HE grenades 240 NEPM rounds	SOCAL: Warning Area-291, SHOBA
Missile Exercise (Surface-to-Surface) (MISSILEX [S-S])	12	12 Missiles	HRC: Warning Area-188	12	12 Missiles	HRC: Warning Area-188	12	12 Missiles	HRC: Warning Area-188
	N/A	N/A	SOCAL: Warning Area-291	4	4 Missiles	SOCAL: Warning Area-291	4	4 Missiles	SOCAL: Warning Area-291

Notes: SOCAL = Southern California [Range Complex], SHOBA = Shore Bombardment Area, HE = High Explosive, HRC = Hawaii Range Complex, NEPM = Non-Explosive Practice Munitions, N/A = Not Analyzed (this event was not analyzed as part of the baseline)

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Anti-Surface Warfare (ASUW) (continued)									
Gunnery Exercise (Air-to-Surface) – Small-caliber (GUNEX [A-S])-Small-caliber	152	60,800 rounds	HRC: Warning Areas-188, 191, 192, 193, 194, 196, Mela South	275	74,000 rounds	HRC: Warning Areas-188, 191, 192, 193, 194, 196, Mela South	275	74,000 rounds	HRC: Warning Areas-188, 191, 192, 193, 194, 196, Mela South
	60	48,000	SOCAL: Warning Area-291, (SOAR T-3, T-4, T-5, MTR-2)	131	104,800	SOCAL: Warning Area-291, (SOAR T-3, T-4, T-5, MTR-2)	131	104,800	SOCAL: Warning Area-291, (SOAR T-3, T-4, T-5, MTR-2)
Gunnery Exercise (Air-to-Surface) – Medium-caliber (GUNEX [A-S])-Medium-caliber	N/A	N/A	HRC: Warning Areas-188, 191, 192, 193, 194, 196, Mela South	130	27,000 (6,000 HE)	HRC: Warning Areas-188, 191, 192, 193, 194, 196, Mela South	130	27,000 (6,000 HE)	HRC: Warning Areas-188, 191, 192, 193, 194, 196, Mela South
	N/A	N/A	SOCAL: Warning Area-291, (SOAR T-3, T-4, T-5, MTR-2)	100	48,000 rounds (12,000 HE)	SOCAL: Warning Area-291, (SOAR T-3, T-4, T-5, MTR-2)	100	48,000 rounds (12,000 HE)	SOCAL: Warning Area-291, (SOAR T-3, T-4, T-5, MTR-2)
Missile Exercise (Air-to-Surface) – Rocket (MISSILEX [A-S] – Rocket)	N/A	N/A	HRC: Warning Area 188	20	760 rockets (760 HE)	HRC: Warning Area 188	20	760 rockets (760 HE)	HRC: Warning Area 188
	N/A	N/A	SOCAL: Warning Area 291,SOAR, FLETA Hot, MISRs	130	3,800 rockets (3,800 HE)	SOCAL: Warning Area 291,SOAR, FLETA Hot, MISRs	130	3,800 rockets (3,800 HE)	SOCAL: Warning Area 291,SOAR, FLETA Hot, MISRs

Notes: HRC = Hawaii Range Complex, HE = High Explosive, SOCAL = Southern California [Range Complex], SOAR = Southern California Anti-submarine Warfare Range, MTR = Mine Training Range, FLETA = Fleet Training Area, MISR = Missile Range, N/A = Not Analyzed (this event was not analyzed as part of the baseline)

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Anti-Surface Warfare (ASUW) (continued)									
Missile Exercise (Air-to-Surface) (MISSILEX [A-S])	20	20 HE missiles	HRC: Warning Area-188	57	57 HE missiles	HRC: Warning Area-188	57	57 HE missiles	HRC: Warning Area-188
	20	20 HE missiles	SOCAL-SOAR, SHOBA (LTR 1/2)	214	214 HE missiles	SOCAL-SOAR, SHOBA (LTR 1/2)	214	214 HE missiles	SOCAL-SOAR, SHOBA (LTR 1/2)
Bombing Exercise (Air-to-Surface) (BOMBEX [A-S])	38	240 bombs (38 HE bombs)	HRC-Hawaii OPAREA	28	180 bombs (56 HE bombs)	HRC-Hawaii OPAREA	28	180 bombs (56 HE bombs)	HRC-Hawaii OPAREA
	40	1,280 bombs (640 HE bombs)	SOCAL-SOAR, T-3, T-4, T-5, MTR-2, SHOBA	120	1,280 bombs (160 HE bombs)	SOCAL-SOAR, T-3, T-4, T-5, MTR-2, SHOBA	120	1,280 bombs (160 HE bombs)	SOCAL-SOAR, T-3, T-4, T-5, MTR-2, SHOBA
	N/A	N/A	HSTT Transit Corridor	5	90 bombs (0 HE)	HSTT Transit Corridor	5	90 bombs (0 HE)	HSTT Transit Corridor
Laser Targeting	30	None	HRC: Warning Area-188	50	None	HRC: Warning Area-188	50	None	HRC: Warning Area-188
	30	None	SOCAL-SOAR, SHOBA (LTR 1/2)	250	None	SOCAL-SOAR, SHOBA (LTR 1/2)	250	None	SOCAL-SOAR, SHOBA (LTR 1/2)

Notes: HE = High Explosive, HRC = Hawaii Range Complex, OPAREA = Operating Area, SOCAL = Southern California [Range Complex], SOAR = Southern California Anti-submarine Warfare Range, MTR = Mine Training Range, SHOBA = Shore Bombardment Area, LTR = Laser Training Range, HSTT = Hawaii-Southern California Training and Testing, N/A = Not Analyzed (this event was not analyzed as part of the baseline)

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Anti-Surface Warfare (ASUW) (continued)									
Sinking Exercise (SINKEX)	6	72 HE Bombs 66 HE Missiles 4,200 HE Large-caliber rounds 6 MK 48 HE	HRC-Hawaii OPAREA	6	36 Bombs (18 HE) 10 Missiles (6 HE) 300 Large-caliber rounds (120 HE) 6 MK 48 HE 12,000 Medium-caliber NEPM	HRC-Hawaii OPAREA	6	36 Bombs (18 HE) 10 Missiles (6 HE) 300 Large-caliber rounds (120 HE) 6 MK 48 HE 12,000 Medium-caliber NEPM	HRC-Hawaii OPAREA
	2	12 HE Bombs 22 HE Missiles 1,400 HE Large-caliber rounds 2 MK 48 HE	SOCAL: Warning Area-291	2	12 Bombs (6 HE) 4 Missiles (2 HE) 100 Large-caliber rounds (40 HE) 2 MK 48 HE 4,000 Medium-caliber NEPM	SOCAL: Warning Area-291	2	12 Bombs (6 HE) 4 Missiles (2 HE) 100 Large-caliber rounds (40 HE) 2 MK 48 HE 4,000 Medium-caliber NEPM	SOCAL: Warning Area-291

Notes: HE = High Explosive, HRC = Hawaii Range Complex, SOCAL = Southern California [Range Complex], NEPM = Non-explosive Practice Munitions, OPAREA = Operating Area

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Anti-Submarine Warfare (ASW)									
Tracking Exercise/ Torpedo Exercise – Submarine (TRACKEX/ TORPEX-Sub)	134	235 MK 48 EXTORP	Hawaii OPAREA (including BSURE, BARSTUR, SWTR, North Maui Submarine OPAREA)	127	244 MK 48 EXTORP	Hawaii OPAREA (including BSURE, BARSTUR, SWTR, North Maui Submarine OPAREA)	127	244 MK 48 EXTORP	Hawaii OPAREA (including BSURE, BARSTUR, SWTR, North Maui Submarine OPAREA)
	62	76 MK 48 EXTORP	SOCAL OPAREAs, SOAR (Tanner-Cortez Bank, SWTR-NS)	63	76 MK 48 EXTORP	SOCAL OPAREAs, SOAR (Tanner-Cortez Bank, SWTR-NS)	63	76 MK 48 EXTORP	SOCAL OPAREAs, SOAR (Tanner-Cortez Bank, SWTR-NS)
	N/A	N/A	HSTT Transit Corridor	7	None	HSTT Transit Corridor	7	None	HSTT Transit Corridor
Tracking Exercise/ Torpedo Exercise – Surface (TRACKEX/ TORPEX – Surface)	70	22 EXTORP 5 REXTORP	HRC-Hawaii OPAREA (including BSURE, BARSTUR, SWTR)	274	20 EXTORP 30 REXTORP	HRC-Hawaii OPAREA (including BSURE, BARSTUR, SWTR)	274	20 EXTORP 30 REXTORP	HRC-Hawaii OPAREA (including BSURE, BARSTUR, SWTR)
	925	7 EXTORP 18 REXTORP	SOCAL-SOCAL OPAREAs, PMSR	540	48 EXTORP 69 REXTORP	SOCAL-SOCAL OPAREAs, PMSR	540	48 EXTORP 69 REXTORP	SOCAL-SOCAL OPAREAs, PMSR

Notes: EXTORP = Exercise Torpedo, SOCAL = Southern California [Range Complex], OPAREA = Operating Area, SOAR = Southern California Anti-submarine Warfare Range, SWTR = Shallow Water Training Range, NS = Nearshore, HSTT = Hawaii-Southern California Training and Testing, HRC = Hawaii Range Complex, BSURE = Barking Sands Underwater Range Extension, BARSTUR = Barking Sands Tactical Underwater Range, EXTORP = Exercise Torpedo, REXTORP = Recoverable Exercise Torpedo, PMSR = Point Mugu Sea Range (overlap area only), N/A = Not Analyzed (this event was not analyzed as part of the baseline).

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Anti-Submarine Warfare (ASW) (continued)									
Tracking Exercise/ Torpedo Exercise – Helicopter (TRACKEX/ TORPEX – Helo)	150	12 EXTORP 100 REXTORP	HRC-Hawaii OPAREA (including BSURE, BARSTUR, SWTR)	165	6 EXTORP 110 REXTORP	HRC-Hawaii OPAREA (including BSURE, BARSTUR, SWTR)	165	6 EXTORP 110 REXTORP	HRC-Hawaii OPAREA (including BSURE, BARSTUR, SWTR)
	447	6 EXTORP 245 REXTORP	SOCAL-SOAR, SWTR, San Clemente Island Underwater Range	628	6 EXTORP 200 REXTORP	SOCAL-SOAR, SWTR, San Clemente Island Underwater Range	628	6 EXTORP 200 REXTORP	SOCAL-SOAR, SWTR, San Clemente Island Underwater Range
	N/A	N/A	HSTT Transit Corridor	6	None	HSTT Transit Corridor	6	None	HSTT Transit Corridor
Tracking Exercise/ Torpedo Exercise – Maritime Patrol Aircraft (TRACKEX/ TORPEX – MPA)	395	13 EXTORP 190 REXTORP	HRC-Hawaii OPAREA (including BSURE, BARSTUR, SWTR)	296	20 EXTORP 210 REXTORP	HRC-Hawaii OPAREA (including BSURE, BARSTUR, SWTR)	296	20 EXTORP 210 REXTORP	HRC-Hawaii OPAREA (including BSURE, BARSTUR, SWTR)
	46	29 EXTORP 17 REXTORP	SOCAL-SOAR, (SWTR-OS, SWTR-NS), SWTR, SOCAL OPAREAs	116	24 EXTORP 17 REXTORP	SOCAL-SOAR, (SWTR-OS, SWTR-NS), SWTR, SOCAL OPAREAs	116	24 EXTORP 17 REXTORP	SOCAL-SOAR, (SWTR-OS, SWTR-NS), SWTR, SOCAL OPAREAs

Notes: N/A = Not Analyzed (this event was not analyzed as part of the baseline), EXTORP = Exercise Torpedo, REXTORP = Recoverable Exercise Torpedo, SOCAL = Southern California [Range Complex], SOAR = Southern California Anti-submarine Warfare Range, SWTR = Shallow Water Training Range, HSTT = Hawaii-Southern California Training and Testing, HRC = Hawaii Range Complex, BSURE = Barking Sands Underwater Range Extension, BARSTUR = Barking Sands Tactical Underwater Range, OS = Offshore, NS = Nearshore, OPAREA = Operating Area, PMSR = Point Mugu Sea Range (overlap area only)

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Anti-Submarine Warfare (ASW) (continued)									
Tracking Exercise-Maritime Patrol Advanced Extended Echo Ranging Sonobuoys	4	960 IEER buoys	HRC OPAREA	96	480 IEER buoys 1,440 MAC buoys	HRC OPAREA	96	480 IEER buoys 1,440 MAC buoys	HRC OPAREA
	30	54 IEER/MAC buoys	SOCAL OPAREAs, PMSR, SOAR (SWTR-OS, SWTR-NS)	48	120 IEER buoys 360 MAC buoys	SOCAL OPAREAs, PMSR, SOAR (SWTR-OS, SWTR-NS)	48	120 IEER buoys 360 MAC buoys	SOCAL OPAREAs, PMSR, SOAR (SWTR-OS, SWTR-NS)
Kilo Dip-Helicopter	1,060	None	SOCAL: HCOTAs	1,060	None	SOCAL: HCOTAs	1,060	None	SOCAL: HCOTAs
Submarine Command Course (SCC) Operations	2	30 MK 54 24 MK 48 EXTORP	Hawaii OPAREA, Maui North/ South	2	30 MK 54 72 MK 48 EXTORP	Hawaii OPAREA, Maui North/South	2	30 MK 54 72 MK 48 EXTORP	Hawaii OPAREA, Maui North/South
Electronic Warfare (EW)									
Electronic Warfare Operations (EW Ops)	33	None	Hawaii OPAREA	33	None	Hawaii OPAREA	33	None	Hawaii OPAREA
	400	None	SOCAL Waters (Electronic Warfare Range)	350	None	SOCAL Waters (Electronic Warfare Range)	350	None	SOCAL Waters (Electronic Warfare Range)
Counter Targeting Flare Exercise (FLAREX)	8	None	Hawaii OPAREA	8	None	Hawaii OPAREA	8	None	Hawaii OPAREA
	25	None	SOCAL Waters (Electronic Warfare Range)	25	None	SOCAL Waters (Electronic Warfare Range)	25	None	SOCAL Waters (Electronic Warfare Range)

Notes: SOCAL = Southern California [Range Complex], HCOTA = Helicopter Offshore Training Area, EXTORP = Exercise Torpedo, OPAREA = Operating Area, IEER = Improved Extended Echo Ranging, MAC = Multistatic Active Coherent.

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Electronic Warfare (EW) (continued)									
Counter Targeting Chaff Exercise (CHAFFEX)-Ship	37	None	Hawaii OPAREA	37	None	Hawaii OPAREA	37	None	Hawaii OPAREA
	125	None	SOCAL Waters (Electronic Warfare Range)	125	None	SOCAL Waters (Electronic Warfare Range)	125	None	SOCAL Waters (Electronic Warfare Range)
Counter Targeting Chaff Exercise (CHAFFEX) – Aircraft	N/A	N/A	Hawaii OPAREA	30	None	Hawaii OPAREA	30	None	Hawaii OPAREA
	250	None	SOCAL Waters (Electronic Warfare Range)	250	None	SOCAL Waters (Electronic Warfare Range)	250	None	SOCAL Waters (Electronic Warfare Range)
Mine Warfare (MIW)									
Mine Countermeasure Exercise –Ship Sonar	62	None	HRC-Hawaii OPAREA, Kingfisher, Shallow-water Minefield Sonar Training Area	30	None	HRC-Hawaii OPAREA, Kingfisher, Shallow-water Minefield Sonar Training Area	30	None	HRC-Hawaii OPAREA, Kingfisher, Shallow-water Minefield Sonar Training Area
	48	None	SOCAL-Kingfisher, Tanner-Cortez Bank, Pyramid Cove, CPAAA, Imperial Beach Minefield	92	None	SOCAL-Kingfisher, Tanner-Cortez Bank, Pyramid Cove, CPAAA, Imperial Beach Minefield	92	None	SOCAL-Kingfisher, Tanner-Cortez Bank, Pyramid Cove, CPAAA, Imperial Beach Minefield

Notes: SOCAL = Southern California [Range Complex], OPAREA = Operating Area, HRC = Hawaii Range Complex, CPAAA = Camp Pendleton Amphibious Assault Area, SSTC = Silver Strand Training Complex, N/A = Not Analyzed (this event was not analyzed as part of the baseline).

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Mine Warfare (MIW) (continued)									
Mine Countermeasure Exercise – Surface (SMCMEX)	380	None	SOCAL: Kingfisher, Tanner-Cortez Bank, Imperial Beach Minefield, SSTC, CPAAA	266	None	SOCAL: Kingfisher, Tanner-Cortez Bank, Imperial Beach Minefield, SSTC, CPAAA	266	None	SOCAL: Kingfisher, Tanner-Cortez Bank, Imperial Beach Minefield, SSTC, CPAAA
Mine Neutralization – Explosive Ordnance Disposal (EOD)	68	68 HE	HRC-Puuloa Underwater Range, Barbers Point Underwater Range, NISMF, Lima Landing, Ewa Training Minefield	22	82 HE	HRC-Puuloa Underwater Range, Barbers Point Underwater Range, NISMF, Lima Landing, Ewa Training Minefield	22	82 HE	HRC-Puuloa Underwater Range, Barbers Point Underwater Range, NISMF, Lima Landing, Ewa Training Minefield
	85	85 HE	SOCAL-TAR 2, 3, and 21, SWAT-1&2, SOAR, SWTR	75	300 HE	SOCAL-TAR 2, 3, and 21, SWAT-1&2, SOAR, SWTR	75	300 HE	SOCAL-TAR 2, 3, and 21, SWAT-1&2, SOAR, SWTR
	279	408 HE	SSTC Boat Lanes 1-14	279	414 HE	SSTC Boat Lanes 1-14	279	414 HE	SSTC Boat Lanes 1-14
Mine Countermeasure (MCM) – Towed Mine Neutralization	240	None	SOCAL-Pyramid cove, NW Harbor, Imperial Beach, SSTC	240	None	SOCAL-Pyramid cove, NW Harbor, Imperial Beach, SSTC	240	None	SOCAL-Pyramid cove, NW Harbor, Imperial Beach, SSTC

Notes: HE = High Explosive, HRC = Hawaii Range Complex, NISMF = Naval Intermediate Ship Maintenance Facility, SOCAL = Southern California [Range Complex], SWTR = Shallow Water Training Range, SSTC = Silver Strand Training Complex, CPAAA = Camp Pendleton Amphibious Assault Area, TAR = Training Area and Range, SWAT = Special Warfare Training Area, SOAR = Southern California Anti-submarine Warfare Range

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Mine Warfare (MIW) (continued)									
Mine Countermeasure (MCM) – Towed Mine Neutralization (continued)	100	None	All SSTC Boat Lanes 1-14, in water > 40 ft.	100	None	All SSTC Boat Lanes 1-14, in water > 40 ft.	100	None	All SSTC Boat Lanes 1-14, in water > 40 ft.
Airborne Mine Countermeasure (MCM) – Mine Detection	420	None	SOCAL-Pyramid cove, NW Harbor, Imperial Beach, SSTC	630	None	SOCAL-Pyramid cove, NW Harbor, Imperial Beach, SSTC	630	None	SOCAL-Pyramid cove, NW Harbor, Imperial Beach, SSTC
	248	None	All SSTC Boat Lanes 1-14, in water > 40 ft.	372	None	All SSTC Boat Lanes 1-14, in water > 40 ft.	372	None	All SSTC Boat Lanes 1-14, in water > 40 ft.
Mine Countermeasure (MCM) – Mine Neutralization	36	360 rounds	SOCAL-Pyramid cove, NW Harbor, Kingfisher Training Range, MTR-1, MTR-2, Imperial Beach Minefield	36	360 rounds	SOCAL-Pyramid cove, NW Harbor, Kingfisher Training Range, MTR-1, MTR-2, Imperial Beach Minefield	36	360 rounds	SOCAL-Pyramid cove, NW Harbor, Kingfisher Training Range, MTR-1, MTR-2, Imperial Beach Minefield
Mine Neutralization – Remotely Operated Vehicle	36	8 HE	SOCAL: Kingfisher, Tanner-Cortez Bank, Imperial Beach Minefield, CPAAA	60	8 HE	SOCAL: Kingfisher, Tanner-Cortez Bank, Imperial Beach Minefield, CPAAA	60	8 HE	SOCAL: Kingfisher, Tanner-Cortez Bank, Imperial Beach Minefield, CPAAA

Notes: SOCAL = Southern California [Range Complex], NW = Northwest, SSTC = Silver Strand Training Complex, MTR = Mine Training Range, HE = High Explosive, CPAAA = Camp Pendleton Amphibious Assault Area

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Mine Warfare (MIW) (continued)									
Mine Neutralization – Remotely Operated Vehicle (continued)	208	18 HE Note 1	SSTC-All SSTC Boat Lanes 1-14 Breakers Beach, Delta I, II, and Delta North, Echo	312	20 HE Note 1	SSTC-All SSTC Boat Lanes 1-14 Breakers Beach, Delta I, II, and Delta North, Echo	312	20 HE Note 1	SSTC-All SSTC Boat Lanes 1-14 Breakers Beach, Delta I, II, and Delta North, Echo
Mine Laying	28	336 mine shapes	HRC: R-3101	32	384 mine shapes	HRC: R-3101	32	384 mine shapes	HRC: R-3101
	18	216 mine shapes	SOCAL: MTRs, SWTR, Pyramid Cove, China Point	18	750 mine shapes	SOCAL: MTRs, SWTR, Pyramid Cove, China Point	18	750 mine shapes	SOCAL: MTRs, SWTR, Pyramid Cove, China Point
Marine Mammal System	N/A	N/A	HRC-Hawaii OPAREA, Kingfisher, SWM, Sonar Training Area	10	None	HRC-Hawaii OPAREA, Kingfisher, SWM, Sonar Training Area	10	None	HRC-Hawaii OPAREA, Kingfisher, SWM, Sonar Training Area
	208	8 HE Note 1	All SSTC Boat Lanes 1-14 Breakers Beach	175	8 HE Note 1	All SSTC Boat Lanes 1-14 Breakers Beach	175	8 HE Note 1	All SSTC Boat Lanes 1-14 Breakers Beach
Shock Wave Action Generator	90	90 HE	All SSTC Boat Lanes 1-14 SSTC San Diego Bay-Echo	90	90 HE	All SSTC Boat Lanes 1-14 SSTC San Diego Bay-Echo	90	90 HE	All SSTC Boat Lanes 1-14 SSTC San Diego Bay-Echo

Note 1: Underwater detonations associated with this training occur only in the boat lanes.
Notes: SOCAL = Southern California [Range Complex], NW = Northwest, MTR = Mine Training Range, N/A = Not Analyzed (this event was not analyzed as part of the baseline), SSTC = Silver Strand Training Complex, HE = High Explosive, HRC = Hawaii Range Complex, OPAREA = Operating Area, SOCAL = Southern California [Range Complex], MTR = Mine Training Range, SWTR = Shallow Water Training Range, SWM = Shallow Water Minefield, OS = Offshore

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Mine Warfare (MIW) (continued)									
Surf Zone Test Detachment/ Equipment Test and Evaluation	200	None	All SSTC Boat Lanes 1-14 SSTC San Diego Bay-Echo	200	None	All SSTC Boat Lanes 1-14 SSTC San Diego Bay-Echo	200	None	All SSTC Boat Lanes 1–14 SSTC San Diego Bay-Echo
Submarine Mine Exercise	4	None	Hawaii OPAREA, Kahoolawe Submarine Training Minefield	34	None	Hawaii OPAREA, Kahoolawe Submarine Training Minefield	34	None	Hawaii OPAREA, Kahoolawe Submarine Training Minefield
	N/A	N/A	ARPA Training Minefield, SOCAL OPAREA, Tanner-Cortez Bank	32	None	ARPA Training Minefield, SOCAL OPAREA, Tanner-Cortez Bank	32	None	ARPA Training Minefield, SOCAL OPAREA, Tanner-Cortez Bank
Civilian Port Defense	N/A	N/A	Pearl Harbor, HI	1	4 HE	Pearl Harbor, HI	1	4 HE	Pearl Harbor, HI
	N/A	N/A	San Diego, CA	1	4 HE	San Diego, CA	1	4 HE	San Diego, CA
Naval Special Warfare (NSW)									
Personnel Insertion/ Extraction – Submarine	145	None	Hawaii OPAREA, MCTAB, PMRF (Main Base)	145	None	Hawaii OPAREA, MCTAB, PMRF (Main Base)	145	None	Hawaii OPAREA, MCTAB, PMRF (Main Base)

Notes: N/A = Not Analyzed (this event was not analyzed as part of the baseline), SSTC = Silver Strand Training Complex, OPAREA = Operating Area, ARPA = Advanced Research Projects Agency, HE = High Explosive, PMRF = Pacific Missile Range Facility, MCTAB = Marine Corps Training Area Bellows

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Naval Special Warfare (NSW)									
Personnel Insertion/ Extraction – Submarine (continued)	40	None	SSTC Boat Lanes 1-10 Delta III, Echo, Foxtrot, Golf, Hotel	40	None	SSTC Boat Lanes 1-10 Delta III, Echo, Foxtrot, Golf, Hotel	40	None	SSTC Boat Lanes 1–10 Delta III, Echo, Foxtrot, Golf, Hotel
Personnel Insertion/ Extraction – Non-submarine	15	None	SOCAL OPAREA, San Clemente Island	15	None	SOCAL OPAREA, San Clemente Island	15	None	SOCAL OPAREA, San Clemente Island
	394	None	All SSTC Boat Lanes 1-14 Echo	394	None	All SSTC Boat Lanes 1-14 Echo	394	None	All SSTC Boat Lanes 1–14 Echo
Underwater Demolition Multiple Charge – Mat Weave and Obstacle Loading	18	18 HE	SOCAL: NW Harbor (TAR 2 and 3), SWAT	18	18 HE	SOCAL: NW Harbor (TAR 2 and 3), SWAT	18	18 HE	SOCAL: NW Harbor (TAR 2 and 3), SWAT
Underwater Demolition Qualification/ Certification	24	30 HE	All SSTC Boat and Beach Lanes 1-14	24	30 HE	All SSTC Boat and Beach Lanes 1-14	24	30 HE	All SSTC Boat and Beach Lanes 1–14
Major Training Events									
Composite Training Unit Exercise (COMPTUEX)	4	Note 1	SOCAL-SOCAL OPAREA and PMSR	4	Note 1	SOCAL-SOCAL OPAREA and PMSR	4	Note 1	SOCAL-SOCAL OPAREA and PMSR

Note 1: Exercise is comprised of various activities accounted for elsewhere within Table 2.8-1.
Notes: SSTC = Silver Strand Training Complex, SOCAL = Southern California [Range Complex], OPAREA = Operating Area, HE = High Explosive, TAR = Training Areas and Ranges, SWAT = Special Warfare Training Area, PMSR = Point Mugu Sea Range (overlap area only)

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Major Training Events (continued)									
Joint Task Force Exercise (JTFEX)/ Sustainment Exercise (SUSTEX)	5	Note 1	SOCAL-SOCAL OPAREA and PMSR	5	Note 1	SOCAL-SOCAL OPAREA and PMSR	65	Note 1	SOCAL-SOCAL OPAREA and PMSR
Rim of the Pacific (RIMPAC) Exercise	1	Note 1	HRC-Hawaii OPAREA	1	Note 1	HRC-Hawaii OPAREA	1	Note 1	HRC-Hawaii OPAREA
		Note 2	SOCAL		Note 2	SOCAL		Note 2	SOCAL
Multi-Strike Group Exercise	1	Note 3	Hawaii OPAREA	1	None	Hawaii OPAREA	1	None	Hawaii OPAREA
Integrated Anti-Submarine Warfare Course (IAC)	4	Note 1	SOCAL OPAREA-SOAR	4	Note 1	SOCAL OPAREA-SOAR	4	Note 1	SOCAL OPAREA-SOAR
Group Sail	N/A	N/A	Hawaii OPAREA	2	Note 1	Hawaii OPAREA	2	Note 1	Hawaii OPAREA
	N/A	N/A	SOCAL OPAREA	8	Note 1	SOCAL OPAREA	8	Note 1	SOCAL OPAREA
Undersea Warfare Exercise (USWEX)	5	Note 1	Hawaii OPAREA	5	Note 1	Hawaii OPAREA	5	Note 1	Hawaii OPAREA

Note 1: Exercise is comprised of various activities accounted for elsewhere within Table 2.8-1.
Note 2: Some components of RIMPAC may be conducted in SOCAL.
Note 3: If a Multi-Strike Group Exercise were planned for any given year, either other exercises (of a different type) would be cancelled or limited to ensure that the specified number of sonar hours (and, therefore, take of marine mammals) was not exceeded or the Navy would seek separate MMPA authorization.
Notes: N/A = Not Analyzed (this event was not analyzed as part of the baseline), SOCAL = Southern California [Range Complex], OPAREA = Operating Area, PMSR = Point Mugu Sea Range (overlap area only)

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Major Training Events (continued)									
Ship ASW Readiness and Evaluation Measuring (SHAREM)	1	None	SOCAL OPAREA	2	8 MK 48 EXTORP 16 MK 46/54 EXTORP	SOCAL OPAREA	2	8 MK 48 EXTORP 16 MK 46/54 EXTORP	SOCAL OPAREA
Other									
Precision Anchoring	N/A	N/A	HRC-PHDSA	18	None	HRC-PHDSA	18	None	HRC-PHDSA
	72	None	SSTC-Anchorages	72	None	SSTC-Anchorages	72	None	SSTC-Anchorages
Small Boat Attack	N/A	N/A	Hawaii OPAREAs	6	2,100 small-caliber rounds	Hawaii OPAREAs	6	2,100 small-caliber rounds	Hawaii OPAREAs
	36	10,500 blank rounds	SSTC Boat Lanes 1-10	36	10,500 blank rounds	SSTC Boat Lanes 1-10	36	10,500 blank rounds	SSTC Boat Lanes 1–10
Offshore Petroleum Discharge System (OPDS)	6	None	SSTC Boat Lanes 1-10, Bravo, Waters outside of boat lanes	6	None	SSTC Boat Lanes 1-10, Bravo, Waters outside of boat lanes	6	None	SSTC Boat Lanes 1–10, Bravo, Waters outside of boat lanes
Elevated Causeway System (ELCAS)	4	None	SSTC Boat Lanes 1-10, Designated Bravo Beach training lane	4	None	SSTC Boat Lanes 1-10, Designated Bravo Beach training lane, CPAAA	4	None	SSTC Boat Lanes 1–10, Designated Bravo Beach training lane, CPAAA

Notes: N/A (Not Analyzed). This event was not analyzed as part of the baseline. SOCAL = Southern California [Range Complex], OPAREA = Operating Area, EXTORP = Exercise Torpedo, HRC = Hawaii Range Complex, PHDSA = Pearl Harbor Defensive Sea Area, SSTC = Silver Strand Training Complex, CPAAA = Camp Pendleton Amphibious Assault Area

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Other (continued)									
Submarine Navigation Exercise	N/A	N/A	Pearl Harbor Channel and virtual channel south of Pearl Harbor	216	None	Pearl Harbor Channel and virtual channel south of Pearl Harbor	216	None	Pearl Harbor Channel and virtual channel south of Pearl Harbor
	N/A	N/A	Subase Pt. Loma and seaward virtual channel	84	None	Subase Pt. Loma and seaward virtual channel	84	None	Subase Pt. Loma and seaward virtual channel
Submarine Under Ice Certification	N/A	N/A	Hawaii OPAREAs	12	None	Hawaii OPAREAs	12	None	Hawaii OPAREAs
	N/A	N/A	SOCAL OPAREAs	6	None	SOCAL OPAREAs	6	None	SOCAL OPAREAs
Salvage Operations	3	None	HRC: Puuloa Underwater Range, PHDSA, Keehi Lagoon, Pearl Harbor	3	None	HRC: Puuloa Underwater Range, PHDSA, Keehi Lagoon, Pearl Harbor	3	None	HRC: Puuloa Underwater Range, PHDSA, Keehi Lagoon, Pearl Harbor
Surface Ship Sonar Maintenance	N/A	N/A	Hawaii OPAREA; Pearl Harbor; FORACS Range	148	None	Hawaii OPAREA; Pearl Harbor; FORACS Range	148	None	Hawaii OPAREA; Pearl Harbor; FORACS Range
	N/A	N/A	SOCAL OPAREA, San Diego Bay and ports	488	None	SOCAL OPAREA, San Diego Bay and ports	488	None	SOCAL OPAREA, San Diego Bay and ports

Notes: OPAREA = Operating Area, SOCAL = Southern California [Range Complex], HRC = Hawaii Range Complex, PHDSA = Pearl Harbor Defensive Sea Area, FORACS = Fleet Operational Readiness Accuracy Check Site, N/A = Not Analyzed (this event was not analyzed as part of the baseline)

Table 2.8-1: Baseline and Proposed Training Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Other (continued)									
Surface Ship Sonar Maintenance (continued)	N/A	N/A	HSTT Transit Corridor	4	None	HSTT Transit Corridor	4	None	HSTT Transit Corridor
Submarine Sonar Maintenance	N/A	N/A	Hawaii OPAREA: Pearl Harbor; FORACS Range	132	None	Hawaii OPAREA: Pearl Harbor; FORACS Range	132	None	Hawaii OPAREA: Pearl Harbor; FORACS Range
	N/A	N/A	SOCAL OPAREA and inport San Diego	68	None	SOCAL OPAREA and inport San Diego	68	None	SOCAL OPAREA and inport San Diego
	N/A	N/A	HSTT Transit Corridor	4	None	HSTT Transit Corridor	4	None	HSTT Transit Corridor

Notes: HSTT = Hawaii-Southern California Training and Testing, FORACS = Fleet Operational Readiness Accuracy Check Site, SOCAL = Southern California [Range Complex], OPAREA = Operating Area, N/A = Not Analyzed (this event was not analyzed as part of the baseline)

Table 2.8-2: Baseline and Proposed Naval Air Systems Command Testing Activities

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Anti-Air Warfare (AAW)									
Air Combat Maneuver	10	None	Hawaii OPAREA	10	None	Hawaii OPAREA	11	None	Hawaii OPAREA
	100	None	SOCAL OPAREA	100	None	SOCAL OPAREA	110	None	SOCAL OPAREA
Air Platform/Vehicle Test	45	None	Hawaii OPAREA	45	None	Hawaii OPAREA	50	None	Hawaii OPAREA,
	300	None	SOCAL OPAREA	350	None	SOCAL OPAREA	385	None	SOCAL OPAREA
Air Platform Weapons Integration Test	19	None	Hawaii OPAREA	40	None	Hawaii OPAREA	44	None	Hawaii OPAREA
	150	5 missiles, 3,000 small- and medium-caliber rounds	SOCAL OPAREA	150	25 missiles, 20,000 small- and medium-caliber rounds, 300 rockets	SOCAL OPAREA	165	28 missiles, 22,000 small- and medium-caliber rounds, 330 rockets	SOCAL OPAREA
Intelligence, Surveillance, and Reconnaissance Test	10	None	Hawaii OPAREA	10	None	Hawaii OPAREA	11	None	Hawaii OPAREA
	45	None	SOCAL OPAREA	45	None	SOCAL OPAREA	50	None	SOCAL OPAREA
Anti-Surface Warfare (ASUW)									
Air-to-Surface Missile Test	8	8 missiles (4 HE)	Hawaii OPAREA	8	8 missiles (4 HE)	Hawaii OPAREA	10	10 missiles (5 HE)	Hawaii OPAREA
	89	98 missiles (24 HE)	SOCAL OPAREA	89	142 missiles (44 HE)	SOCAL OPAREA	100	156 missiles (48 HE)	SOCAL OPAREA
Air-to-Surface Gunnery Test	20	6,000 (1,500 HE) medium caliber rounds	SOCAL OPAREA	50	40,000 medium caliber rounds (10,000 HE)	SOCAL OPAREA	55	44,000 medium caliber rounds (11,000 HE)	SOCAL OPAREA

Notes: OPAREA = Operating Area, SOCAL = Southern California [Range Complex], HE = High Explosive

Table 2.8-2: Baseline and Proposed Naval Air Systems Command Testing Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Anti-Surface Warfare (ASUW) (continued)									
Rocket Test	15	15 rockets (NEPM)	SOCAL OPAREA	60	680 rockets (184 HE)	SOCAL OPAREA	66	748 rockets (202 HE)	SOCAL OPAREA
Laser Targeting Test	5	None	SOCAL OPAREA	5	None	SOCAL OPAREA	6	None	SOCAL OPAREA
Electronic Warfare (EW)									
Electronic Systems Evaluation	150	None	SOCAL OPAREA	600	None	SOCAL OPAREA	670	None	SOCAL OPAREA
Anti-Submarine Warfare (ASW)									
Anti-submarine Warfare Torpedo Test	5	10 torpedoes (All NEPM)	Hawaii OPAREA	10	20 torpedoes (All NEPM)	Hawaii OPAREA	12	22 torpedoes (All NEPM)	Hawaii OPAREA
	10	20 torpedoes (All NEPM)	SOCAL OPAREA	32	64 torpedoes (All NEPM)	SOCAL OPAREA	36	70 torpedoes (All NEPM)	SOCAL OPAREA
Kilo Dip	4	None	Hawaii OPAREA	4	None	Hawaii OPAREA	5	None	Hawaii OPAREA
	4	None	SOCAL OPAREA	4	None	SOCAL OPAREA	5	None	SOCAL OPAREA
Sonobuoy Lot Acceptance Test	29	660 (HE)	SOCAL OPAREA	34	720 (HE) sonobuoys	SOCAL OPAREA	36	744 (HE) sonobuoys	SOCAL OPAREA
Anti-submarine Warfare Tracking Test – Helicopter	10	None	Hawaii OPAREA	111	192 HE sonobuoys	Hawaii OPAREA	122	211 HE sonobuoys	Hawaii OPAREA
	10	None	SOCAL OPAREA	171	1,152 HE sonobuoys	SOCAL OPAREA	188	1,267 HE sonobuoys	SOCAL OPAREA

Notes: HE = High Explosive, NEPM = Non-explosive Practice Munition, SOCAL = Southern California [Range Complex], OPAREA = Operating Area

Table 2.8-2: Baseline and Proposed Naval Air Systems Command Testing Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Anti-Submarine Warfare (ASW) (continued)									
Anti-submarine Warfare Tracking Test – Maritime Patrol Aircraft	70	314 HE sonobuoys	Hawaii OPAREA	10	216 HE sonobuoys	Hawaii OPAREA	14	308 HE sonobuoys	Hawaii OPAREA
	51	1,992 HE sonobuoys	SOCAL OPAREA	29	888 HE sonobuoys	SOCAL OPAREA	33	1,004 HE sonobuoys	SOCAL OPAREA
Mine Warfare (MIW)									
Airborne Mine Neutralization System Test (AMNS)	15	20 HE neutralizers	SOCAL OPAREA	16	48 HE neutralizers	SOCAL OPAREA	17	53 HE neutralizers	SOCAL OPAREA
Airborne Towed Minehunting Sonar System Test	15	None	SOCAL OPAREA	15	None	SOCAL OPAREA	17	None	SOCAL OPAREA
Airborne Towed Minesweeping System Test	15	None	SOCAL OPAREA	15	None	SOCAL OPAREA	17	None	SOCAL OPAREA
Airborne Laser-Based Mine Detection System Test – ALMDS	15	None	SOCAL OPAREA	15	None	SOCAL OPAREA	17	None	SOCAL OPAREA
Airborne Projectile-based Mine Clearance System Test	5	100 medium caliber rounds (All NEPM)	SOCAL OPAREA	15	300 medium caliber rounds (All NEPM), 5 HE mines	SOCAL OPAREA	17	330 medium caliber rounds (All NEPM), 6 HE mines	SOCAL OPAREA

Notes: OPAREA = Operating Area, SOCAL = Southern California [Range Complex], HE = High Explosive

Table 2.8-2: Baseline and Proposed Naval Air Systems Command Testing Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Other Testing									
Test and Evaluation – Catapult Launch	8,700	None	HSTT Study Area	8,700	None	HSTT Study Area	9,570	None	HSTT Study Area
Air Platform Shipboard Integration Test	124	None	HSTT Study Area	124	None	HSTT Study Area	136	None	HSTT Study Area
Shipboard Electronic Systems Evaluation	124	None	HSTT Study Area	124	None	HSTT Study Area	136	None	HSTT Study Area

Notes: SOCAL = Southern California [Range Complex], OPAREA = Operating Area, NEPM = Non-explosive Practice Munition, HE = High Explosive, HSTT = Hawaii-Southern California Training and Testing

Table 2.8-3: Baseline and Proposed Naval Sea Systems Command Testing Activities

Range Activity		No Action Alternative			Alternative 1			Alternative 2		
		No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
New Ship Construction										
Surface Combatant Sea Trials	Pierside Sonar Testing	N/A	N/A	N/A	2	None	Pierside: Pearl Harbor, HI	2	None	Pierside: Pearl Harbor, HI
		N/A	N/A	N/A	2	None	Pierside: San Diego, CA	2	None	Pierside: San Diego, CA
	Propulsion Testing	N/A	N/A	N/A	2	None	HRC	2	None	HRC
		N/A	N/A	N/A	2	None	SOCAL	2	None	SOCAL
	Gun Testing	N/A	N/A	N/A	2	52 large-caliber rounds 1,400 medium-caliber rounds	HRC	2	52 large-caliber rounds 1,400 medium-caliber rounds	HRC
		N/A	N/A	N/A	2	52 large-caliber rounds 1,400 medium-caliber rounds	SOCAL	2	52 large-caliber rounds 1,400 medium-caliber rounds	SOCAL
	Missile Testing	N/A	N/A	N/A	2	4 HE missiles	HRC	2	4 HE missiles	HRC
		N/A	N/A	N/A	2	4 HE missiles	SOCAL	2	4 HE missiles	SOCAL

Notes: N/A (Not Analyzed). This event was not analyzed as part of the baseline. HI = Hawaii, CA = California, HRC = Hawaii Range Complex, SOCAL = Southern California [Range Complex]

Table 2.8-3: Baseline and Proposed Naval Sea Systems Command Testing Activities (continued)

Range Activity		No Action Alternative			Alternative 1			Alternative 2		
		No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
New Ship Construction (continued)										
Surface Combatant Sea Trials (continued)	Decoy Testing	N/A	N/A	N/A	2	None	HRC	2	None	HRC
		N/A	N/A	N/A	2	None	SOCAL	2	None	SOCAL
	Surface Warfare Testing	N/A	N/A	N/A	2	96 large-caliber rounds	HRC	2	96 large-caliber rounds	HRC
		N/A	N/A	N/A	2	96 large caliber rounds	SOCAL	2	96 large caliber rounds	SOCAL
	Anti-Submarine Warfare Testing	N/A	N/A	N/A	2	None	HRC	2	None	HRC
		N/A	N/A	N/A	2	None	SOCAL	2	None	SOCAL
Other Ship Class[Note 1] Sea Trials	Propulsion Testing	N/A	N/A	N/A	21	None	SOCAL	21	None	SOCAL
	Gun Testing – Small Caliber	N/A	N/A	N/A	6	6,000 rounds	SOCAL	6	6,000 rounds	SOCAL
ASW Mission Package Testing		None	None	None	40	40 torpedoes	SOCAL	40	40 torpedoes	SOCAL
		None	None	N/A	16	16 torpedoes	HRC	16	16 torpedoes	HRC

Note 1: "Other Ships" indicates classes of vessels without hull-mounted sonar. Example ship classes include LCS, MLP, and T-AKE.
Note 2: N/A (Not Analyzed). This event was not analyzed as part of the baseline.
Notes: HRC = Hawaii Range Complex, SOCAL = Southern California [Range Complex], FLETA = Fleet Training Area, SOAR = Southern California Anti-submarine Warfare Range, ASW = Anti-submarine Warfare, ASUW = Anti-surface Warfare, N/A = Not Analyzed

Table 2.8-3: Baseline and Proposed Naval Sea Systems Command Testing Activities (continued)

Range Activity		No Action Alternative			Alternative 1			Alternative 2		
		No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
New Ship Construction (continued)										
Surface Warfare Mission Package Testing	Gun Testing – Small-caliber	None	None	None	4 (either location)	2,000 rounds	HRC	5 (either location)	2,500 rounds	HRC
							SOCAL			SOCAL
	Gun Testing – Medium-caliber	None	None	None	4 (either location)	5,600 rounds (2,800 HE)	HRC	5 (either location)	7,000 rounds (3,500 HE)	HRC
							SOCAL			SOCAL
	Gun Testing – Large-caliber	None	None	None	4 (either location)	5,600 rounds (3,920 HE)	HRC	5 (either location)	7,000 rounds (4,900 HE)	HRC
							SOCAL			SOCAL
	Missile/ Rocket Testing	None	None	None	13 (either location)	26 missiles/ rockets (13 HE)	HRC	15 (either location)	30 missiles/ rockets (15 HE)	HRC
							SOCAL			SOCAL
MCM Mission Package Testing		None	None	None	3	None	SOCAL: CPAAA	4	None	SOCAL: CPAAA
					6	96 neutralizers (48 HE)	SOCAL: Pyramid Cove	8	128 neutralizers (64 HE)	SOCAL: Pyramid Cove
					3	None	SOCAL: Tanner Bank Minefield	4	None	SOCAL: Tanner Bank Minefield
					6	96 neutralizers (48 HE)	HRC	4	128 neutralizers (64 HE)	HRC

Notes: ASUW = Anti-surface Warfare, MCM = Mine Countermeasure, SOCAL = Southern California [Range Complex], CPAAA = Camp Pendleton Amphibious Assault Area, HRC = Hawaii Range Complex, HI = Hawaii, HE = High Explosive, N/A = Not Analyzed (this event was not analyzed as part of the baseline)

Table 2.8-3: Baseline and Proposed Naval Sea Systems Command Testing Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Life Cycle Activities									
Post-Homeporting Testing (all classes)	N/A	N/A	N/A	20	None	HRC	22	None	HRC
				20	None	SOCAL	22	None	SOCAL
Ship Signature Testing	N/A	N/A	N/A	2	None	HRC	3	None	HRC
				5	None	Pierside Pearl Harbor, HI	6	None	Pierside Pearl Harbor, HI
				35	None	SOCAL	39	None	SOCAL
Surface Ship Sonar Testing/Maintenance (in OPAREAs and Ports)	N/A	N/A	N/A	16	None	HRC	17	None	HRC
				10	None	SOCAL	10	None	SOCAL
Submarine Sonar Testing/Maintenance (in OPAREAs and Ports)	N/A	N/A	N/A	16	None	HRC	18	None	HRC
				8	None	SOCAL	9	None	SOCAL
Combat System Ship Qualification Trial (CSSQT) – In-port Maintenance Period	N/A	N/A	N/A	2	None	Pierside: Pearl Harbor, HI	2	None	Pierside: Pearl Harbor, HI
				2	None	Pierside: San Diego, CA	2	None	Pierside: San Diego, CA

Notes: HI = Hawaii, CA = California, OPAREAs = Operating Areas, HRC = Hawaii Range Complex, PMRF = Pacific Missile Range Facility, SOCAL = Southern California [Range Complex], HE = High Explosive, N/A = Not Analyzed (this event was not analyzed as part of the baseline)

Table 2.8-3: Baseline and Proposed Naval Sea Systems Command Testing Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Life Cycle Activities (continued)									
Combat System Ship Qualification Trial (CSSQT) – Air Defense (AD)	N/A	N/A	N/A	6	12,000 med. caliber rounds, 120 large caliber rounds (48 HE), 84 missiles (42 HE)	HRC: PMRF	6	12,000 med. caliber rounds, 120 large caliber rounds (48 HE), 84 missiles (42 HE)	HRC: PMRF
				2	2 HE missiles	SOCAL	2	2 HE missiles	SOCAL
Combat System Ship Qualification Trial (CSSQT) – Anti-surface Warfare (ASUW)	N/A	N/A	N/A	6	12,000 medium caliber rounds, 1,800 large caliber rounds (678 HE), 6 missiles	HRC: PMRF	6	12,000 medium caliber rounds, 1,800 large caliber rounds (678 HE), 6 missiles	HRC: PMRF
	N/A	N/A	N/A	13	14,000 medium caliber rounds, 3,420 large caliber rounds (1,511 HE), 9 missiles	SOCAL	13	14,000 medium caliber rounds, 3,420 large caliber rounds (1,511 HE), 9 missiles	SOCAL

Notes: HE = High Explosive, SOCAL = Southern California [Range Complex], HRC = Hawaii Range Complex, PMRF = Pacific Missile Range Facility, HI = Hawaii, N/A = Not Analyzed (this event was not analyzed as part of the baseline)

Table 2.8-3: Baseline and Proposed Naval Sea Systems Command Testing Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Life Cycle Activities (continued)									
Combat System Ship Qualification Trial (CSSQT) – Undersea Warfare (USW)	N/A	N/A	N/A	10	80 torpedoes	HRC: PMRF	10	80 torpedoes	HRC: PMRF
				11	88 torpedoes	SOCAL	11	88 torpedoes	SOCAL
Anti-Surface Warfare (ASUW)/Anti-Submarine Warfare (ASW) Testing									
Missile Testing	N/A	N/A	N/A	12	12 missiles	HRC: PMRF	24 (either location)	24 missiles	HRC: PMRF
				12	12 missiles	SOCAL			SOCAL
Kinetic Energy Weapon Testing	None	None	None	50	2,000 projectiles	HRC: PMRF	55	2,200 projectiles	HRC: PMRF
				1 event total	5,000 projectiles	HRC: PMRF	1 event total	5,000 projectiles	HRC: PMRF
Electronic Warfare Testing	N/A	N/A	N/A	96	None	Pierside: Pearl Harbor, HI	106	None	Pierside: Pearl Harbor, HI
				15	None	HRC	16	None	HRC
				49	None	SOCAL	54	None	SOCAL
Torpedo (Non-explosive) Testing	5	80 torpedoes	HRC: HATS, NMAUI or Penguin Bank	8	124 torpedoes	HRC: HATS, NMAUI or Penguin Bank	9	140 torpedoes	HRC: HATS, NMAUI or Penguin Bank

Notes: HRC = Hawaii Range Complex, HATS = Hawaii Area Tracking System, NMAUI = Test area north of Maui, PMRF = Pacific Missile Range Facility, SWTR = Shallow Water Training Range, SOCAL = Southern California [Range Complex], SOAR = Southern California Anti-Submarine Warfare Range, SHOBA = Shore Bombardment Area, HE = High Explosive, N/A = Not Analyzed. This event was not analyzed as part of the baseline

Table 2.8-3: Baseline and Proposed Naval Sea Systems Command Testing Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Anti-Surface Warfare (ASUW)/Anti-Submarine Warfare (ASW) Testing (continued)									
Torpedo (Non-explosive) Testing (continued)	5	80 torpedoes	HRC: PMRF	8	100 torpedoes	HRC: PMRF	10	250 torpedoes	HRC: PMRF
				1	8 torpedoes	Hawaii SWTR	2	16 torpedoes	Hawaii SWTR
	15	240 torpedoes	SOCAL: Tanner Bank Minefield, SOAR, or SHOBA	16	248 torpedoes	SOCAL: Tanner Bank Minefield, SOAR, or SHOBA	17	391 torpedoes	SOCAL: Tanner Bank Minefield, SOAR, or SHOBA
Torpedo (Explosive) Testing	2	24 torpedoes (8 HE torpedoes)	HRC	2	28 torpedoes (8 HE)	HRC	2	28 torpedoes (8 HE)	HRC
	0	0	SOCAL	2	28 torpedoes (8 HE)	SOCAL	2	28 torpedoes (8 HE)	SOCAL
Countermeasure Testing	N/A	N/A	N/A	1	None	Transit Corridor	1	None	Transit Corridor
				5	105 torpedoes (21 HE)	HRC	5	105 torpedoes (21 HE)	HRC
				2	84 torpedoes	SOCAL	2	84 torpedoes	SOCAL
Pierside Sonar Testing	N/A	N/A	N/A	8 (either location)	None	Pierside: Pearl Harbor, HI	10 (either location)	None	Pierside: Pearl Harbor, HI
						Pierside: San Diego, CA			Pierside: San Diego, CA

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California [Range Complex], HI = Hawaii, CA = California, HE = High Explosive, N/A (Not Analyzed). This event was not analyzed as part of the baseline.

Table 2.8-3: Baseline and Proposed Naval Sea Systems Command Testing Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Anti-Surface Warfare (ASUW)/Anti-Submarine Warfare (ASW) Testing (continued)									
At-sea Sonar Testing	N/A	N/A	N/A	9	None	HRC	20 (either location)	None	HRC
				9		SOCAL			SOCAL
Mine Warfare (MIW) Testing									
Mine Detection and Classification Testing	N/A	N/A	N/A	1	None	HRC	2	None	HRC
				2	None	HRC: Kahoolawe Training Minefield	3	None	HRC: Kahoolawe Training Minefield
				4	None	SOCAL	5	None	SOCAL
				2	None	SOCAL: Mission Bay Training Minefield	3	None	SOCAL: Mission Bay Training Minefield
Mine Countermeasure/ Neutralization Testing	N/A	N/A	N/A	12	24 HE charges	SOCAL	14	28 HE charges	SOCAL
Pierside Systems Health Checks	N/A	N/A	N/A	3	None	Pierside: San Diego, CA	4	None	Pierside: San Diego, CA
Shipboard Protection Systems and Swimmer Defense Testing									
Pierside Integrated Swimmer Defense	5	None	Pierside: San Diego, CA	4	None	Pierside: San Diego, CA	5	None	Pierside: San Diego, CA
Shipboard Protection Systems Testing	N/A	N/A	N/A	3	None	Pierside: San Diego, CA	4	None	Pierside: San Diego, CA

Notes: CA = California, HRC = Hawaii Range Complex, SOCAL = Southern California [Range Complex], HE = High Explosive, N/A = Not Analyzed (this event was not analyzed as part of the baseline)

Table 2.8-3: Baseline and Proposed Naval Sea Systems Command Testing Activities (continued)

Range Activity	No Action Alternative			Alternative 1			Alternative 2		
	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location	No. of events (per year)	Ordnance (Number per year)	Location
Shipboard Protection Systems and Swimmer Defense Testing (continued)									
Shipboard Protection Systems Testing (continued)	N/A	N/A	N/A	3	1,000 rounds (small-caliber)	SOCAL	4	1,300 rounds (small-caliber)	SOCAL
Chemical/Biological Simulant Testing	N/A	N/A	N/A	220	None	HRC	440 (either location)	None	HRC
				220	None	SOCAL			SOCAL
Unmanned Vehicle Testing									
Underwater Deployed Unmanned Aerial Vehicle Testing	N/A	N/A	N/A	13	None	HRC	30 (either location)	None	HRC
				13	None	SOCAL			SOCAL
Unmanned Vehicle Development and Payload Testing	N/A	N/A	N/A	15	None	HRC	17	None	HRC
				24	None	SOCAL	26	None	SOCAL
Other Testing									
Special Warfare	None	None	None	3 (either location)	None	HRC	4 (either location)	None	HRC
						SOCAL			SOCAL
Acoustic Communications Testing	1	None	HRC	1	None	HRC	2 (either location)	None	HRC
				1	None	SOCAL			SOCAL

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California [Range Complex], N/A = Not Analyzed (this event was not analyzed as part of the baseline)

Table 2.8-4: Baseline and Proposed Space and Naval Warfare Systems Command Testing Activities

Range Activity	No Action Alternative		Alternative 1		Alternative 2	
	No. of events (per year)	Location	No. of events (per year)	Location	No. of events (per year)	Location
Autonomous Undersea Vehicle (AUV) Anti-Terrorism/Force Protection (AT/FP) Mine Countermeasures	68	SOCAL	80	SOCAL	92	SOCAL
	8	HRC	16	HRC	20	HRC
AUV Underwater Communications	68	SOCAL	80	SOCAL	92	SOCAL
	8	HRC	16	HRC	20	HRC
Fixed System Underwater Communications	27	SOCAL	34	SOCAL	37	SOCAL
AUV Autonomous Oceanographic Research and Meteorology and Oceanography (METOC)	68	SOCAL	80	SOCAL	92	SOCAL
	8	HRC	16	HRC	20	HRC
Fixed Autonomous Oceanographic Research and METOC	18	SOCAL	24	SOCAL	26	SOCAL
Passive Mobile Intelligence, Surveillance, and Reconnaissance Sensor Systems	21	SOCAL	24	SOCAL	27	SOCAL
Fixed Intelligence, Surveillance, and Reconnaissance Sensor Systems	21	SOCAL	36	SOCAL	39	SOCAL
	N/A	HRC	4	HRC	4	HRC
Anti-Terrorism/Force Protection (AT/FP) Fixed Sensor Systems	9	SOCAL	10	SOCAL	11	SOCAL

Notes: (1) Activities in this table located in SOCAL may occur in San Diego Bay; (2) HRC = Hawaii Range Complex, SOCAL = Southern California [Range Complex]

Table 2.8-5: Baseline and Proposed Office of Naval Research Testing Activities

Range Activity	No Action Alternative		Alternative 1		Alternative 2	
	No. of events (per year)	Location	No. of events (per year)	Location	No. of events (per year)	Location
Office of Naval Research						
Kauai Acoustic Communications Experiment	N/A	N/A	2	Hawaii Range Complex – PMRF (Warning Areas -72B, and 386 [Air D, G, H, and K])	2	Hawaii Range Complex – PMRF (Warning Areas -72B, and 386 [Air D, G, H, and K])

Notes: N/A = Not Analyzed, PMRF = Pacific Missile Range Facility

REFERENCES

Richardson, W. J., Greene, C. R., Jr., Malme, C. I. & Thomson, D. H. (1995). Marine Mammals and Noise (pp. 576). San Diego, CA: Academic Press.

Southall, B., Bowles, A., Ellison, W., Finneran, J., Gentry, R., Greene, C., Tyack, P. (2007). Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. *Aquatic Mammals, 33*(4), 122.

The President. (June 2006). Proclamation 8031- Establishment of the Northwestern Hawaiian Islands Marine National Monument. *Federal Register, 71*(122), 36443-36475.

The White House President George W. Bush. (January 2009). Statement by the President on the Occasion of the Designation of the Marianas Trench National Monument, Pacific Remote Islands National Monument, and the Rose Atoll Marine National Monument.

U.S. Department of the Navy. (2002). Final Environmental Impact Statement/Overseas Environmental Impact Statement Point Mugu Sea Range. (pp. 712) Naval Air Systems Command, Naval Air Warfare Center Weapons Division.

U.S. Department of the Navy. (2008a). Hawaii Range Complex, Final Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS). Hawaii Range Complex. Prepared by Pacific Missile Range Facility.

U.S. Department of the Navy. (2008b). Southern California Range Complex Environmental Impact Statement/Oversea Environmental Impact Statement Volume 2 of 2: Chapters 4-10 and Appendices A-F. (Vol. 2, pp. 926).

U.S. Department of the Navy. (2008c). Southern California Range Complex Environmental Impact Statement/Overseas Environmental Impact Statement Volume 1 of 2: Chapters 1-3.

U.S. Department of the Navy. (2011). Silver Strand Training Complex Environmental Impact Statement [EIS]. Prepared by U.S. Pacific Fleet.

Urick, R. (1983). Principles of Underwater Sound, *Principles of Underwater Sound for Engineers* (3rd ed., pp. 325). Los Altos Hills, California: Peninsula Publishing.

This Page Intentionally Left Blank

3 Introduction

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.0 INTRODUCTION

This chapter describes existing environmental conditions in the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area) as well as the analysis of resources potentially impacted by the Proposed Action described in Chapter 2 (Description of Proposed Action and Alternatives). The Study Area is described in Section 2.1 (Description of the Hawaii-Southern California Training and Testing Study Area) and depicted in Figure 2.1-1. Because of the immense Study Area and the broad range of Navy training and testing activities in the Proposed Action (Tables 2.8-1 through 2.8-5), this chapter is very lengthy. Therefore, Section 3.0 addresses issues that apply to many or all of the resources. The resource sections refer back to subsections in Section 3.0 for the general information contained here.

Section 3.0.1 (Regulatory Framework) presents the regulatory framework for the analyses of the resources in Chapter 3. It briefly describes each law, executive order, and directive used to develop the analyses. Other laws and regulations that may apply to this EIS/OEIS, but that were not specifically used in the analysis, are listed in Chapter 6 (Additional Regulatory Considerations). Section 3.0.2 (Data Sources and Best Available Data) lists the sources of data used in the analysis.

The Study Area covers a broad range of ecosystems where Navy training and testing is proposed, so Section 3.0.3 (Ecological Characterization of the Study Area) describes areas known as large marine ecosystems and open ocean areas. The Study Area contains large portions of two large marine ecosystems (the California Current and the Insular Pacific-Hawaiian) and one open ocean area (the North Pacific Subtropical Gyre). Figure 3.0-1 is an overview map of the entire Study Area overlain with the Navy's range complexes and major current systems in the Pacific Ocean. In addition to these descriptions, Section 3.0.3 presents information on ocean bathymetry, currents, and fronts. These topics have general applicability to the resources analyzed.

One of the major issues addressed in this Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS) is the effects of noise on biological resources. The topic of acoustics can be very complicated to the general reader, so Section 3.0.4 (Acoustic and Explosives Primer) presents a primer on sound in water and in air. The primer explains how sound propagates through air and water; defines terms used in the analysis; and describes the physical properties of sound, metrics used to characterize sound exposure, and frequencies produced during Navy training and testing activities.

Section 3.0.5 (Overall Approach to Analysis) describes a general approach to the analysis. It identifies the resources considered for the analysis, as well as those resources eliminated from further consideration. Each Navy training and testing activity was examined to determine which environmental stressors could adversely impact a resource; these stressors were grouped into categories for ease of presentation (Table 3.0-6). Table 3.0-7 associates the stressor categories with training and testing activities. A detailed description of each stressor category is contained in Section 3.0.5.3 (Identification of Stressors for Analysis). Descriptions of stressors that only apply to one resource are found in the associated resource section. Lastly, the general approach section contains the methods used in the biological resource sections. These methods are also organized by stressor categories.

The sections following Section 3.0 analyze each resource. The physical resources (sediment and water quality and air quality) are presented first (Sections 3.1 and 3.2, respectively). Any potential impacts on these resources were considered as potential secondary stressors on the remaining resources to be described: marine habitats, marine mammals, sea turtles, seabirds, marine vegetation, marine invertebrates, and fish (Sections 3.3 through 3.9). Following the biological resource sections are human resource sections: cultural, socioeconomics, and public health and safety (Sections 3.10, 3.11, and 3.12).

The Navy has made changes to this Final EIS/OEIS based on comments received during the public comment period. Changes include factual corrections, additions to existing information, and improvements or modifications to the analyses presented in the Draft EIS/OEIS. A summary of public comments received and the Navy's response to these comments is provided in Appendix E (Public Participation). While these comments provided valuable guidance and additional information, none of the changes between the Draft and Final EIS/OEIS resulted in substantive changes to the Proposed Action, alternatives, or the conclusions of the environmental consequences of the Proposed Action.

3.0.1 Regulatory Framework

In accordance with the Council on Environmental Quality regulations for implementing the requirements of the National Environmental Policy Act (NEPA), other planning and environmental review procedures are integrated to the fullest extent possible. This section provides a brief overview of the primary federal statutes (3.0.1.1), executive orders (3.0.1.2), and guidance (3.0.1.3) that form the regulatory framework for the evaluation of resources in Chapter 3 (Affected Environment and Environmental Consequences). This section also describes how each applies to the analysis of environmental consequences. Chapter 6 (Additional Regulatory Considerations) provides a summary listing and status of compliance with the applicable environmental laws, regulations, and executive orders that were considered in preparing this EIS/OEIS. More detailed information on the regulatory framework, including other statutes not listed here, may be presented as necessary in each resource section. Although all the environmental laws, regulations, and executive orders provided in Chapter 6 were evaluated in this EIS/OEIS, some were included in regulatory determinations for resources during the analysis of impacts. More detailed discussions of selected regulations are included below to provide insight into the criteria used in the analyses.

3.0.1.1 Federal Statutes

Abandoned Shipwreck Act

The 1987 Abandoned Shipwreck Act (43 United States Code [U.S.C.] §§ 2101–2106) asserts the federal government's title to any abandoned shipwreck that meets criteria for inclusion in the National Register of Historic Places. The Act stipulates that title to these shipwrecks will be transferred to the appropriate State. States have the responsibility to manage the wrecks and to allow access to the sites by the general public while preserving the historical and environmental integrity of the site for scientific investigation. Abandoned shipwreck means any shipwreck to which title has voluntarily been given up by the owner with the intent of never claiming a right or interest in the vessel in the future and without vesting ownership in any other person. Such shipwrecks ordinarily are treated as being abandoned after the expiration of 30 days from the sinking.

Clean Air Act

The purpose of the Clean Air Act (42 U.S.C. § 7401 et seq.) is to protect and enhance the quality of the nation's air resources to promote the public health and welfare and the productive capacity of its population. To fulfill the act's purpose, federal agencies classify air basins according to their attainment status under the National Ambient Air Quality Standards (40 Code of Federal Regulations [C.F.R.] Part 50) and regulate emissions of criteria pollutants and air toxins to protect the public health and welfare.

Noncriteria air pollutants that can affect human health are categorized as hazardous air pollutants under Section 112 of the Clean Air Act. The U.S. Environmental Protection Agency (USEPA) identified 188 hazardous air pollutants such as benzene, perchloroethylene, and methylene chloride. Section 176(c)(1) of the Clean Air Act, commonly known as the General Conformity Rule, requires federal agencies to ensure that their actions conform to applicable implementation plans for achieving and maintaining the National Ambient Air Quality Standards for criteria pollutants.

Clean Water Act

The Clean Water Act (33 U.S.C. § 1251 et seq.) regulates discharges of pollutants in surface waters of the United States. Section 403 of the Clean Water Act provides for the protection of ocean waters (waters of the territorial seas, the contiguous zone, and the high seas beyond the contiguous zone) from point-source discharges. Under Section 403(a), the USEPA or an authorized state agency may issue a permit for an ocean discharge only if the discharge complies with Clean Water Act guidelines for protection of marine waters. For the HSTT EIS/OEIS, the Proposed Action does not include the analysis of discharges incidental to the normal operation of Navy ships.

Endangered Species Act

The Endangered Species Act (ESA) of 1973 (16 U.S.C. § 1531 et seq.) established protection over and conservation of threatened and endangered species and the ecosystems upon which they depend. An “endangered” species is a species in danger of extinction throughout all or a significant portion of its range. A “threatened” species is one that is likely to become endangered within the near future throughout all or in a significant portion of its range. The U.S. Fish and Wildlife Service and National Marine Fisheries Service (NMFS) jointly administer the ESA and are also responsible for the listing of species (designating a species as either threatened or endangered). The ESA allows the designation of geographic areas as critical habitat for threatened or endangered species. Section 7(a)(2) requires each federal agency to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When a federal agency's action “may affect” a listed species, that agency is required to consult with NMFS or U.S. Fish and Wildlife Service, depending on the jurisdiction (50 C.F.R. § 402.14[a]).

Magnuson-Stevens Fishery Conservation and Management Act and Sustainable Fisheries Act

The Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq.) enacted in 1976 and amended by the Sustainable Fisheries Act in 1996, mandates identification and conservation of essential fish habitat. Essential fish habitat is defined as those waters and substrates necessary (required to support a sustainable fishery and the federally managed species) to fish for spawning, breeding, feeding, or growth to maturity (i.e., full life cycle). These waters include aquatic areas and their associated physical, chemical, and biological properties used by fish, and may include areas historically used by fish. Substrate types include sediment, hard bottom, structures underlying the waters, and associated biological communities. Federal agencies are required to consult with NMFS and to prepare an essential fish habitat assessment if potential adverse effects on essential fish habitat are anticipated from their activities.

Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) of 1972 (16 U.S.C. § 1361 et seq.) established, with limited exceptions, a moratorium on the “taking” of marine mammals in waters or on lands under U.S. jurisdiction. The act further regulates “takes” of marine mammals in the global commons (that is, the high seas) by vessels or persons under U.S. jurisdiction. The term "take," as defined in Section 3 (16 U.S.C. § 1362 [13]) of the MMPA, means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." "Harassment" was further defined in the 1994 amendments to the MMPA, which provided two levels of harassment: Level A (potential injury) and Level B (potential behavioral disturbance).

The Marine Mammal Protection Act directs the Secretary of Commerce (Secretary) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens or agencies who engage in a specified activity (other than commercial fishing) within a specified geographical region if NMFS finds that the taking will have a negligible impact on the species or stock(s), and will not have an unmitigatable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). The authorization must set forth the permissible methods of taking, other means of effecting the least practicable adverse impact on the species or stock and its habitat, and requirements pertaining to the mitigation, monitoring and reporting of such taking.

The National Defense Authorization Act of Fiscal Year 2004 (Public Law 108-136) amended the definition of harassment, removed the "specified geographic area" requirement, and removed the small numbers provision as applied to military readiness activities or scientific research activities conducted by or on behalf of the federal government consistent with Section 104(c)(3) (16 U.S.C. § 1374(c)(3)). The Fiscal Year 2004 National Defense Authorization Act adopted the definition of "military readiness activity" as set forth in the Fiscal Year 2003 National "Defense Authorization Act (Public Law 107-314). A "military readiness activity" is defined as "all training and operations of the Armed Forces that relate to combat" and the "adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use." For military readiness activities, the relevant definition of harassment is any act that

- injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild ("Level A harassment") or
- disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behavioral patterns are abandoned or significantly altered ("Level B harassment") [16 U.S.C. § 1362 (18)(B)(i) and (ii)].

Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 (16 U.S.C. § 703 et seq.) and the Migratory Bird Conservation Act (16 U.S.C. §§ 715–715d, 715e, 715f–715r) of 18 February 1929, are the primary laws in the United States established to conserve migratory birds. The Migratory Bird Treaty Act prohibits the taking, killing, or possessing of migratory birds or the parts, nests, or eggs of such birds, unless permitted by regulation.

The 2003 National Defense Authorization Act provides that the Armed Forces may take migratory birds incidental to military readiness activities provided that, for those ongoing or proposed activities that the Armed Forces determine may result in a significant adverse effect on a population of a migratory bird species, the Armed Forces confers and cooperates with the Service to develop and implement appropriate conservation measures to minimize or mitigate such significant adverse effects (50 C.F.R. § 21.15).

National Environmental Policy Act

The Navy prepared this EIS/OEIS in accordance with the President's Council on Environmental Quality regulations implementing NEPA (40 C.F.R. Parts 1500–1508). National Environmental Policy Act (42 U.S.C. §§ 4321–4347) requires federal agencies to prepare an EIS for a proposed action with the potential to significantly affect the quality of the human environment, disclose significant environmental impacts, and inform decision makers and the public of the reasonable alternatives to the proposed action. Based on Presidential Proclamation 5928, issued 27 December 1988, impacts on ocean areas that lie within 12 nautical miles (nm) of land (U.S. territory) are subject to analysis under NEPA.

National Historic Preservation Act

The National Historic Preservation Act of 1966 (16 U.S.C. 470 et seq.) establishes preservation as a national policy, and directs the federal government to provide leadership in preserving, restoring, and maintaining the historic and cultural environment. Section 106 of the National Historic Preservation Act requires federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. The National Historic Preservation Act created the National Register of Historic Places, the list of National Historic Landmarks, and the State Historic Preservation Offices to help protect each state's historical and archaeological resources. Section 110 of the National Historic Preservation Act requires federal agencies to assume responsibility for the preservation of historic properties owned or controlled by them and to locate, inventory, and nominate all properties that qualify for the National Register. Agencies shall exercise caution to assure that significant properties are not inadvertently transferred, sold, demolished, substantially altered, or allowed to deteriorate. The National Historic Preservation Act applies to cultural resources evaluated in this EIS/OEIS.

3.0.1.2 Executive Orders

Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*

This OEIS has been prepared in accordance with Executive Order (EO) 12114 (44 Federal Register [FR] 1957) and Navy implementing regulations in 32 C.F.R. Part 187, *Environmental Effects Abroad of Major Department of Defense Actions*. An OEIS is required when a proposed action and alternatives have the potential to significantly harm the environment of the global commons. The global commons are defined as geographical areas outside the jurisdiction of any nation and include the oceans outside of the territorial limits (more than 12 nm from the coast) and Antarctica but do not include contiguous zones and fisheries zones of foreign nations (32 C.F.R. § 187.3). As used in EO 12114, "environment" means the natural and physical environment and excludes social, economic, and other environments. The EIS and OEIS have been combined into one document, as permitted under NEPA and EO 12114, to reduce duplication.

Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*

Executive Order 13514 (74 FR 52117) was signed in October 2009 to establish an integrated strategy toward sustainability in the federal government and to make reduction of greenhouse gas emissions a priority for federal agencies. The Department of Defense (DoD) developed a Strategic Sustainability Performance Plan that identifies performance-based goals and subgoals, provides a method to meet the goals (including investment strategies), and outlines a plan for reporting on performance. The Strategic Sustainability Performance Plan is included in the analyses in this EIS/OEIS.

Executive Order 13547, *Stewardship of the Ocean, Our Coasts, and the Great Lakes*

Executive Order 13547 (75 FR 43023) was issued in 2010. It is a comprehensive national policy for the stewardship of the ocean, our coasts, and the Great Lakes. This order adopts the recommendations of the Interagency Ocean Policy Task Force and directs executive agencies to implement the recommendations under the guidance of a National Ocean Council. This order establishes a national policy to

- ensure the protection, maintenance, and restoration of the health of ocean, coastal, and Great Lakes ecosystems and resources;
- enhance the sustainability of ocean and coastal economies, preserve our maritime heritage,
- support sustainable uses and access;
- provide for adaptive management to enhance our understanding of and capacity to respond to climate change and ocean acidification; and
- coordinate with our national security and foreign policy interests.

3.0.1.3 Guidance

Department of Defense and Navy Directives and Instructions

Several military communications are included in this EIS/OEIS that establish policy or a plan to govern an action, conduct, or procedure. For example, DoD Directive 4540.1, *Use of Airspace by U.S. Military Aircraft and Firings over the High Seas*, and Chief of Naval Operations Instruction 3770.4A, *Use of Airspace by U.S. Military Aircraft and Firing over the High Seas*, specify procedures for conducting aircraft maneuvers and for firing missiles and projectiles. Other directives and instructions referred to in the EIS/OEIS are specific for a range complex or test range such as the Fleet Area Control and Surveillance Facility San Diego Instruction 3120.1G, which is the *Manual of EASTPAC and MIDPAC Fleet Operating Areas*. Each range complex and test range has its own manual; however, many of the components are similar.

3.0.2 Data Sources and Best Available Data

The Navy used the best available data and information to compile the environmental baseline and environmental consequences evaluated in Chapter 3. In accordance with NEPA, the Administrative Procedure Act of 1946 (5 U.S.C. §§ 551–559), and EO 12114, best available data accepted by the appropriate regulatory and scientific communities were used in the analyses of resources.

Literature searches of journals, books, periodicals, bulletins, and other technical reports were conducted in preparation of this EIS/OEIS. Searches included general queries in the resource areas evaluated to document the environmental baseline and specific queries for analysis of environmental consequences. A wide range of primary literature was used in preparing this EIS/OEIS from federal agencies such as the NMFS, the USEPA, international organizations including the United Nations Educational Scientific and Cultural Organization, state agencies, and nonprofit and nongovernment organizations. Internet searches were conducted, and websites were evaluated for credibility of the source, quality of the information, and relevance of the content to ensure use of the best available information in this document.

3.0.2.1 Geographical Information Systems Data

Table 3.0-1 lists sources of non-Navy Geographical Information System data used in Chapter 3 figures.

Table 3.0-1: Sources of Non-Navy Geographic Information System Data Used to Generate Figures in Chapter 3

Feature/Layer	Applicable Figures	Data Source References
Large Marine Ecosystems	All Chapter 3 figures	(National Oceanic and Atmospheric Administration 2002)
Bathymetry and Ocean Base Map	3.0-1, 3.0-2, 3.0-3, 3.0-4, 3.0-5	(General Bathymetric Chart of the Oceans 2010, Intergovernmental Oceanographic Commission 2009)
Sea Surface Temperature	3.0-7, 3.0-8	(University of Miami Rosenstiel School of Marine and Atmospheric Science et al. 2007)
California Air Basins	3.2-1	(California Air Resources Board 2004)
Critical Habitat	All Critical Habitat Figures	(National Marine Fisheries Service and U. S. Fish and Wildlife Service 2009)
NRHP Eligible or Listed Resources/Sovereign Immunity, Shipwrecks	3.10-1, 3.10-2, 3.10-3, 3.10-4, 3.10-5	(NOAA's Automated Wreck and Obstruction Information System [AWOIS] 2002; Google Earth 2010)
Commercially Used Waterways	3.11-1, 3.11-2	(Vanderbilt Engineering Center for Transportation Operations and Research 2004)
Danger Zones and Restricted Areas	3.11-9	(Title 33-Navigation and Navigable Waters, Chapter II-Corps of Engineers, Department of the Army, Department of Defense, Part 334-Danger Zone and Restricted Area Regulations 2005)

Notes: NOAA = National Oceanic and Atmospheric Administration, U.S. = United States, HAPC = Habitat Area of Particular Concern, AWOIS = Automated Wreck and Obstruction Information System, NRHP = National Register of Historic Places, nm = nautical miles, OCS = Office of Coast Survey

3.0.2.2 Navy Integrated Comprehensive Monitoring Program

Since 2006, the Navy, as well as non-Navy marine mammal scientists and research institutions have conducted scientific monitoring and research in and around ocean areas in the Atlantic and Pacific where the Navy has been training and testing and where it proposes to continue these activities. Data collected from Navy monitoring, scientific research findings, and annual reports provided to NMFS may inform the analysis of impacts on marine mammals for a variety of reasons, including species distribution, habitat use, and evaluation of potential responses to Navy activities. Monitoring is performed using various methods, including visual surveys from surface vessels and aircraft and passive acoustics. Navy monitoring can generally be divided into two types of efforts: (1) collecting long-term data on distribution, abundance, and habitat use patterns within Navy activity areas; and (2) collecting data during individual training or testing activities. Monitoring efforts during anti-submarine warfare and explosive events focus on observing individual animals in the vicinity of the event and documenting behavior and any observable responses. Although these monitoring events are very localized and short-term, over time they will provide valuable information to support the impact analysis.

Most of the training and testing activities the Navy is proposing for the next 5 years are similar if not identical to activities that have been occurring in the same locations for decades. For example, the mid-frequency anti-submarine warfare sonar system on the cruisers, destroyers, and frigates has the same sonar system components in the water as those first deployed in the 1970s. While the signal analysis and computing processes onboard these ships have been upgraded with modern technology, the power and output of the sonar transducer, which puts signals into the water, have not changed. Therefore, the history of past marine mammal observations, research, and monitoring reports remain applicable to the analysis of effects from the proposed future training and testing activities.

3.0.2.2.1 Relevant Data From the Hawaii-Southern California Training and Testing Study Area

In the Hawaii Range Complex portion of the Hawaii-Southern California Training and Testing (HSTT) Study Area between 2006 and 2012, 21 scientific marine mammal surveys were conducted before, during, or after major exercises. In the Southern California and Hawaii Range Complex portions of HSTT from 2009 to 2011, Navy-funded marine mammal monitoring research completed over 5,000 hours of visual survey effort covering more than 65,000 nautical miles, sighted more than 256,000 individual marine mammals, took more than 45,600 digital photos and 36 hours of digital video, attached 70 satellite tracking tags to individual marine mammals, and collected more than 40,000 hours of passive acoustic recordings.

The Navy also co-funded additional visual surveys conducted by the NMFS' Pacific Island Fisheries Science Center and Southwest Fisheries Science Center. Finally, there were an additional 1,532 sightings of an estimated 16,224 marine mammals made and reported by Navy lookouts aboard Navy ships within the HSTT from 2009 to 2012.

Based on this research, monitoring before, during, and after training and testing events since 2006, and the reports that have been submitted to and reviewed by NMFS, the Navy's assessment is that it is unlikely there will be impacts to populations of marine mammals having any long-term consequences as a result of the proposed continuation of training and testing in the ocean areas historically used by the Navy.

This assessment of likelihood is based on four indicators from areas in the Pacific where Navy training and testing has been ongoing for decades: (1) evidence suggesting or documenting increases in the numbers of marine mammals present, (2) examples of documented presence and site fidelity of species and long-term residence by individual animals of some species, (3) use of training and testing areas for breeding and nursing activities, and (4) 6 years of comprehensive monitoring data indicating a lack of any observable effects to marine mammal populations as a result of Navy training and testing activities.[1]

3.0.2.3 Marine Species Density Database

A quantitative analysis of impacts on a species requires data on the abundance and concentration of the species population in the potentially impacted area. The most appropriate metric for this type of analysis is density, which is the number of animals present per unit area.

Estimating marine species density requires significant effort to collect and analyze data to produce a usable estimate. NMFS is the primary agency responsible for estimating marine mammal and sea turtle density within the U.S. Exclusive Economic Zone. Other independent researchers often publish density data for key species in specific areas of interest. For example, manatee abundance data is collected by state agencies. Within most of the world's oceans, although some survey effort may have been completed, the required amount of surveys has not been conducted to allow density estimation. To approximate distribution and abundance of species for areas or seasons that have not been surveyed, the Habitat Suitability Index or Relative Environmental Suitability model is used to estimate occurrence based on modeled relationships of where the animals are sighted and the associated environmental variables (i.e., depth, sea surface temperature, etc.).

[1] Monitoring of Navy activities began in July 2006 as a requirement under issuance of an Incidental Harassment Authorization by NMFS for the Rim of the Pacific exercise and has continued to the present for training events in the HRC and SOCAL as well as other monitoring as part of the coordinated efforts under the Navy's ICMP developed in coordination with NMFS and others.

There is no single source of density data for every area of the world, species, and season because of the fiscal costs, resources, and effort involved in providing survey coverage to sufficiently estimate density. Therefore, to characterize the marine species density for large areas such as the Study Area, the Navy compiled data from multiple sources. To compile and structure the most appropriate database of marine species density data, the Navy developed a protocol to select the best available data sources based on species, area, and time (season). Refer to the HSTT EIS website for a technical report describing in detail the process the Navy used to create the marine species density database. The resulting Geographic Information System database includes seasonal density values for every marine mammal and sea turtle species present within the Study Area (U.S. Department of the Navy 2012a).

3.0.3 Ecological Characterization of the Hawaii-Southern California Training and Testing Study Area

Navy activities in the marine environment predominately occur within established operating areas (OPAREAs), range complexes, test ranges, ports, and pierside locations, although some occur outside these designated areas. These locations were defined by training and testing requirements and regulated maritime and airspace boundaries. However, the Navy-defined boundaries are not consistent with ecological boundaries that may be more appropriate when assessing potential impacts on marine resources. Therefore, for the purposes of this document, the Navy analyzed the marine resources in an ecological context to more comprehensively assess the potential impacts. The Navy used biogeographical classification systems to frame this ecological context.

Biogeographic classifications organize and describe the patterns and distributions of organisms and the biological and physical processes that influence this distribution. These biogeographic classification systems and areas are described in Section 3.0.3.1 (Biogeographic Classifications). Additional ecosystem-related concepts, as well as a discussion of how Navy activities and potential stressors of the Proposed Action fit into the ecosystem, are presented in a separate detailed report titled the *Ecosystem Technical Report for the Hawaii-Southern California Training and Testing Draft Environmental Impact Statement* (U.S. Department of the Navy et al. 2012b). Refer to the HSTT EIS website to review a copy of the technical report.

3.0.3.1 Biogeographic Classifications

For the purposes of this document, the Navy organized and described the resources in coastal waters by large marine ecosystems, where primary productivity is higher than open ocean areas; the Navy organized and described the resources in open ocean areas by main oceanographic features (currents, gyres). Primary productivity is the rate of the formation of organic material from inorganic carbon from solar radiation (e.g., marine vegetation) or chemical reactions.

The development of the large marine ecosystem classification system began in the mid-1980s as a spatial planning tool to address transboundary management issues such as fisheries and pollution (Duda and Sherman 2002). Large marine ecosystems are “relatively large regions on the order of 58,310 square nautical miles (nm^2) or greater, characterized by distinct water depths and bottom features; water features such as tides, currents, and waves; nutrient and food availability; and levels that different organisms occupy in the food chain” (National Oceanic Atmospheric Administration 2010). The large marine ecosystem concept for ecosystem-based management includes a five-module approach: (1) productivity, (2) fish and fisheries, (3) pollution and ecosystem health, (4) socioeconomics, and (5) governance. This approach is being applied to 16 international projects in Africa, Asia, Latin America, and Eastern Europe (Duda and Sherman 2002).

The large marine ecosystem classification system was advocated by the Council on Environmental Quality's Interagency Ocean Policy Task Force (The White House Council on Environmental Quality 2010) as a marine spatial framework for regional coordination and planning in the United States. However, this task force did not endorse any particular classification system for open ocean areas. Therefore, for this EIS/OEIS, two main oceanographic features are used: the California Current and the North Pacific Subtropical Gyre. The Study Area contains two large marine ecosystems: the California Current and the Insular Pacific-Hawaiian, and one open ocean area: the North Pacific Subtropical Gyre. The two large marine ecosystems and one open ocean area are shown in Figure 3.0-1 and briefly described in Section 3.0.3.1.1 (California Current Large Marine Ecosystem) through Section 3.0.3.1.3 (North Pacific Subtropical Gyre Open Ocean Area).

3.0.3.1.1 California Current Large Marine Ecosystem

The California Current Large Marine Ecosystem encompasses an area of approximately 849,425 square miles (mi.^{2}) (2,200,000 square kilometers [km^2]) (Sherman and Hempel 2009) (Figure 3.0-1). This Large Marine Ecosystem is bordered by the United States and Mexico (Heileman and Mahon 2009). Characteristics of this Large Marine Ecosystem are the temperate climate and strong coastal upwelling (Heileman and Mahon 2009). The effects of variable coastal upwelling, the El Nino Southern Oscillation, and the Pacific Decadal Oscillation in this Large Marine Ecosystem lead to interannual variability (yearly changes) in the productivity of the ecosystem including catch levels of harvest species (Heileman and Mahon 2009). The average primary productivity within this large marine ecosystem is low: less than 150 grams of carbon per square meter per year (g carbon/m^2/year) (Aquarone and Adams 2009). The productivity ranges for some typical global ecosystems are included in Table 3.0-2 for comparison with the values provided for large marine ecosystems.

Table 3.0-2: Net Primary Production for Several Ecosystem Types, for Comparison with the Primary Productivity Values Provided for Each Large Marine Ecosystem

Ecosystems (in descending order of productivity)	Net Primary Productivity g carbon/m^2/year	Large Marine Ecosystems with Equivalent Average Primary Productivity
Salt marsh wetland	4,100–23,000	None in Study Area
Mangrove wetland	3,000–14,800	None in Study Area
Coral reef	1,370–11,000	None in Study Area
Rain forest	2,750–9,600	None in Study Area
Open ocean	5–1,100	California Current Insular Pacific-Hawaiian

Notes: g = grams, m^2 = square meters
Source: Mitsch and Gosselink 1993

3.0.3.1.2 Insular Pacific-Hawaiian Large Marine Ecosystem

The Insular Pacific-Hawaiian Large Marine Ecosystem encompasses an area of approximately 386,102 mi.^{2} (1,000,000 km^2) (Sherman and Hempel 2009). This Large Marine Ecosystem extends 1,500 miles (mi.) (2,414 km) from the Main Hawaiian Islands to the outer Northwestern Hawaiian Islands (Heileman and Mahon 2009) (Figure 3.0-1). This region is characterized by limited ocean nutrients, which leads to high biodiversity but low sustainable yields for fisheries (Heileman and Mahon 2009). Fisheries in this large marine ecosystem are comparatively smaller in scale than other U.S. fisheries. The average primary productivity within this large marine ecosystem is considered low at less than 150 g of carbon per m^2/year (Aquarone and Adams 2009). This is comparable to productivity levels associated with the open ocean (Table 3.0-1).

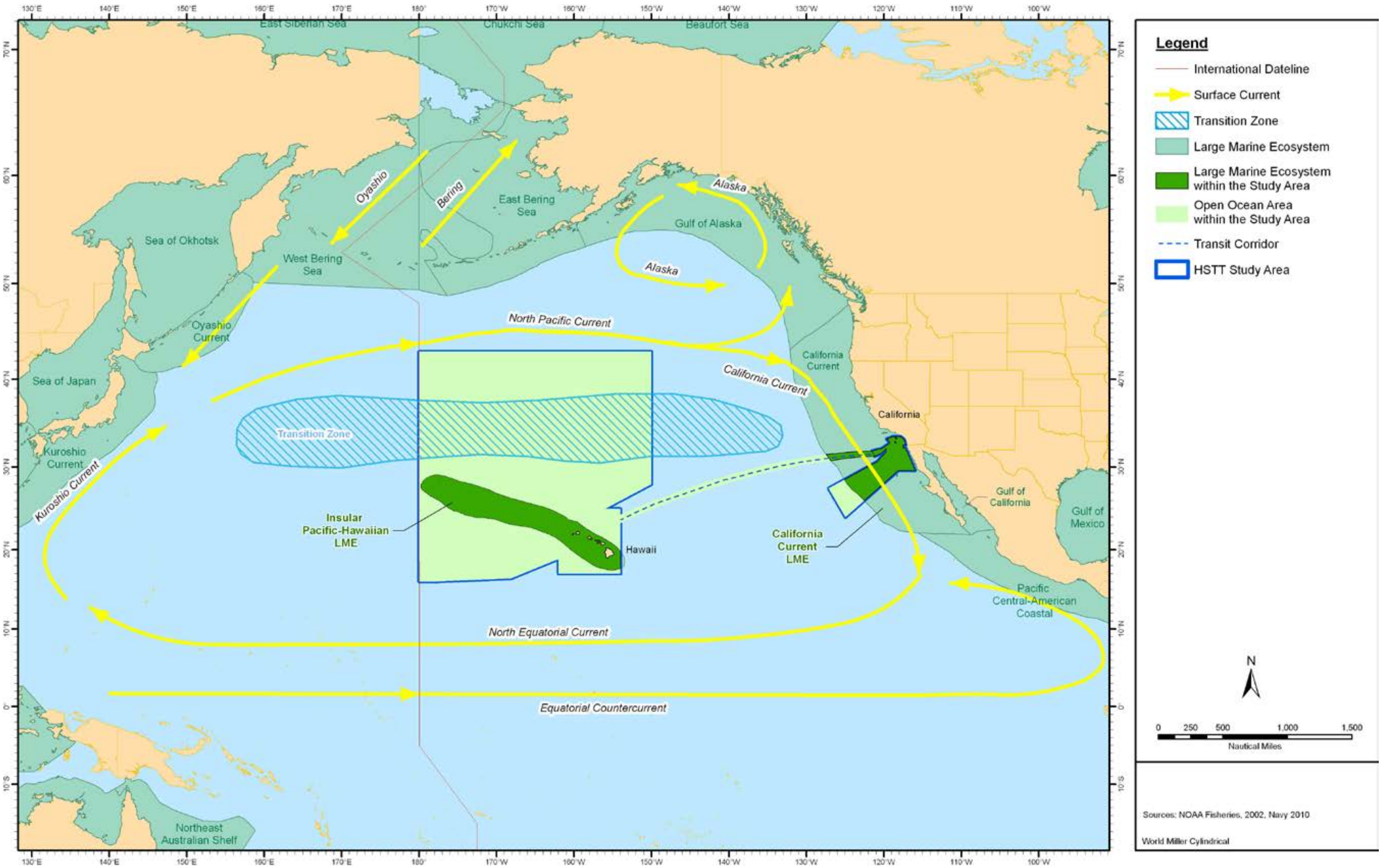


Figure 3.0-1: Large Marine Ecosystems and Open Ocean Portions of the Hawaii-Southern California Training and Testing Study Area

3.0.3.1.3 North Pacific Subtropical Gyre Open Ocean Area

North Pacific Ocean circulation is driven by the clockwise motion of the North Pacific Subtropical Gyre (Tomczak and Godfrey 2003c). The North Pacific Subtropical Gyre occurs between the equator and 50 degrees (°) North (N) and is defined to the north by the North Pacific Current, to the east by the California Current, to the south by the North Equatorial Current, and to the west by the Kuroshio Current (Tomczak and Godfrey 2003c) (Figure 3.0-1). The North Pacific Subtropical Gyre, like all the ocean's large subtropical gyres, has extremely low rates of primary productivity (Valiela 1995) caused by a persistent thermocline (a distinct layer of water in which temperature changes more rapidly with depth than it does above or below) that prevents the vertical mixing of water. Thermocline layers are present in the water column at varying depths throughout the world's oceans; however, in most areas, particularly nearshore, they are broken down seasonally, allowing nutrient-rich waters below the thermocline to replenish surface waters and fuel primary production.

3.0.3.2 Bathymetry

This section provides a description of the bathymetry (water depth) of the Study Area. Given that the bathymetry of an area reflects the topography (surface features) of the seafloor, it is an important factor for understanding the potential impacts of Navy training and testing activities on the seafloor, the propagation of underwater sound (see Section 3.0.4.4.1, Sound Attenuation and Transmission Loss), and species diversity (see Sections 3.3–3.9). The discussion of bathymetry includes a general overview of the Study Area followed by more detailed sections by biogeographic classification area. Table 3.0-3 provides a description of the bathymetry of Navy training and testing areas within each large marine ecosystem and open ocean area.

Table 3.0-3: Summary of Bathymetric Features within Large Marine Ecosystems and Open Ocean Areas in Important Navy Training and Testing Areas

Range/Component	Description	General Bathymetry[1,2]
California Current Large Marine Ecosystem		
Range Complexes		
SOCAL Range Complex	Located offshore of Southern California and the Baja Peninsula (Mexico) in the southern half of the California Current LME.	Varying continental shelf width. Steep continental slope. Numerous near surface banks, seamounts, escarpments, canyons, and basins characterize the bathymetry of the OPAREA.
Silver Strand Training Complex	Located on the Silver Strand, a narrow, sandy isthmus separating the San Diego Bay from the Pacific Ocean.	Shallow waters of San Diego Bay to the east (see below).
Ports, Bays, and Shipyards		
Naval Base Coronado	Located on the northern end of the Silver Strand isthmus at the mouth of San Diego Bay.	Adjacent to dredged channel leading to the Bay (12 m) and shallow shoals (2 - 4 m) on either side of the channel. See San Diego Bay description below.
Naval Base San Diego	Located on the eastern shore of San Diego Bay.	
Naval Base Point Loma	Located on Point Loma, across the mouth of San Diego Bay from Naval Base Coronado.	

Table 3.0-3: Summary of Bathymetric Features within Large Marine Ecosystems and Open Ocean Areas in Important Navy Training and Testing Areas (continued)

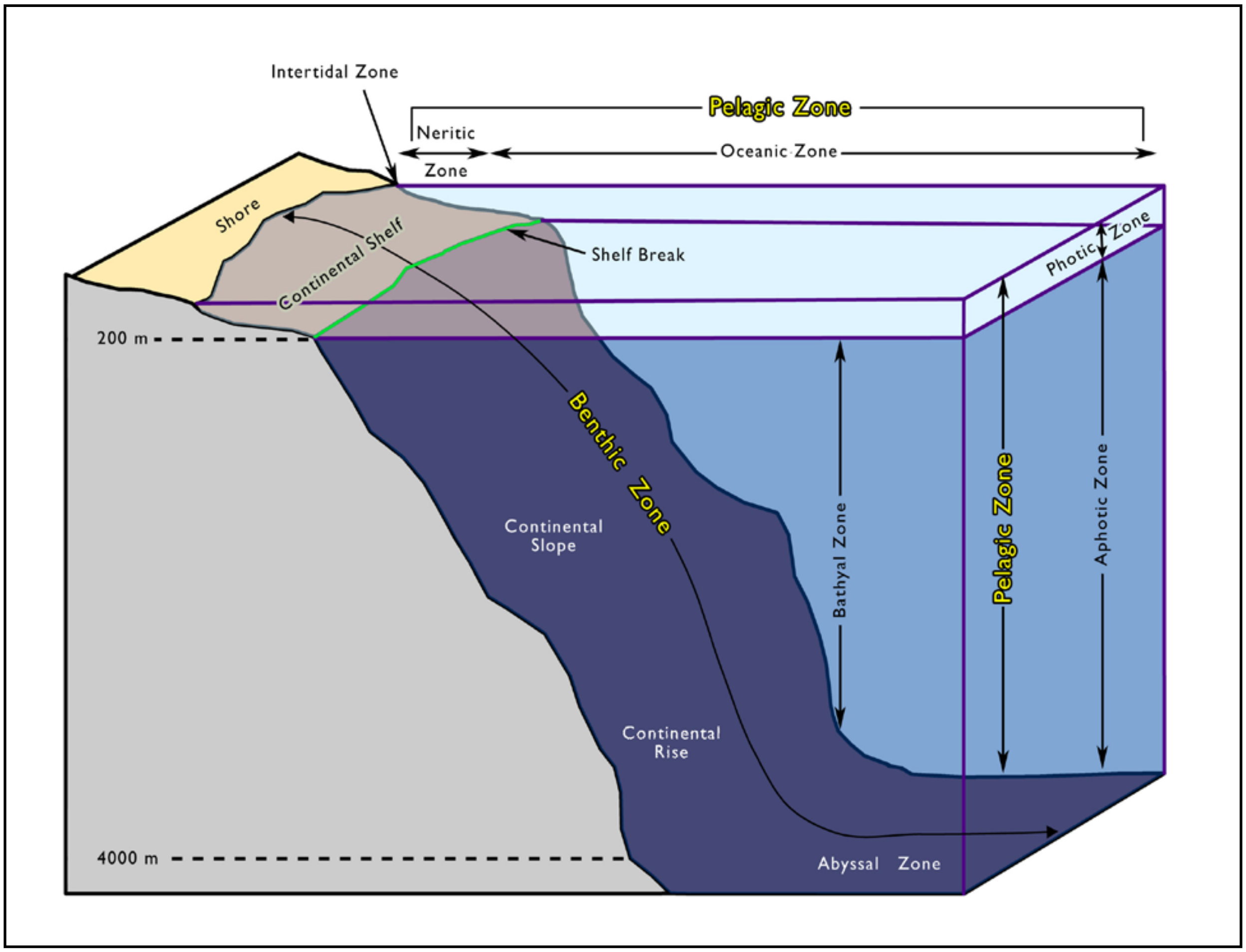
Range/Component	Description	General Bathymetry[1,2]
California Current Large Marine Ecosystem (continued)		
Ocean Operating Areas Outside the Bounds of Existing Range Complexes		
Transit Corridor	Shortest route between Southern California and Hawaii linking the HRC and the SOCAL Range Complex	Open ocean with a variety of bottom types, characterized by both SOCAL Range Complex and Hawaii Range Complex features.
Bodies of Water		
San Diego Bay	Naturally formed, crescent-shaped embayment located along the Southern California coast. Approximately 25 km long and 1–4 km wide.	The mouth of the bay averages 12 m; the southern end of the bay ranges from 1–4 m deep. Shoals at 2–4 m deep are located immediately beyond the mouth of the bay on either side of the dredged approach channel.
Insular Pacific-Hawaiian Large Marine Ecosystem		
Range Complexes		
Hawaii Range Complex	Located in the central North Pacific Ocean, surrounding the Hawaiian Islands. Surface area is approximately 235,000 nm^2.	No continental shelf. Steeply sloping gradients from land to the seafloor. Atolls, seamounts, submarine plateaus are features found throughout the OPAREA.
Ports, Bases, and Shipyards		
Pearl Harbor Naval Complex	Located on the southern coast of Oahu off of Mamala Bay.	Consists of a natural estuary with a mean depth of 9.1 m. The deepest portion is along the Waipio Peninsula in the main channel with a depth of 28 m. Tidal flow is weak and variable.
Ocean Operating Areas Outside the Bounds of Existing Range Complexes		
Transit Corridor	Shortest route between Southern California and Hawaii linking the HRC and the SOCAL Range Complex.	Open ocean with a variety of bottom types, characterized by both SOCAL Range Complex and Hawaii Range Complex features.
North Pacific Subtropical Gyre Open Ocean Area		
Range Complexes		
Hawaii Range Complex	Located in the central North Pacific Ocean, surrounding the Hawaiian Islands. Surface area is approximately 235,000 nm^2.	No continental shelf. Steeply sloping gradients from land to the seafloor. Atolls, seamounts, submarine plateaus are features found throughout the OPAREA.

[1] Navy Research Laboratory 2011

[2] National Oceanic and Atmospheric Administration 2001. NOAA Nautical Charts were also reviewed to determine depth ranges at specific locations. Some "pierside activities" listed as taking place at these locations actually take place away from the coastal areas and are located inside ranges.

Notes: SOCAL = Southern California, OPAREA = Operating Area, m = meters, HRC = Hawaii Range Complex, km = kilometers, nm^2 = square nautical miles

The contour of the ocean floor as it descends from the shoreline has an important influence on the distribution of organisms, as well as the structure and function of marine ecosystems (Madden et al. 2009). The continental shelf and slope make up the continental margin of oceans, which is an extension of the continental crust. A representation of the benthic and pelagic zones of the oceans is shown in Figure 3.0-2. The continental shelf extends seaward from shore with an average gradient of just 0.1°. The distance the shelf extends seaward varies from almost non-existent to over 400 mi. (643.7 km) in the certain areas, such as the Arctic shelf of Siberia (Pickard and Emery 1990). The average width of the continental shelf is approximately 40 mi. (64.4 km), and at the termination of the shelf, referred to as the shelf break, reaches a maximum depth of approximately 660 ft. (200 m) (Tomczak and Godfrey 2003a; United Nations Educational Scientific and Cultural Organization 2009b).



Source: U.S.Department of the Navy 2007

Figure 3.0-2: Three-Dimensional Representation of the Intertidal Zone (Shoreline), Continental Margin, Abyssal Zone, and Water Column Zones

The continental slope begins at the shelf break, which is defined by a dramatic increase in the seaward gradient of the seafloor to approximately 4 degrees (Pickard and Emery 1990). The continental slope extends to an average depth of approximately 9,800 ft. (2,987.04 m) and terminates at the continental rise, where the seafloor gradient decreases to approximately 0.3 degrees (Neumann and Pierson 1966). The continental rise extends from the base of the continental slope to a depth of approximately 13,000 ft. (3,962.4 m) and terminates at the abyssal zone or deep sea bottom. Just as on land, there are flat plains, valleys, and mountains in the abyssal zone. Depths are approximately 19,600 ft. (5,974.08 m) (Pickard and Emery 1990). Abyssal zones in the Pacific Ocean reach depths greater than 26,000 ft. (7,924.8 m).

The pelagic zone describes the water column extending from the intertidal zone seaward and from the water's surface to the seafloor (Figure 3.0-2). An important component of the pelagic zone to marine life in nearshore and oceanic waters is the photic zone. The photic zone is defined by the depth within the water column to which light penetrates. In the clearest oceanic water light that is sufficient for photosynthesis will penetrate up to 656 ft. (200.05 m) (Pickard and Emery 1990).

Bathymetric features associated with the continental margin and the deep seafloor of the Study Area include submarine canyons, volcanic islands, atolls, seamounts (underwater mountains), trenches, ridges, and plateaus.

3.0.3.2.1 Bathymetry of the Hawaii Range Complex

In the open ocean areas of the Hawaii Range Complex, bathymetric features include the Hess Rise, a large plateau that occurs to the east of the Hawaii Emperor Seamount Chain, and the Shatsky Rise, a plateau that occurs to the west of the Hawaii Emperor Seamount Chain (Nemoto and Kroenke 1981) (Figure 3.0-3). The Emperor Trough and numerous fracture zones, including the Mendocino Fracture Zone, are found within this region of the North Pacific Subtropical Gyre (Nemoto and Kroenke 1981).

Figure 3.0-3: Bathymetry of the Hawaiian Islands

In the Insular Pacific-Hawaiian Large Marine Ecosystem, bathymetric features are dominated by the Hawaiian Archipelago. Formed from volcanic eruptions, the Hawaiian Archipelago does not have a continental shelf. The Hawaiian Archipelago is composed of high islands, reefs, banks (continental shelf underwater elevation), atolls (coral reef islands surrounding a shallow lagoon), and seamounts (deep sea floor underwater mountains) (Polovina et al. 1995; Rooney et al. 2008). Other major bathymetric features in this region include submarine canyons, which reach depths greater than 6,560 ft. (2,000 m). have been identified off of Nihoa Island and Maro Reef, off of Oahu and Molokai islands (Vetter et al. 2010) and off of Hawaii and Kauai islands.

3.0.3.2.2 Bathymetry of the Southern California Range Complex

Bathymetric features of the California Current Large Marine Ecosystem and the Southern California portion of the Study Area include a continental shelf, a continental slope, a rise, and a deep seafloor (Figure 3.0-4). The continental shelf off of Southern California is associated with a borderland, a broad irregular region that extends seaward of the continental shelf (Gorsline 1992; Tomczak and Godfrey 2003b; United Nations Educational Scientific and Cultural Organization 2009a). The continental shelf extends from the shore to depths of approximately 655 ft. (200 m) (Tomczak and Godfrey 2003b; United Nations Educational Scientific and Cultural Organization 2009a). The continental slope, beginning at the shelf break, descends steeply to seafloor. The continental slope is divided into the upper slope (655-2,625 ft. [200–800 m]), which is adjacent to the shelf break, the mid-slope (2,625–4,590 ft. [800-1,400 m]), and the lower slope (4,590–13,125 ft. [1,400–4,000 m]). Beyond the lower slope is a relatively flat or gently sloping abyssal plain, typically at depths between 11,480 ft. (3,500 m) and 21,325 ft. (6,500 m). Bathymetric features associated with the shelf and slope include elevated banks, seamounts, and steep ridges (Gorsline 1992).

The shape of California's coastline south of Point Conception creates a broad ocean embayment known as the Southern California Bight (National Research Council 1990). The Southern California Bight encompasses the area from Point Conception south into Mexico, including the Channel Islands. The Channel Islands archipelago is composed of eight volcanic islands that are located along the coastline of Southern California (Moody 2000). The southernmost islands that occur in the Study Area include San Nicolas, Santa Catalina, and San Clemente islands, which are located off of California between Ventura and Los Angeles County (Moody 2000). Bottom topography in the Southern California Bight varies from broad expanses of continental shelf to deep basins (National Research Council 1990). Southwest of the Channel Islands lies the Patton Escarpment, a steep ridge with contours bearing in a northwesterly direction (Uchupi and Emery 1963). This ridge drops approximately 4,900 ft. (1,500 m) to the deep ocean floor. Between the Patton Escarpment and the mainland lie the Santa Rosa Cortes Ridge, deep shelf basins (e.g., Catalina, San Clemente, East Cortes, West Cortes, San Nicolas, and Tanner); two important channels (Santa Barbara and San Pedro); and a series of escarpments, canyons, banks, and seamounts (e.g., Cortes Bank, Tanner Bank, 60 Mile Bank, Farnsworth Bank, and Lausen Sea Mount) (National Research Council 1990). Farther to the southwest, beyond Patton Escarpment, the only major bottom feature is the Westfall Seamount. To the south, along the coast of Baja California, lie several additional banks and basins.

Submarine canyons dissect the continental shelf, slope, and rise off of Southern California and in the Study Area. These underwater canyons transport sediments from the continental shelf and slope to the deep seafloor, producing distinct sediment fans at their base (Covault et al. 2007). Major submarine canyons the Study Area include the Coronado, La Jolla, Scripps, and Catalina.

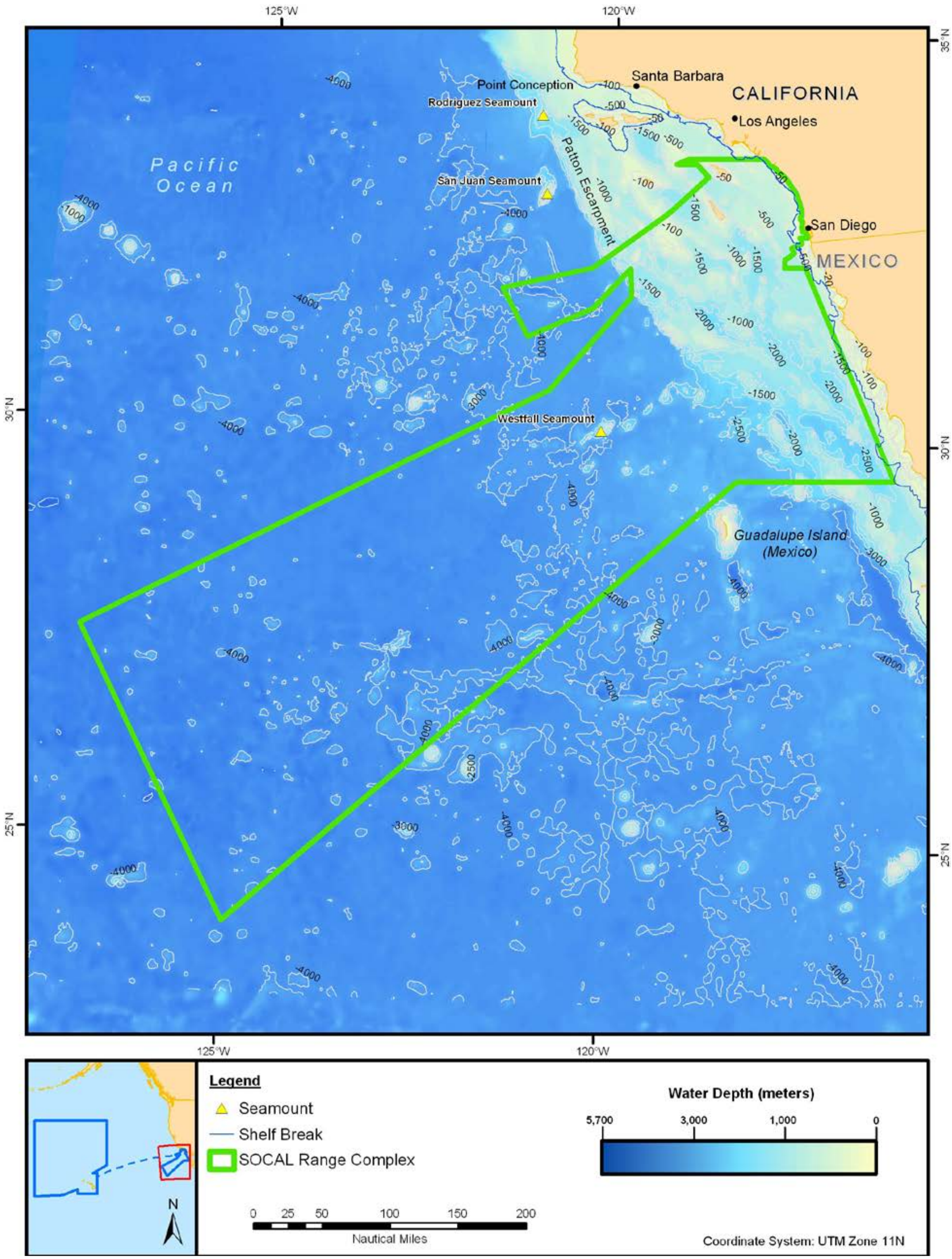


Figure 3.0-4: Bathymetry of the Southern California Range Complex

3.0.3.3 Currents, Circulation Patterns, and Water Masses

Ocean circulation in the Study Area is dominated by the clockwise motion of the North Pacific Subtropical Gyre (Tomczak and Godfrey 2003b). The North Pacific Subtropical Gyre occurs between the equator and 50° N and is bounded to the north by the North Pacific Current, to the east by the California Current, to the south by the North Equatorial Current, and to the west by the Kuroshio Current (Tomczak and Godfrey 2003b).

Surface currents are horizontal movements of water primarily driven by the drag of the wind over the sea surface. Wind-driven circulation dominates in the upper 330 ft. (100 m) of the water column and therefore drives circulation over continental shelves (Hunter et al. 2007). Surface currents of the Pacific Ocean include equatorial currents, circumpolar currents, eastern boundary, and western boundary currents. Major surface currents within the Study Area include the California Current, California Countercurrent, and the Southern California Eddy in the SOCAL OPAREA and the North Equatorial Current, North Hawaiian Ridge Current, and Hawaii Lee Current in the Hawaii OPAREA (Figure 3.0-5 and Figure 3.0-6).

Current speeds in the world's oceans vary widely. Currents flowing along the western boundaries of oceans are narrow, deep, and swift and have speeds exceeding 3 ft./s (1 m/s) (Pickard and Emery 1990). The western boundary current in the North Pacific is the Kuroshio Current which flows northward off the coast of Japan at an average speed of 3.3 to 5.0 ft./s (1.0 to 1.5 m/s). Eastern boundary currents, such as the California Current, are relatively shallow, broad, and slow-moving and travel toward the equator along the eastern boundaries of ocean basins. In general, eastern boundary currents carry cold waters from higher latitudes to lower latitudes, and western boundary currents carry warm waters from lower latitudes to higher latitudes (Reverdin et al. 2003).

Water masses throughout the world's oceans are defined by their chemical and physical properties. The temperature and salinity of a water mass determines its density. Density differences cause water masses to move both vertically and horizontally in relation to one another. Cold, salty, dense water formed at the surface will sink, whereas warm, less salty, and less dense water will rise. These density differences are responsible for large-scale, global ocean water circulation, which plays a major role in global climate variation and the transport of water, heat, nutrients, and larvae (Kawabe and Fujito 2010).

Thermohaline circulation—also describe as the ocean "conveyor belt" or meridional overturning—is the continuous circulation of water masses throughout the ocean. This cycle begins with the sinking of dense waters and the subsequent formation of deep water masses at the in the North Atlantic and Southern oceans (Dickson and Brown 1994). Deep water masses in the Study Area include Lower and Upper Circumpolar Deep Waters, Antarctic Circumpolar Current, and North Pacific Deep Water. Lower and Upper Circumpolar Deep Waters and Antarctic Intermediate Water are transported from the Antarctic Circumpolar Current to the North Pacific (Kawabe and Fujito 2010). The eastern branch of the Lower Circumpolar Deep Water flows eastward south of the Hawaiian Ridge. The western portion of the Lower Circumpolar Deep Water upwells and is transformed into North Pacific Deep Water. North Pacific Deep Water mixes with Upper Circumpolar Deep Waters around the Hawaiian Islands.

Intermediate water masses (residing above deep water and below surface water) in the Study Area include Pacific Intermediate Water, Pacific Central Water, and Antarctic Intermediate Water (Johnson 2008; Kawabe and Fujito 2010). Pacific Intermediate Water is formed in the northwest portion of the North Pacific Subtropical Gyre and is transported into the California Current Large Marine Ecosystem (Talley 1993).

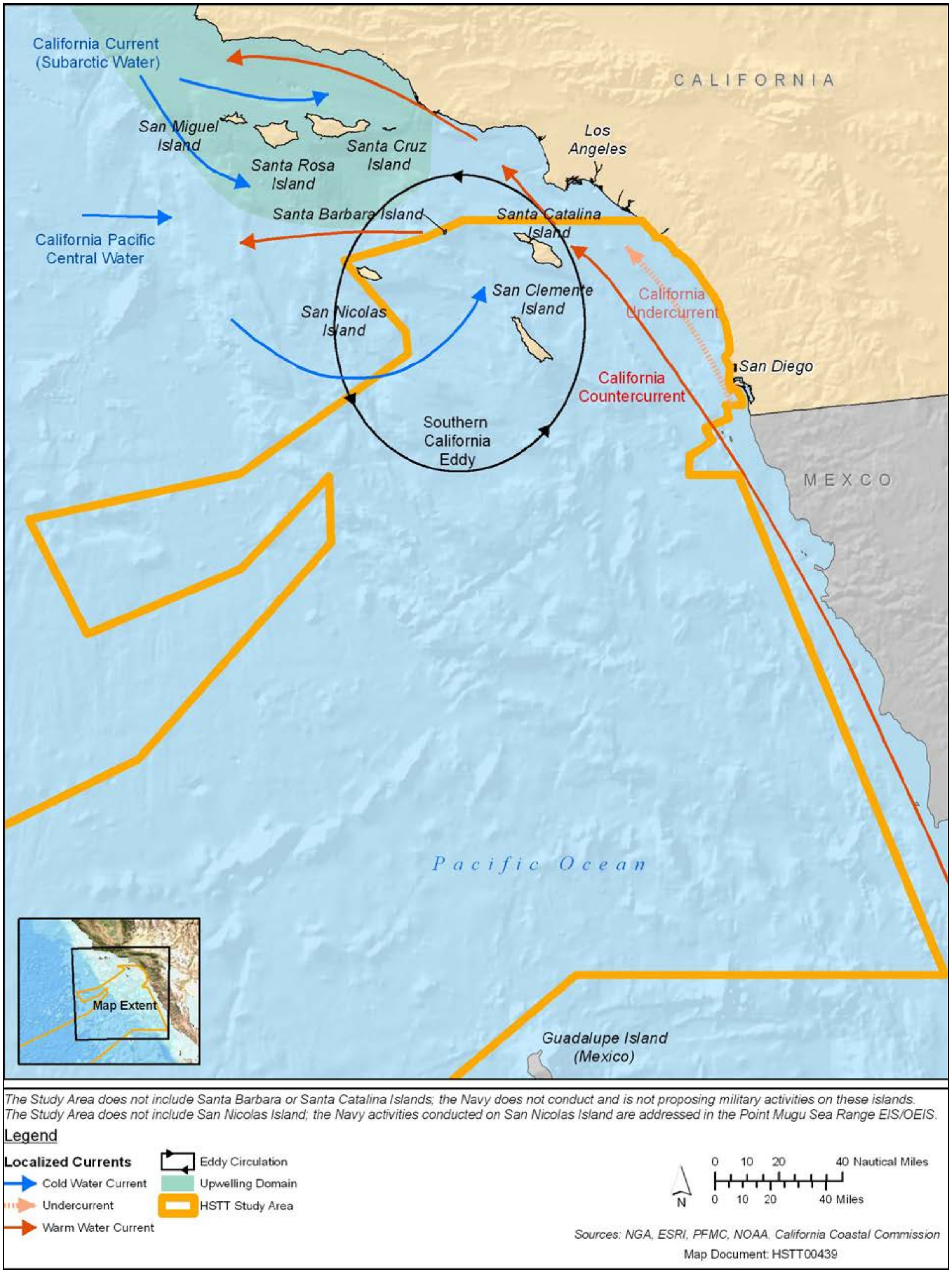


Figure 3.0-5: California Current and Countercurrent circulation in the Southern California Bight

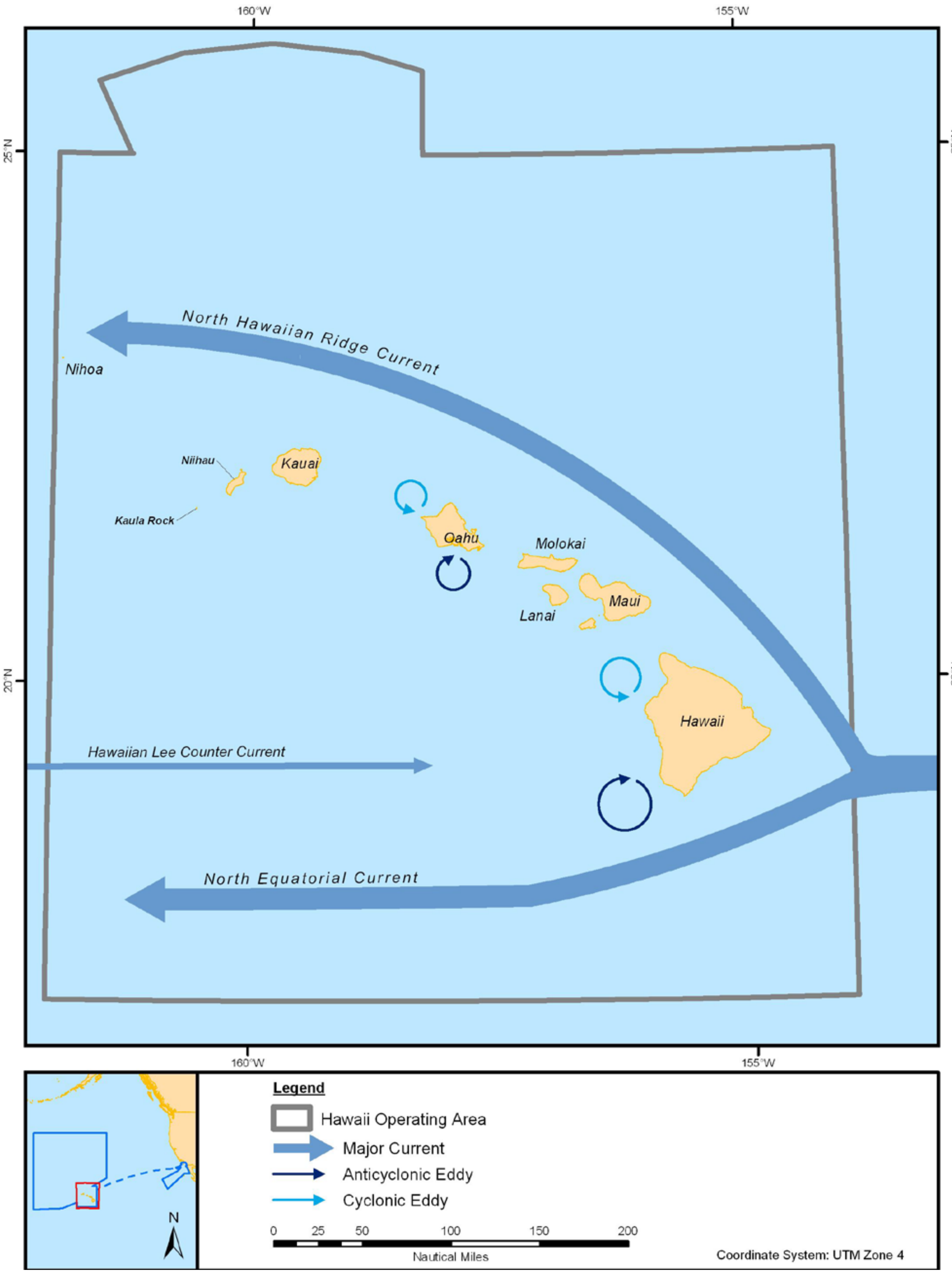


Figure 3.0-6: Surface circulation in the Hawaiian Islands

3.0.3.3.1 North Pacific Transition Zone

The North Pacific Transition Zone is a convergence of the North Pacific Current, which forms the southern part of the North Pacific Subpolar Gyre (cold water), and the northern part of the North Pacific Subtropical Gyre (warm water). This convergence creates the Transition Zone Chlorophyll Front where cool, surface water with high concentrations of chlorophyll from the Alaska Gyre meets warm, low chlorophyll surface water from the North Pacific Subtropical Gyre (Polovina et al. 2001). Extending over 4,970 miles (mi.) (8,000 km) across the North Pacific, the Transition Zone Chlorophyll Front shifts seasonally north and south about 620 mi. (1,000 km). In the winter the front is located at about 30–35° N latitude. In the summer, the front is located at about 40–45° N. Satellite telemetry data on movements of loggerhead turtles and detailed fisheries data for albacore tuna show that both travel along this front as they migrate across the North Pacific (Howell et al. 2010; North Pacific Marine Science Organization 2004).

3.0.3.3.2 Currents, Circulation Patterns, and Water Masses of the Hawaii Range Complex

The Hawaii portion of the Study Area is influenced by the North Pacific Current, North Equatorial Current, North Hawaiian Ridge Current, and Hawaii Lee Current. The North Pacific Current is an eastward flowing current that forms the upper boundary of the North Pacific Subtropical Gyre (Tomczak and Godfrey 2003b). The North Pacific Current in the eastern North Pacific splits at approximately 45–50° N and forms the northward flowing Alaska Current and the southward flowing California Current. The North Equatorial Current is a westward flowing current that splits at the Hawaiian Islands; one branch travels north along the Hawaiian Ridge to form the North Hawaiian Ridge Current (Itano and Holland 2000). The North Hawaiian Ridge Current turns and continues westward at the tip of the Hawaiian Ridge (Qiu et al. 1997). The Hawaiian Lee Current occurs on the west side of the Hawaiian Islands and travels east toward the Islands (Chavanne et al. 2002). As the Hawaiian Lee Current approaches the Hawaiian Islands, it appears to form a counterclockwise gyre centered at 20.5° N and a clockwise gyre centered at 19° N (Chavanne et al. 2002; Flament et al. 2009). The latter, clockwise gyre merges with the North Equatorial Current in the south (Chavanne et al. 2002; Flament et al. 2009). The North Equatorial Current is primarily driven by the northeast and southeast trade winds and therefore flows westward (see Figure 3.0-6). This current is strongest during winter, particularly in February when the trade winds are also the strongest. The North Equatorial Current flows between 8° N and 15° N with an average velocity less than 1.0 ft. per second (0.3 m per second) (Tomczak and Godfrey 2003b; Wolanski et al. 2003). The North Equatorial Current splits at the Hawaiian Islands; one branch travels north and the other continues west. The westward flowing branch of the North Equatorial Current approaches Japan and splits again, forming the southward flowing Mindanao Current and the northward flowing Kuroshio Current.

3.0.3.3.3 Currents, Circulation Patterns, and Water Masses of the Southern California Range Complex

The Southern California portion of the Study Area is dominated by the California Current System. The California Current System includes four major currents: the California Current, the California Undercurrent, the Southern California Countercurrent, and the Southern California Eddy (Batteen et al. 2003). The California Current flows south along the coasts of Washington, Oregon, California, and the Baja Peninsula, where it joins the North Pacific Subtropical Gyre via the westward flowing North Equatorial Current (Bograd 2004). The California Current flows south, about 621 mi. (1,000 km) offshore, along the entire coast of California (Batteen et al. 2003), and carries cold, low salinity water with high dissolved oxygen and high nutrient concentrations southward (Gelpi and Norris 2008; Tomczak and

Godfrey 2003b). The California Current flows parallel to the continental borderland along Southern California at an average current speed of 0.49 ft./s (0.15 m/s) (Hickey 1992).

Winds off the California Coast that blow towards the equator are redirected offshore (to the west) by the earth's rotation. The westerly winds force surface waters along the coast farther offshore, creating a lower sea surface height, which results in a pressure gradient that directs current flow toward the equator (Tomczak and Godfrey 2003b). Furthermore, as coastal waters are pushed offshore, upwelling results as the water at the surface is replaced from below by colder, subsurface water. Upwelling of deep water brings nutrients to the surface, enhancing primary production along the coast of California. However, the intensity of regional upwelling is affected by seasonal variability in wind direction and strength. Winds are strongest from May to June in waters off Southern California (Reid et al. 1958). During winter, the winds from the north weaken, surface waters are not pushed as far offshore, upwelling is reduced, and the circulation in the region is dominated by the Southern California Eddy and the Southern California Countercurrent (Batteen et al. 2003; Gelpi and Norris 2008; Reid et al. 1958). The Southern California Countercurrent flows northward, inshore of the California Current, carrying warm, saline water with low dissolved oxygen and low nutrient concentrations into the Study Area (Hickey 1992). During fall and winter, a portion of the Southern California Countercurrent continues north, past Point Conception, forming the Davidson Current (Batteen et al. 2003); however, the majority of the Southern California Countercurrent is entrained in the Southern California Eddy.

The Southern California Eddy is a semi-permanent counterclockwise gyre (Di Lorenzo 2003; Dorman 1982) formed as the trade winds act on the California Current and the California Countercurrent. Maximum strength of the eddy occurs in summer and fall when winds from the north are weak and the strength of the California Countercurrent is therefore greatest (Di Lorenzo 2003). Persistent upwelling of nutrient rich waters also occurs at the center of the gyre and results in enhanced primary production (Bograd et al. 2000). The California Current System is among the most productive areas in the world.

The California Undercurrent is a deep water current that flows northward along the entire coast of California. The strength of the Californian Undercurrent varies throughout the year, with peaks during summer and early fall. The current is typically at its weakest in spring and early summer (flow at depth may occasionally reverse and move south). The Californian Undercurrent flows inshore of the California Current (Gay and Chereskin 2009), and at times may surface and combine with the California Counter Current to form the Davidson Current north of Point Conception. The California Undercurrent is composed of Pacific Equatorial Water and is therefore characterized by warm, salty, and nutrient poor water (Gay and Chereskin 2009). The warm, salty waters of the California Undercurrent flow at about 328 ft. (100 m) beneath the cold, nutrient rich waters of the California Current (Lynn et al. 2003) (National Research Council 1990, 1992).

The Subarctic Pacific water mass that occurs off Southern California includes the North Pacific Intermediate Water that is characterized as cold, low salinity, nutrient rich water (Blanton and Pattullo 1970; North Pacific Marine Science Organization 2004; Talley 1993). Subarctic waters bring nutrients including nitrate, phosphate, and silica to Southern California (Bograd 2004). Nitrogen and phosphorus are required by phytoplankton (small floating plants) for photosynthesis (Loh and Bauer 2000). Photosynthesis is the production of chemical compounds into energy from sunlight. Therefore, these intrusions result in increases in phytoplankton densities and therefore enhance the rate at which organic matter is produced from the sun's energy (primary production) (Bograd 2004).

3.0.3.4 Oceanic Fronts

Similar to cold fronts and warm fronts in the atmosphere that signal an abrupt change in the weather, an oceanic front is the boundary between two water masses with distinct differences in temperature and salinity (i.e., density). An oceanic front is characterized by rapid changes in water properties over a short distance.

The Hawaii portion of the Study Area is influenced by the Subarctic Front and Subtropical Front (Norcross et al. 2003; North Pacific Marine Science Organization 2004). The Subarctic Frontal Zone is at the northern boundary of the North Pacific Current and is located between 40° N and 43° N (North Pacific Marine Science Organization 2004). The Subarctic Front develops between the cold, low salinity, productive subarctic waters in the north and the low nutrient subtropical waters of the central Pacific (Howell et al. 2010; North Pacific Marine Science Organization 2004). The Subtropical Frontal Zone occurs between the cold, low salinity surface waters of the north and the warm, higher salinity subtropical waters from the south (North Pacific Marine Science Organization 2004).

The Southern California portion of the Study Area is influenced by the Ensenada Front formed by the convergence of equatorial waters and waters of the California Current (Figure 3.0-5) (Venrick 2000). The Ensenada Front is a broad zone where sharp gradients in temperature, salinities, and nutrient concentrations occur as these waters meet. The Ensenada front appears between Point Conception and Punta Vizcaino, Mexico and is present in the Study Area throughout most of the year. This front marks the boundary between the low nutrient waters to the south and the high nutrient, highly productive waters to the north (Santamaria-del-Angel et al. 2002). Therefore, this front is associated with a distinct species boundary between southern warm water species and northern cold water species (Chereskin and Niiler 1994).

3.0.3.5 Water Column Characteristics and Processes

Seawater is made up of a number of components including gases, salts, nutrients, dissolved compounds, particulate matter (solid compounds such as sand, marine organisms, and feces), and trace metals (Garrison 1998). Seawater characteristics are primarily determined by temperature and the gases and solids dissolved in it.

Sea surface temperature varies considerably across the Pacific Ocean (see Figure 3.0-7 and Figure 3.0-8), from season to season and from day to night. Sea surface temperatures are affected by atmospheric conditions, and can show seasonal variation in association with upwelling, climatic conditions, and latitude (Tomczak and Godfrey 2003b). Annual average sea surface temperatures increase from north to south in the North Pacific Subtropical Gyre (Flament et al. 2009) (Figure 3.0-8).

In the Hawaii open ocean portion of the Study Area, sea surface temperature ranges from 47° Fahrenheit (F) (8° Celsius [C]) in the North Pacific Current to 86°F (30°C) in the North Pacific Subtropical Gyre (United Nations Educational Scientific and Cultural Organization 2009a) (Table 3.0-4). In the inland and open ocean Southern California portions of the Study Area, sea surface temperature ranges from approximately 54°F (12°C) in winter to 70°F (21°C) in summer (Bograd et al. 2000). The coldest sea surface temperatures typically occur in February, while the warmest temperatures typically occur in September.

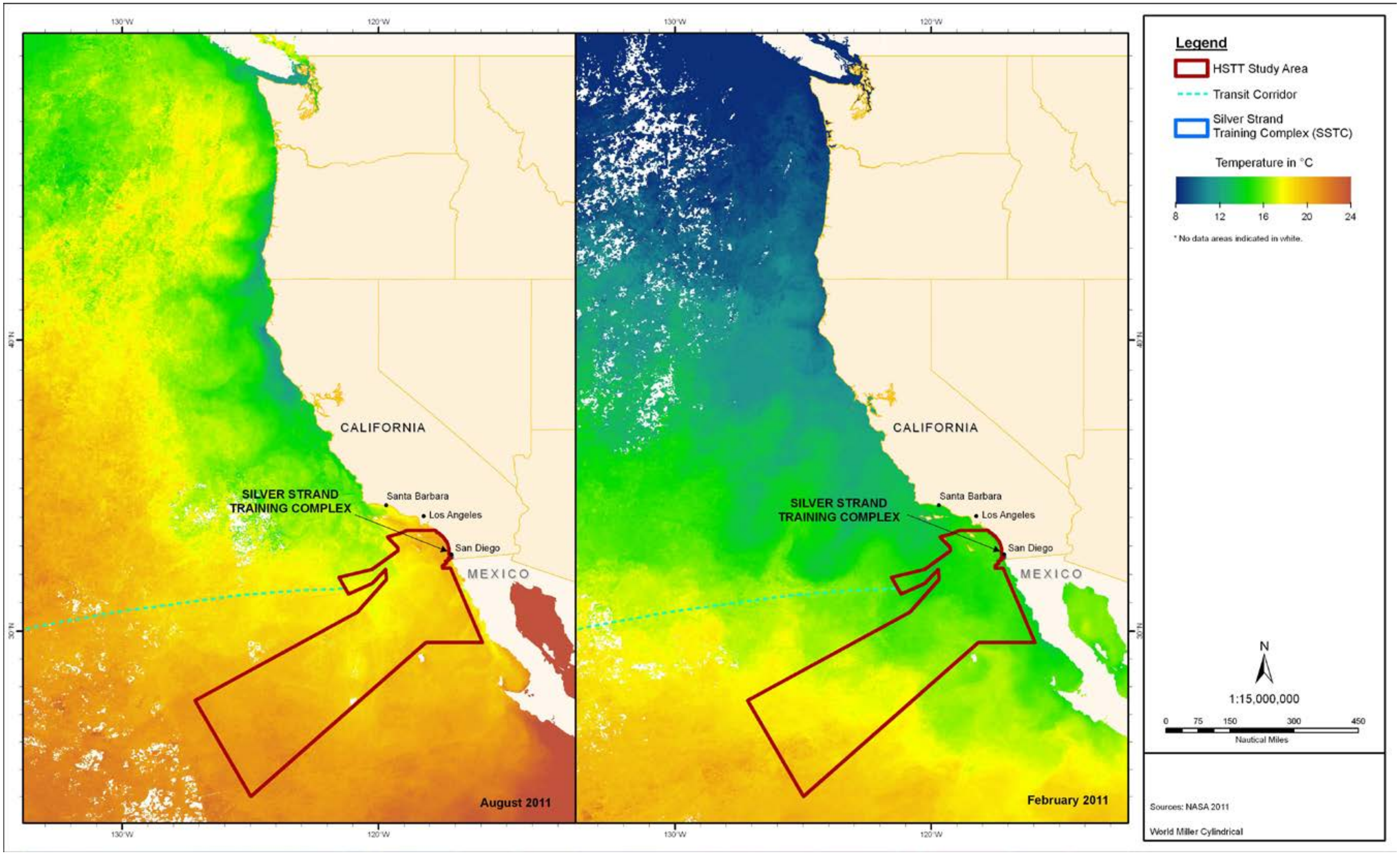
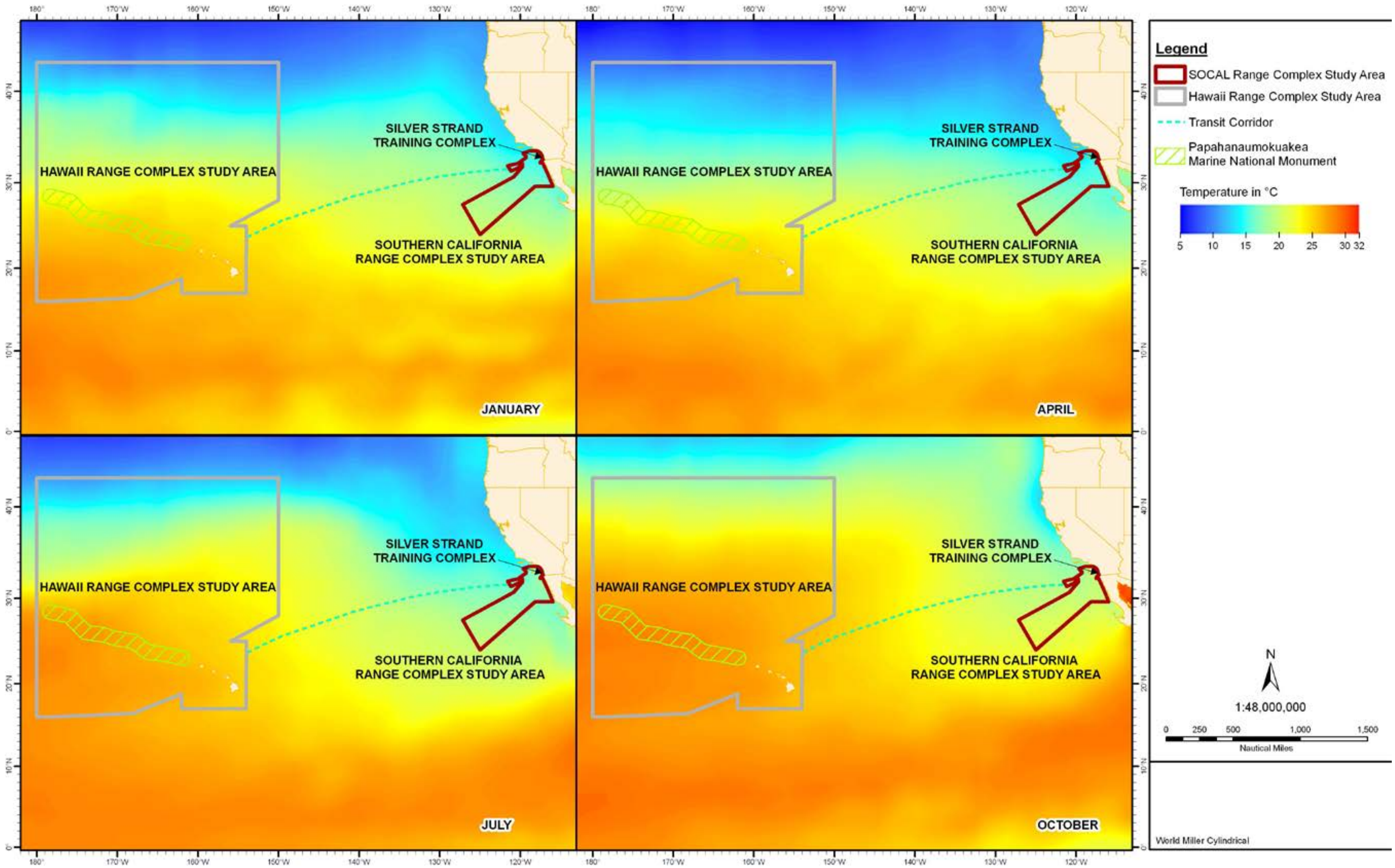


Figure 3.0-7: Sea Surface Temperature Showing the Seasonal Variation in the Convergence of the Cold California Current and Warm Equatorial Waters



Source: University of Miami Rosenstiel School of Marine and Atmospheric Science and National Oceanic and Atmospheric Administration 2007

Figure 3.0-8: Sea Surface Temperature in the Study Area

Table 3.0-4: Sea Surface Temperature Range for Large Marine Ecosystems and Open Ocean Areas of the Study Area

Region	Longitude	Latitude	Sea Surface Temperature °F (°C)
Large Marine Ecosystem			
California Current Large Marine Ecosystem	137° W–117° W	25° N–49° N	69–51 (21–11)
Insular Pacific-Hawaiian Large Marine Ecosystem	180° W–155° W	19° N–30° N	86–77 (30–25)
Open Ocean			
North Pacific Transition Zone	130° E–150° W	32° N–42° N	71–47 (22–8)
North Pacific Subtropical Gyre	130° E–150° W	6° N–37° N	85–64 (29–18)

Notes: ° = degree, F = Fahrenheit, C = Celsius, W = West, N = North, E = East

Sea surface temperature and nutrients are also influenced by long-term climatic conditions including El Niño, La Niña, the Pacific Decadal Oscillation, and climate change. The recurring El Niño pattern is one of the strongest in the ocean atmosphere system (Gergis and Fowler 2009). El Niño events result in significantly warmer water in the tropical Pacific. Upwelling of cold nutrient rich water along the coasts of North and South America is drastically reduced. La Niña is the companion phase of El Niño. La Niña events are characterized by stronger than average easterly trade winds that push the warm surface waters of the tropical Pacific to the west and enhance upwelling along the eastern Pacific coastline (Bograd et al. 2000). The Pacific Decadal Oscillation is a long-term climatic pattern with alternating warm and cool phases (Mantua and Hare 2002; Polovina et al. 1994). Every 20 to 30 years, the surface waters of the central and northern Pacific Ocean (20° N and poleward) shift several degrees from their average temperature. This oscillation affects primary production in the eastern Pacific Ocean and, consequently, affects organism abundance and distribution throughout the food chain.

The Hawaii portion of the Study Area experiences El Niño events that result in decreased annual rainfall and increased sea surface temperature (Fletcher et al. 2002). The 10 driest years on record for the Hawaiian Islands are all associated with El Niño years. Coral bleaching events throughout the Hawaiian archipelago have been associated with El Niño events (Goreau and Hayes 1994). Coral bleaching is triggered by abnormally high sea surface temperatures which cause corals to lose their symbiotic (close association) algae which are what make corals colorful. Increased sea surface temperature resulting from climate change is now threatening coral reefs around the world (Spalding et al. 2007). During a La Niña event, conditions in the central Pacific can change. Typically, the trade winds strengthen, coastal upwelling and primary productivity increase, and populations of cold water fishes increase.

The Southern California portion of the Study Area experiences considerable changes during El Niño and La Niña events (Barber and Chavez 1983; Hayward 2000; Millán-Núñez et al. 1997). During an El Niño event, atmospheric temperatures increase along with corresponding increases in coastal rainfall, local sea level, sea surface temperature, the strength of the California Countercurrent, and local populations of warm water fishes. Concurrently, the trade winds weaken, upwelling and primary production decrease, and local kelp beds are severely impacted (Allen et al. 2002; Barber and Chavez 1983; Barber et al. 1985; Hayward 2000; Leet et al. 2001). During a La Niña event, opposite climactic patterns emerge. The trade winds strengthen, coastal upwelling and primary productivity increase, the California Current strengthens, and populations of cold water fishes increase. At the same time, a decrease in coastal rainfall (drought-like conditions) and a decline in local sea level and sea surface temperatures are observed (Bograd et al. 2000).

Seawater is primarily composed of dissolved salts. Chlorine, sodium, calcium, potassium, magnesium, and sulfate make up 98 percent of the solids in seawater, with chloride and sodium making up 85 percent of that total (Garrison 1998). Sea surface salinity within the Study Area ranges from 33 to 35 parts per thousand (National Oceanic and Atmospheric Administration 2009; United Nations Educational Scientific and Cultural Organization 2009a). Within the North Pacific Subtropical Gyre and the North Pacific Current as they relate to the Hawaii portion of the Study Area, salinities decrease from north to south (Flament et al. 2009) and range from 34 to 35 parts per thousand; and in the Southern California portion of the Study Area salinities are about 33 parts per thousand (National Oceanic and Atmospheric Administration 2009).

The density of seawater varies with salinity and temperature (Libes 1992), which leads to stratification (arranged in layers). There are typically 3 density layers in the water column of the ocean: a surface layer (0–655 ft. [0–200 m]), an intermediate layer (655–4,920 ft. [200–1,500 m]), and a deep layer (below 4,920 ft. [1,500 m]) (Castro and Huber 2007).

Nutrients are chemicals or elements necessary to produce organic matter. Basic nutrients include dissolved nitrogen, phosphates, and silicates. Dissolved inorganic nitrogen occurs in ocean water as nitrates, nitrites, and ammonia, with nitrates as the dominant form. The nitrate concentration of the coastal waters within the Hawaii portion of the Study Area varies are low ranging from approximately 0.1 to 0.4 parts per billion (0.1 to 0.4 micrograms per liter) with nitrate depletion occurring during the summer months down to depths of 820 ft. (250 m) (Johnson et al. 2010). The nitrate concentration of the coastal waters within the Southern California portion of Study Area varies annually from 0.1 to 10.0 parts per billion (0.1 to 10.0 micrograms per liter). The lowest concentrations typically occur in summer. At a depth of 33 ft. (10 m), concentrations of phosphate and silicate in the California Current typically range from 0.25 to 1.25 parts per billion (0.25 to 1.25 micrograms per liter) and 2 to 15 parts per billion (2 to 15 micrograms per liter), respectively (Barber et al. 1985).

The availability of iron affects primary production in the marine environment. Iron is introduced to the marine environment primarily by rivers and wind driven transport from continents, and from volcanic eruptions (Langmann et al. 2010). Iron is a limiting factor for growth of phytoplankton in high nutrient, low chlorophyll surface water, including surface waters of the north and equatorial Pacific Ocean (Coale et al. 1998; Coale et al. 1996; Martin and Gordon 1988). Increases in iron concentrations also increases nitrogen fixation (see Section 3.0.3.6 for an explanation of nitrogen fixation) (Krishnamurthy et al. 2009).

3.0.4 ACOUSTIC AND EXPLOSIVES PRIMER

This section introduces basic acoustic principles and terminology describing how sound travels or “propagates” in air and water. These terms and concepts are used when analyzing potential impacts due to acoustic sources and explosives used during naval training and testing. This section briefly explains the transmission of sound; introduces some of the basic mathematical formulas used to describe the transmission of sound; and defines acoustical terms, abbreviations, and units of measurement. Because seawater is a very efficient medium for the transmission of sound, the differences between transmission of sound in water and in air are discussed. Finally, it discusses the various sources of underwater sound, including physical, biological, and anthropogenic sounds.

3.0.4.1 Terminology/Glossary

Sound is an oscillation in pressure, particle displacement, or particle velocity, as well as the auditory sensation evoked by these oscillations, although not all sound waves evoke an auditory sensation (i.e., they are outside of an animal's hearing range) (American National Standards Institute 1994). Sound may be described in terms of both physical and subjective attributes. Physical attributes may be directly measured. Subjective (or sensory) attributes cannot be directly measured and require a listener to make a judgment about the sound. Physical attributes of a sound at a particular point are obtained by measuring pressure changes as sound waves pass. The following material provides a short description of some of the basic parameters of sound.

3.0.4.1.1 Particle Motion and Sound Pressure

Sound is produced when a medium (air or water in this analysis) is set into motion, often by a vibrating object within the medium. As the object vibrates, its motion is transmitted to adjacent particles of the medium. The motion of these particles is transmitted to adjacent particles, and so on. As the sound wave travels through the medium, the individual particles of the medium oscillate about their original positions but do not actually move with the sound wave. The result is a mechanical disturbance (the "sound wave") that propagates away from the source. The measurable properties of a sound are the pressure oscillations of the sound wave and the velocity, displacement amplitude, and direction of particle movements. The basic unit of sound pressure is the Pascal (Pa) (1 Pa = 1.45×10^{-4} pounds per square inch), although the most commonly encountered unit is the micro Pascal (µPa) (1 µPa = 1×10^{-6} Pa).

Animals with an eardrum or similar structure directly detect the pressure component of sound. Some marine fish also have specializations to detect pressure changes. Certain animals (e.g., most invertebrates and some marine fish) likely cannot detect sound pressure, only the particle motion component of sound. Because particle motion is most detectable near a sound source and at lower frequencies, this difference in acoustic energy sensing mechanisms limits the range at which these animals can detect most sound sources analyzed in this document.

3.0.4.1.2 Frequency

The number of oscillations or waves per second is called the frequency of the sound, and the metric is Hertz (Hz). One Hz is equal to one oscillation per second, and 1 kilohertz (kHz) is equal to 1,000 oscillations per second. The inverse of the frequency is the period or duration of one acoustic wave.

Frequency is the physical attribute most closely associated with the subjective attribute "pitch"; the higher the frequency, the higher the pitch. Human hearing generally spans the frequency range from 20 Hz to 20 kHz. The pitch based on these frequencies is subjectively "low" (at 20 Hz) or "high" (at 20 kHz).

Pure tones have a constant, single frequency. Complex tones contain multiple, discrete frequencies, rather than a single frequency. Broadband sounds are spread across many frequencies. The frequency range of a sound is called its bandwidth. A harmonic of a sound at a particular frequency is a multiple of that frequency (e.g., harmonic frequencies of a 2 kHz tone are 4 kHz, 6 kHz, 8 kHz, etc.). A source operating at a nominal frequency may emit several harmonic frequencies at much lower sound pressure levels.

In this document, sounds are generally described as either low- (less than 1 kHz), mid- (1 kHz - 10 kHz), high- (greater than 10 kHz - 100 kHz), or very high- (greater than 100 kHz and less than 200 kHz) frequency. Hearing ranges of marine animals (e.g., fish, birds, and marine mammals) are quite varied and are species-dependent. For example, some fish can hear sounds below 100 Hz and some species of marine mammals have hearing capabilities that extend above 100 kHz. Discussions of sound and potential impacts must therefore focus not only on the sound pressure, but the composite frequency of the noise and the species considered.

3.0.4.1.3 Duty Cycle

Duty cycle describes the portion of time that a sound source actually generates sound. It is defined as the percentage of the time during which a sound is generated over a total operational period. For example, if a sound navigation and ranging (sonar) source produces a 10-second ping once every 100 seconds, the duty cycle is 10 percent. Duty cycles vary among different acoustic sources; in general, a low duty cycle is 20 percent or less and a high duty cycle is 80 percent or higher.

3.0.4.1.4 Categories of Sound

3.0.4.1.4.1 Signal Versus Noise

When sound is purposely created to convey information, communicate, or obtain information about the environment, it is often referred to as a signal. Examples of sounds that could be considered signals are sonar pings, marine mammal vocalizations/echolocations, tones used in hearing experiments, and small sonobuoy explosions used for submarine detection.

Noise is undesired sound (American National Standards Institute 1994). Sounds produced by naval aircraft and vessel propulsion are considered noise because they represent possible inefficiencies and increased detectability, which are undesirable. Whether a sound is noise often depends on the receiver (i.e., the animal or system that detects the sound). For example, small explosives and sonar used to generate sounds that can locate an enemy submarine produce *signals* that are useful to sailors engaged in anti-submarine warfare, but are assumed to be *noise* when detected by marine mammals.

Noise also refers to all sound sources that may interfere with detection of a signal (background noise) and the combination of all of the sounds at a particular location (ambient noise) (American National Standards Institute 1994).

3.0.4.1.4.2 Impulsive versus Non-Impulsive Sounds

Although no standard definitions exist, sounds may be broadly categorized as impulsive or non-impulsive. Impulsive sounds feature a very rapid increase to high pressures, followed by a rapid return to the static pressure. Impulsive sounds are often produced by processes involving a rapid release of energy or mechanical impacts (Hamernik and Hsueh 1991). Explosions, airgun detonations, and impact pile driving are examples of impulsive sound sources analyzed in this document. Non-impulsive sounds lack the rapid rise time and can have longer durations than impulsive sounds. Non-impulsive sound can be continuous or intermittent. Sonar pings, vessel noise, and underwater transponders are all examples of non-impulsive sound sources analyzed in this document.

3.0.4.1.4.3 Explosive Detonations

An explosive detonation generates a high-speed shock wave that rises almost instantaneously to a maximum pressure, and then rapidly decays. At the instant of explosion, gas is instantaneously generated at high pressure and temperature, creating a bubble. In addition, the heat causes a certain amount of water to vaporize, adding to the volume of the bubble. This action immediately begins to force the water in contact with the blast front in an outward direction creating an intense pressure wave. This shock wave passes into the surrounding medium and travels faster than the speed of sound. The near-instantaneous rise from ambient to high pressures is what makes the shock wave potentially damaging. As the high pressure wave travels away from the source, it begins to slow and act like an acoustic wave similar to other impulsive sources that lack the strong shock wave (e.g., airguns). Energy associated with the blast is also transmitted into the surrounding medium as acoustic waves.

The peak pressure experienced by a receptor (i.e., an animal) is a function of the explosive material, the net explosive weight (the equivalent explosive energy expressed in weight of trinitrotoluene [TNT]), and the distance from the charge. The peak pressure is higher for larger charge weights at a given distance and decreases for increasing distances from a given charge. In general, shock wave effects near an explosive charge increase in proportion to the cube root of the explosive weight (Young 1991). For example, shock wave impacts will double when the explosive charge weight is increased by a factor of eight (i.e., cube root of eight equals two).

If the detonation occurs underwater, and is not near the surface, gases released during the explosive chemical reaction form a bubble that pulsates as the gases expand and contract. These bubble pulsations create pressure waves that are weaker than the original shock wave but can still be damaging. If the detonation occurs at or just below the surface, a portion of the explosive power is released into the air and a pulsating gas bubble is not formed.

The detonation depth of an explosive is important because of the propagation effect known as surface-image interference. For underwater explosions near the sea surface, a distinct interference pattern arises from reflection from the water's surface. As the source depth or the source frequency decreases, these two paths increasingly, destructively interfere with each other, reaching total cancellation at the surface (barring surface reflection scattering loss). This effect can significantly reduce the peak pressures experienced near the water surface.

3.0.4.2 Sound Metrics

3.0.4.2.1 Pressure

Various sound pressure metrics are illustrated in Figure 3.0-9 for a hypothetical (a) pure tone (non-impulsive), and (b) an impulsive sound. Sound pressure varies differently with time for non-impulsive and impulsive sounds. As shown in the figure, the non-impulsive sound has a relatively gradual rise in pressure from static pressure (the ambient pressure without the added sound), while the impulsive sound has a near-instantaneous rise to a higher peak pressure. The peak pressure shown on both illustrations is the maximum absolute value of the instantaneous sound pressure during a specified time interval, which accounts for the values of peak pressures below the static pressure (American National Standards Institute 1994). Peak-to-peak pressure is the difference between the maximum and minimum sound pressures. The root-mean-squared sound pressure is often used to describe the average pressure level of sounds. As the name suggests, this method takes the square root of the average squared sound pressure values over a time interval. The duration of this time interval can have a strong effect on the measured root-mean-squared sound pressure for a given sound, especially where pressure levels vary significantly, as during an impulse. If the analysis duration includes a significant portion of the waveform after the impulse has ended and the pressure has returned to near static, the root-mean-squared level would be relatively low. If the analysis duration includes the highest pressures of the impulse and excludes the portion of the waveform after the impulse has terminated, the root-mean-squared level would be comparatively high. For this reason, it is important to specify the duration used to calculate the root-mean-squared pressure for impulsive sounds.

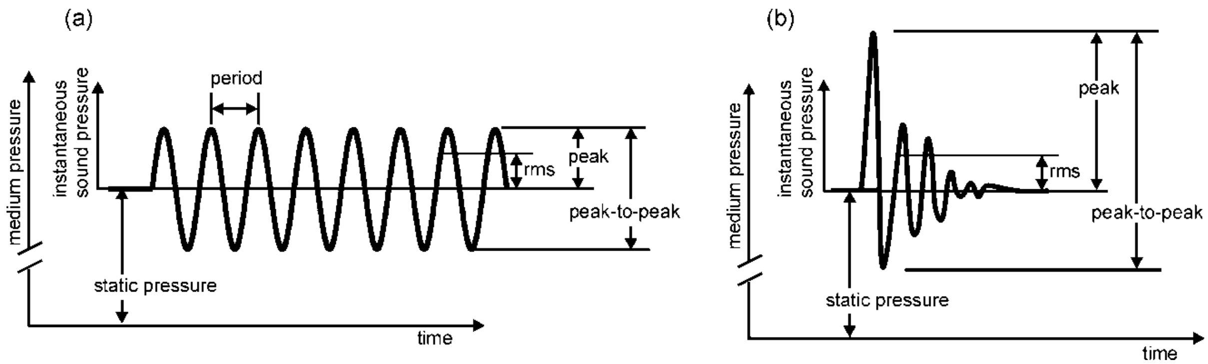


Figure 3.0-9: Various Sound Pressure Metrics for a Hypothetical (a) Pure Tone (Non-Impulsive) and (b) Impulsive Sound

3.0.4.2.1.1 Sound Pressure Level

Because mammalian ears can detect large pressure ranges and humans judge the relative loudness of sounds by the ratio of the sound pressures (a logarithmic behavior), sound pressure level is described by taking the logarithm of the ratio of the sound pressure to a reference pressure (American National Standards Institute 1994). Use of a logarithmic scale compresses the wide range of pressure values into a more usable numerical scale.

Sound levels are normally expressed in decibels (dB). To express a pressure X in decibels using a reference pressure X_{ref}, the equation is:

$$20\log_{10}\left(\frac{X}{X_{ref}}\right)$$

The pressure X is the root-mean-square value of the pressure. When a value is presented in decibels, it is important to specify the value and units of the reference pressure. Normally the decibel value is given, followed by the text "re," meaning "with reference to," and the value and unit of the reference pressure. The standard reference pressures are 1 µPa for water and 20 µPa for air (American National Standards Institute 1994). It is important to note that, because of the difference in reference units between air and water, the same absolute pressures would result in different decibel values for each medium.

3.0.4.2.1.2 Sound Exposure Level

When analyzing effects on marine animals from multiple moderate-level sounds, it is necessary to have a metric that quantifies cumulative exposure(s) (American National Standards Institute 1994). The sound exposure level can be thought of as a composite metric that represents both the intensity of a sound and its duration. Individual time-varying noise events (e.g., a series of sonar pings) have two main characteristics: (1) a sound level that changes throughout the event and (2) a period of time during which the source is exposed to the sound. Cumulative sound exposure level provides a measure of the net impact of the entire acoustic event, but it does not directly represent the sound level heard at any given time. Sound exposure level is determined by calculating the decibel level of the cumulative sum-of-squared pressures over the duration of a sound, with units of dB re 1 micro Pascal-squared seconds (μPa^2-s) for sounds in water.

Some rules of thumb for sound exposure level are as follows:

- The numeric value of sound exposure level is equal to the sound pressure level of a one-second sound that has the same total energy as the exposure event. If the sound duration is one second, sound pressure level and sound exposure level have the same numeric value (but not the same reference quantities). For example, a one-second sound with a sound pressure level of 100 dB re 1 µPa has a sound exposure level of 100 dB re 1 squared micro Pascal-second (μPa^2-s).
- If the sound duration is constant but the sound pressure level changes, sound exposure level will change by the same number of decibels as the sound pressure level.
- If the sound pressure level is held constant and the duration (*T*) changes, sound exposure level will change as a function of $10\log_{10}(T)$:
    - $10\log_{10}(10) = 10$, so increasing duration by a factor of 10 raises sound exposure level by 10 dB.
    - $10\log_{10}(0.1) = –10$, so decreasing duration by a factor of 10 lowers sound exposure level by 10 dB.
    - Since $10\log_{10}(2) \approx 3$, so doubling the duration increases sound exposure level by 3 dB.
    - $10\log_{10}(1/2) \approx –3$, so halving the duration lowers sound exposure level by 3 dB.

Figure 3.0-10 illustrates the summation of energy for a succession of sonar pings. In this hypothetical case, each ping has the same duration and sound pressure level. The sound exposure level at a particular location from each individual ping is 100 dB re 1 μPa^2-s (red circles). The upper, blue curve shows the running total or cumulative sound exposure level.

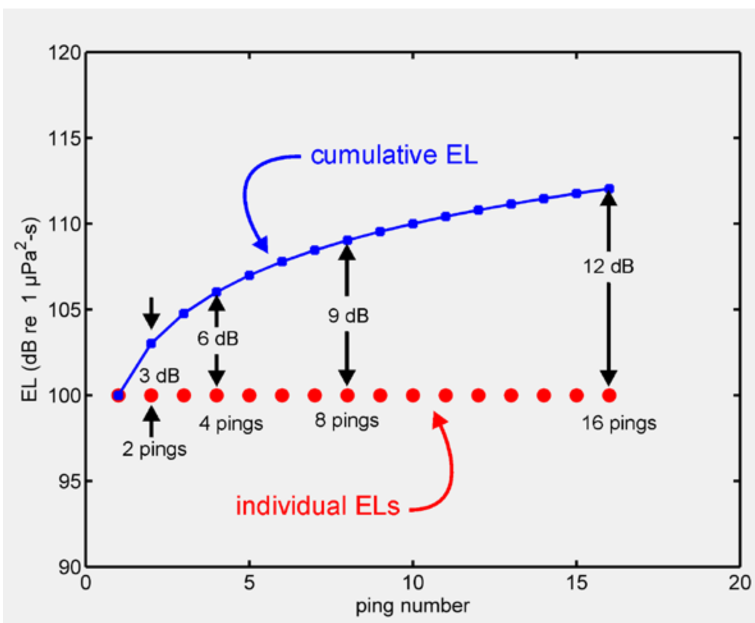


Figure 3.0-10: Summation of Acoustic Energy (Cumulative Exposure Level, or Sound Exposure Level) from a Hypothetical, Intermittently Pinging, Stationary Sound Source (EL = Exposure Level)

After the first ping, the cumulative sound exposure level is 100 dB re 1 µPa^2-s. Since each ping has the same duration and sound pressure level, receiving two pings is the same as receiving a single ping with twice the duration. The cumulative sound exposure level from two pings is therefore 103 dB re 1 µPa^2-s. The cumulative sound exposure level from four pings is 3 dB higher than the cumulative sound exposure level from two pings, or 106 dB re 1 µPa^2-s. Each doubling of the number of pings increases the cumulative sound exposure level by 3 dB.

Figure 3.0-11 shows a more realistic example where the individual pings do not have the same sound pressure level or sound exposure level. These data were recorded from a stationary hydrophone as a sound source approached, passed, and moved away from the hydrophone. As the source approached the hydrophone, the received sound pressure level from each ping increased, causing the sound exposure level of each ping to increase. After the source passed the hydrophone, the received sound pressure level and sound exposure level from each ping decreased as the source moved farther away (downward trend of red line), although the cumulative sound exposure level increased with each additional ping received (slight upward trend of blue line). The main contributions are from those pings with the highest individual sound exposure levels. Individual pings with sound exposure levels 10 dB or more below the ping with the highest level contribute little (less than 0.5 dB) to the total cumulative sound exposure level. This is shown in Figure 3.0-11 where only a small error is introduced by summing the energy from the eight individual pings with sound exposure level greater than 185 dB re 1 µPa^2-s (black line), as opposed to including all pings (blue line).

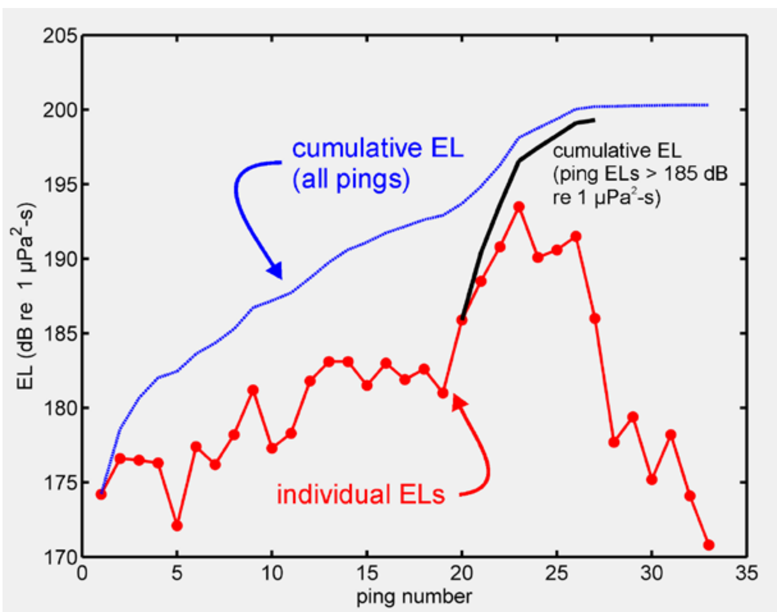


Figure 3.0-11: Cumulative Sound Exposure Level under Realistic Conditions with a Moving, Intermittently Pinging Sound Source (Cumulative Exposure Level = Sound Exposure Level)

3.0.4.2.1.3 Impulse (Pa-s)

Impulse is a metric used to describe the pressure and time component of an intense shock wave from an explosive source. The impulse calculation takes into account the magnitude and duration of the initial peak positive pressure, which is the portion of an impulsive sound most likely to be associated with damage. Specifically, impulse is the time integral of the initial peak positive pressure with units Pascal-seconds (Pa-s). The peak positive pressure for an impulsive sound is shown in Figure 3.0-9 as the first and largest pressure peak above static pressure. This metric is used to assess potential injurious effects from explosives.

3.0.4.3 Loudness and Auditory Weighting Functions

Animals, including humans, are not equally sensitive to sounds across their entire hearing range. The subjective judgment of a sound level by a receiver such as an animal is known as loudness. Two sounds received at the same sound pressure level (an objective measurement), but at two different frequencies, may be perceived by an animal at two different loudness levels depending on its hearing sensitivity (lowest sound pressure level at which a sound is first audible) at the two different frequencies. Furthermore, two different species may judge the relative loudness of the two sounds differently.

Auditory weighting functions are a method common in human hearing risk analysis to account for differences in hearing sensitivity at various frequencies. This concept can be applied to other species as well. When used in analyzing the impacts of sound on an animal, auditory weighting functions adjust received sound levels to emphasize ranges of best hearing and de-emphasize ranges of less or no sensitivity. A-weighted sound levels, often seen in units of “dBA,” (A-weighted decibels) are frequency-weighted to account for the sensitivity of the human ear to a barely audible sound. Many measurements of sound in air appear as A-weighted decibels in the literature because the intent of the authors is often to assess noise impacts on humans.

3.0.4.4 Predicting How Sound Travels

Sounds are produced throughout a wide range of frequencies, including frequencies beyond the audible range of a given receptor. Most sounds heard in the environment do not consist of a single frequency, but rather a broad band of frequencies differing in sound level. The intensities of each frequency add to generate perceptible sound.

The speed of sound is not affected by its intensity, amplitude, or frequency, but rather depends wholly on characteristics of the medium through which it is passing. Sound generally travels faster as the density of the medium increases. Speeds of sound through air are primarily influenced by air temperature, relative humidity, and pressure, averaging about 1,115 ft./s (340 m/s) at standard barometric pressure. Sound speeds in air increase as air temperature increases. Sound travels differently in the water than in air because seawater is a very efficient medium for the transmission of sound. Sound moves at a faster speed in water, about 4,921 ft./s (1,500 m/s). The speed of sound through water is influenced by temperature, pressure, and salinity because sound travels faster as any of these parameters increase.

In the simple case of sound propagating from a point source without obstruction or reflection, the sound waves take on the shape of an expanding sphere. As spherical propagation continues, the sound energy is distributed over an ever-larger area following the inverse square law: the intensity of a sound wave decreases inversely with the square of the distance between the source and the receptor. For example, doubling the distance between the receptor and a sound source results in a reduction in the intensity of the sound of one-fourth of its initial value; tripling the distance results in one-ninth of the original intensity, and so on (Figure 3.0-12). As expected, sound intensity drops at increasing distance from the point source. In spherical propagation, sound pressure levels drop an average of 6 dB for every doubling of distance from the source. Potential impacts on sensitive receptors, then, are directly related to the distance from the receptor to the noise source, and the intensity of the noise source itself.

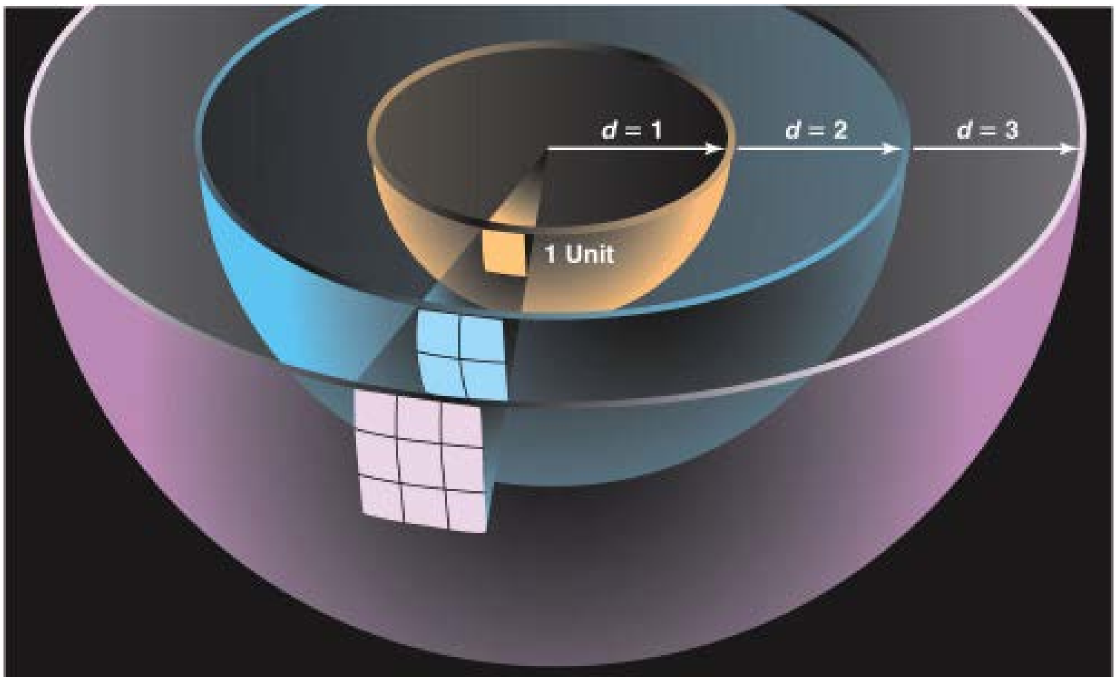


Figure 3.0-12: Graphical Representation of the Inverse-Square Relationship in Spherical Spreading

While the concept of a sound wave traveling from its source to a receptor is relatively simple, sound propagation is quite complex because of the simultaneous presence of numerous sound waves of different frequencies and other phenomena such as reflections of sound waves and subsequent constructive (additive) or destructive (cancelling) interferences between reflected and incident waves. Other factors such as refraction, diffraction, bottom types, and surface conditions also affect sound propagation. While simple examples are provided here for illustration, the Navy Acoustic Effects Model used to quantify acoustic exposures to marine mammals and sea turtles takes into account the influence of multiple factors to predict acoustic propagation (Marine Species Modeling Team 2012).

3.0.4.4.1 Sound Attenuation and Transmission Loss

As a sound wave passes through a medium, the intensity decreases with distance from the sound source. This phenomenon is known as attenuation or propagation loss. Sound attenuation may be described in terms of transmission loss (TL). The units of transmission loss are dB. The transmission loss is used to relate the source level (SL), defined as the sound pressure level produced by a sound source at a distance of 1 m, and the received level (RL) at a particular location, as follows:

$$RL = SL - TL$$

The main contributors to sound attenuation are as follows:

- Geometrical spreading of the sound wave as it propagates away from the source
- Sound absorption (conversion of sound energy into heat)
- Scattering, diffraction, multipath interference, boundary effects
- Other nongeometrical effects (Urick 1983)

3.0.4.4.1.1 Spreading Loss

Spreading loss or divergence loss is a geometrical effect representing regular weakening of a sound wave as it spreads out from a source (Campbell et al. 1988). Spreading describes the reduction in sound pressure caused by the increase in surface area as the distance from a sound source increases. Spherical and cylindrical spreading are common types of spreading loss.

As described before, a point sound source in a homogeneous medium without boundaries will radiate spherical waves—the acoustic energy spreads out from the source in the form of a spherical shell. As the distance from the source increases, the shell surface area increases. If the sound power is fixed, the sound intensity must decrease with distance from the source (intensity is power per unit area). The surface area of a sphere is $4\pi r^2$, where r is the sphere radius, so the change in intensity is proportional to the radius squared. This relationship is known as the spherical spreading law. The transmission loss for spherical spreading is:

$$TL = 20\log_{10} r$$

where *r* is the distance from the source. This is equivalent to a 6 dB reduction in sound pressure level for each doubling of distance from the sound source. For example, calculated transmission loss for spherical spreading is 40 dB at 100 m and 46 dB at 200 m.

In cylindrical spreading, spherical waves expanding from the source are constrained by the water surface and the seafloor and take on a cylindrical shape. In this case the sound wave expands in the shape of a cylinder rather than a sphere and the transmission loss is:

$$TL = 10\log_{10} r$$

Cylindrical spreading is an approximation to wave propagation in a water-filled channel with horizontal dimensions much larger than the depth. Cylindrical spreading predicts a 3 dB reduction in sound pressure level for each doubling of distance from the source. For example, calculated transmission loss for cylindrical spreading is 20 dB at 100 m and 23 dB at 200 m.

3.0.4.4.1.2 Reflection and Refraction

When a sound wave propagating in a medium encounters a second medium with a different density or sound speed (e.g., the air-water boundary) part of the incident sound will be reflected back into the first medium and part will be transmitted into the second medium (Kinsler et al. 1982). If the second medium has a different sound speed than the first, the propagation direction will change as the sound wave enters the second medium; this phenomenon is called refraction. Refraction may also occur within a single medium if the sound speed varies in the medium.

Refraction of sound resulting from spatial variations in the sound speed is one of the most important phenomena that affects sound propagation in water (Urick 1983). The sound speed in the ocean primarily depends on hydrostatic pressure (i.e., depth) and temperature. Sound speed increases with both hydrostatic pressure and temperature. In seawater, temperature has the most important effect on sound speed for depths less than about 300 m. Below 1,500 m, the hydrostatic pressure is the dominant factor because the water temperature is relatively constant. The variation of sound speed with depth in the ocean is called a sound speed profile.

Although the actual variations in sound speed are small, the existence of sound speed gradients in the ocean has an enormous effect on the propagation of sound in the deep ocean. If one pictures sound as rays emanating from an underwater source, the propagation of these rays changes as a function of the sound speed profile in the water column. Specifically, the directions of the rays bend toward regions of slower sound speed. This phenomenon creates ducts in which sound becomes "trapped," allowing it to propagate with high efficiency for large distances within certain depth boundaries. During winter months, the reduced sound speed at the surface due to cooling can create a surface duct that efficiently propagates sound such as shipping noise. The deep sound channel or Sound Frequency and Ranging channel is another duct that exists where sound speeds are lowest in the water column (600 m–1,200 m depth at the mid-latitudes). Intense low-frequency underwater sounds, such as explosions, can be detected halfway around the world from their source via the Sound Frequency and Ranging channel (Baggeroer and Munk 1992).

3.0.4.4.1.3 Diffraction, Scattering, and Reverberation

Sound waves experience diffraction in much the same manner as light waves. Diffraction may be thought of as the bending of a sound wave around an obstacle. Common examples include sound heard from a source around the corner of a building and sound propagating through a small gap in an otherwise closed door or window. An obstacle or inhomogeneity (e.g., smoke, suspended particles, or gas bubbles) in the path of a sound wave causes scattering if secondary sound spreads out from it in a variety of directions (Pierce 1989). Scattering is similar to diffraction. Normally diffraction is used to describe sound bending or scattering from a single object, and scattering is used when there are multiple objects. Reverberation, or echo, refers to the prolongation of a sound that occurs when sound waves in an enclosed space are repeatedly reflected from the boundaries defining the space, even after the source has stopped emitting.

3.0.4.4.1.4 Multipath Propagation

In multipath propagation, sound may not only travel a direct path from a source to a receiver, but also be reflected from the surface or bottom multiple times before reaching the receiver (Urick 1983). At some distances, the reflected wave will be in phase with the direct wave (their waveforms add together) and at other distances the two waves will be out of phase (their waveforms cancel). The existence of multiple sound paths, or rays, arriving at a single point can result in multipath interference, a condition that permits the addition and cancellation between sound waves resulting in the fluctuation of sound levels over short distances. A special case of multipath propagation loss is called the Lloyd mirror effect, where the sound field near the water's surface reaches a minimum because of the destructive interference (cancellation) between the direct sound wave and the sound wave being reflected from the surface. This can cause the sound level to decrease dramatically within the top few meters of the water column.

3.0.4.4.1.5 Surface and Bottom Effects

Because the sea surface reflects and scatters sound, it has a major effect on the propagation of underwater sound in applications where either the source or receiver is at a shallow depth (Urick 1983). If the sea surface is smooth, the reflected sound pressure is nearly equal to the incident sound pressure; however, if the sea surface is rough, the amplitude of the reflected sound wave will be reduced.

The sea bottom is also a reflecting and scattering surface, similar to the sea surface. Sound interaction with the sea bottom is more complex, however, primarily because the acoustic properties of the sea bottom are more variable and the bottom is often layered into regions of differing density and sound speed. The Lloyd mirror effect may also be observed from sound sources located near the sea bottom. For a hard bottom such as rock, the reflected wave will be approximately in phase with the incident wave. Thus, near the ocean bottom, the incident and reflected sound pressures may add together, resulting in an increased sound pressure near the sea bottom.

3.0.4.4.2 Air-Water Interface

Sound from aerial sources such as aircraft, muzzle blasts, and projectile sonic booms, can be transmitted into the water. The most studied of these sources are fixed-wing aircraft and helicopters, which create noise with most energy below 500 Hz. Noise levels in water are highest at the surface and are highly dependent on the altitude of the aircraft and the angle at which the aerial sound encounters the ocean surface. Transmission of the sound once it is in the water is identical to any other sound as described in the section above.

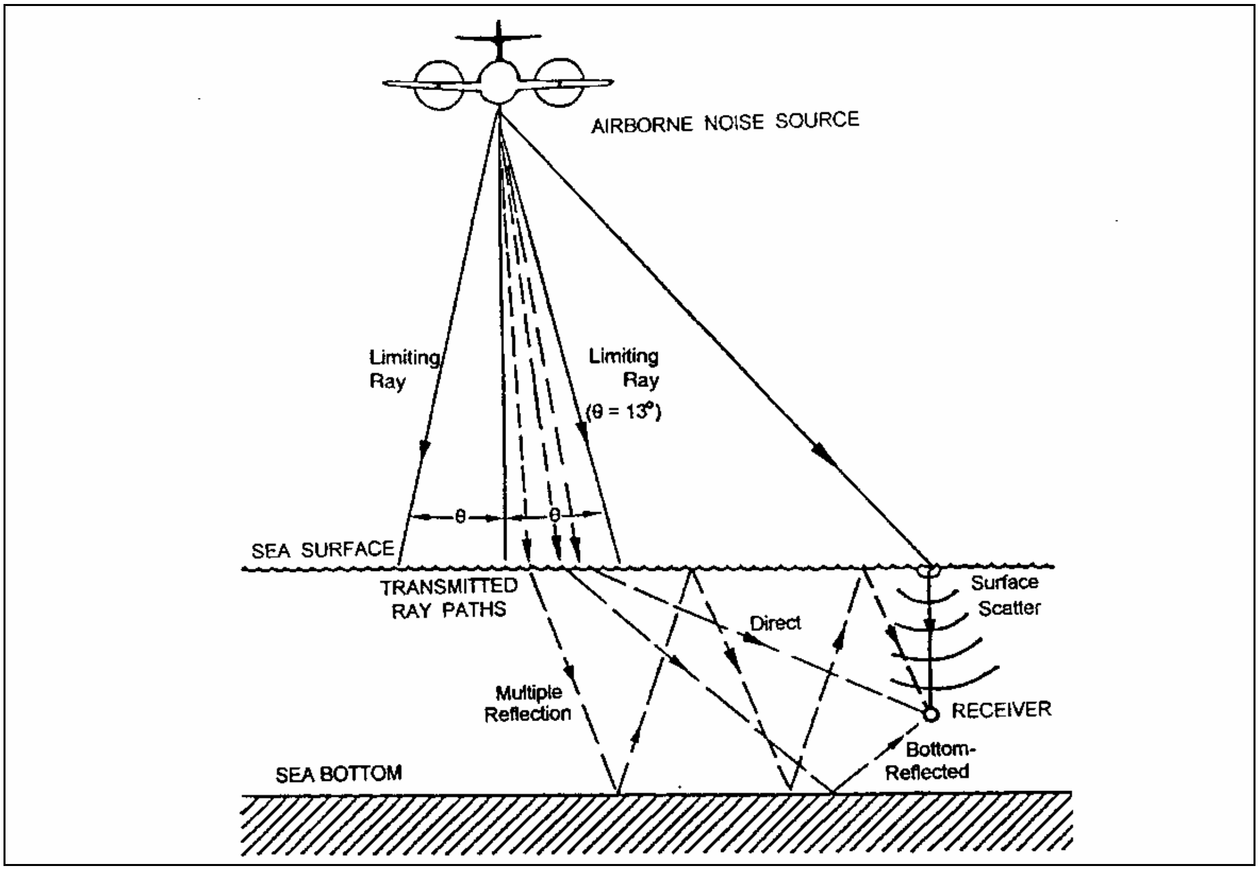
Transmission of sound from a moving airborne source to a receptor underwater is influenced by numerous factors and has been addressed by Urick (1983), Young (1973), Richardson et al*.* (1995), Eller and Cavanagh (2000), Laney and Cavanagh (2000), and others. Sound is transmitted from an airborne source to a receptor underwater by four principal means: (1) a direct path, refracted upon passing through the air-water interface; (2) direct-refracted paths reflected from the bottom in shallow water; (3) evanescent transmission in which sound travels laterally close to the water surface; and (4) scattering from interface roughness due to wave motion.

Airborne sound is refracted upon transmission into water because sound waves move faster through water than through air (a ratio of about 0.23:1). Based on this difference, the direct sound path is reflected if the sound reaches the surface at an angle more than 13 degrees from vertical. As a result, most of the acoustic energy transmitted into the water from an aircraft arrives through a relatively narrow cone extending vertically downward from the aircraft (Figure 3.0-13). The intersection of this cone with the surface traces a “footprint” directly beneath the flight path, with the width of the footprint being a function of aircraft altitude. Sound may enter the water outside of this cone due to surface scattering and as evanescent waves, which travel laterally near the water surface.

The sound pressure field is actually doubled (+6 dB) at the air-to-water interface because of the large difference in the acoustic properties of water and air. For example, an airborne sound with a sound pressure level of 100 dB re 1 µPa at the sea surface becomes 106 dB re 1 µPa just below the surface. The pressure and sound levels then decrease with increasing distance as they would for any other in-water noise.

3.0.4.4.3 Sonic Booms

A sonic boom occurs when an object, such as an aircraft or projectile, exceeds the speed of sound (referred to as supersonic flight). When an object exceeds the speed of sound, air molecules are pushed aside with great force, forming a shock front much like a boat creates a bow wave. All supersonic aircraft generate two shock fronts. One is immediately in front of the aircraft; the other is immediately behind it. These shock fronts “push” a sharply defined surge in air pressure in front of them, creating a sonic boom consisting of two very closely spaced impulses. The two impulses are usually heard as a single sonic boom.



Source: Richardson et al. 1995

Figure 3.0-13: Characteristics of Sound Transmission through the Air-Water Interface

Sonic booms differ from most other sounds because they are impulsive, there is no warning of their impending occurrence, and the peak levels of a sonic boom are higher than those for most other types of airborne noise. Although objects exceeding the speed of sound always create a sonic boom, not all sonic booms are heard near the water or ground surface. As altitude increases, air temperature normally decreases, and these layers of temperature change cause the shock front to be turned upward as it travels toward the ground. Depending on the altitude of the aircraft and its speed, the shock fronts of many sonic booms are bent upward sufficiently that they never reach the ground. This same phenomenon also acts to limit the width (area covered) of those sonic booms that actually do reach the ground.

3.0.4.5 Ambient Noise

Ambient noise is the collection of ever-present sounds of both natural and human-generated origin. Ambient noise in the ocean comprises sound generated by natural physical, natural biological, and anthropogenic (human-generated) sources (Figure 3.0-14). Preindustrial physical and biological noise sources in marine environments were often not high enough to interfere with the hearing of marine animals (Richardson et al. 1995). However, the increase in anthropogenic noise sources in recent times is a concern.

Except for some sounds generated by marine mammals, most natural ocean sound is broadband (composed of a spectrum of numerous frequencies). As shown in Figure 3.0-14, virtually the entire frequency spectrum is represented in ambient sound sources (National Research Council 2003, adapted from Wenz 1962). Earthquakes and explosions produce sound signals from 1 Hz to 100 Hz; marine species can produce signals from 100 Hz to more than 10,000 Hz; and commercial shipping, industrial activities, and naval ships have signals between 10 Hz and 10,000 Hz (Figure 3.0-14). Spray and bubbles associated with breaking waves are the major contributors to the ambient sound in the 500 Hz to 100,000 Hz range. At frequencies greater than 100,000 Hz, "thermal noise" caused by the random motion of water molecules is the primary source. Ambient sources, especially from wave and tidal action, can cause coastal environments to have particularly high ambient sound levels.

3.0.4.6 Underwater Sounds

Physical, biological, and anthropogenic sounds all contribute to the ambient underwater noise environment. Example source levels for various underwater sounds are shown in Table 3.0-5. Many naturally occurring sounds have source levels similar to anthropogenic sounds.

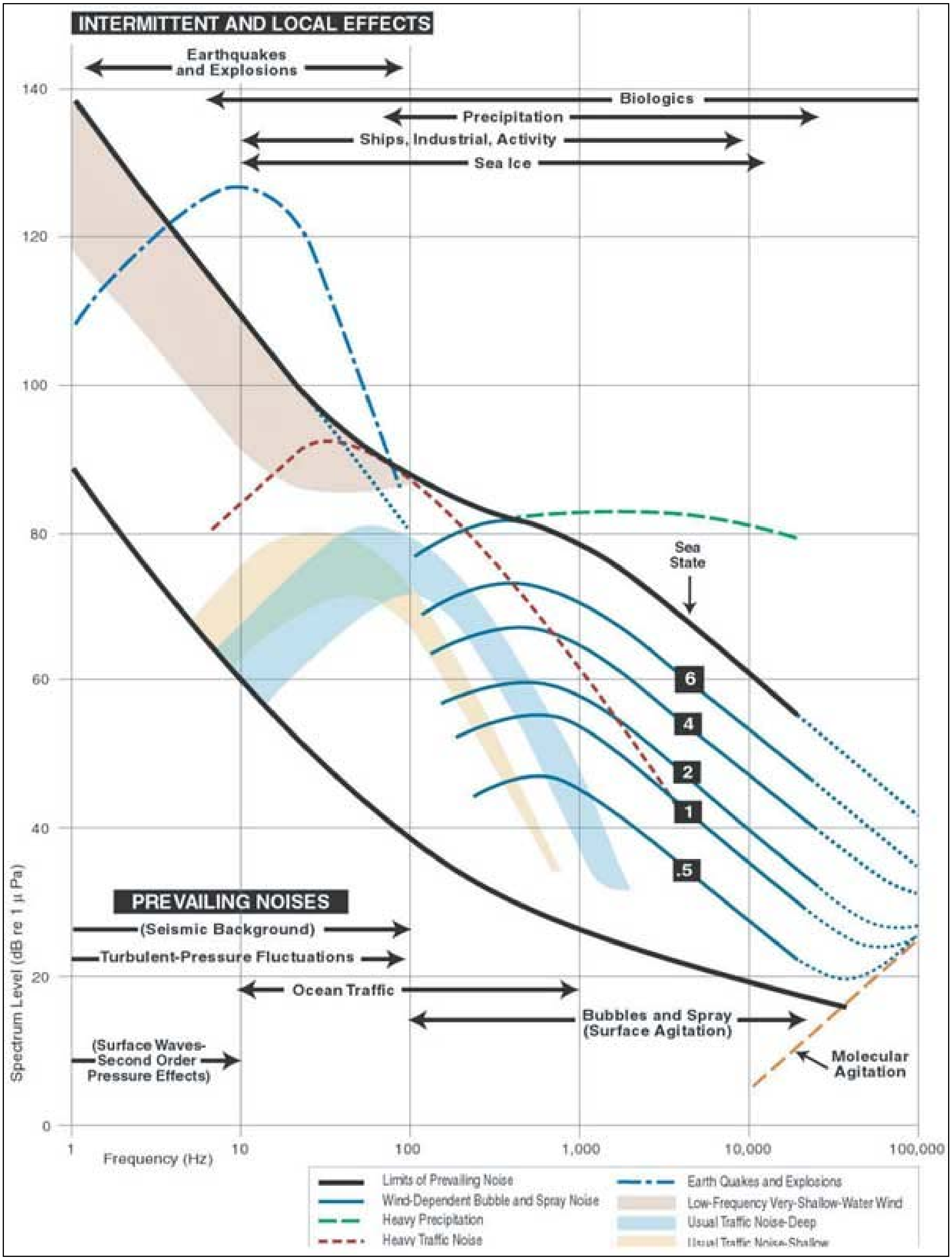
Table 3.0-5: Representative Source Levels of Common Underwater Sounds

Source	Source Level (dB re 1 µPa at 1 m)
Ice breaker ship	193[1]
Large tanker	186[1]
Seismic airgun array (32 guns)	259 (peak)[1]
Dolphin whistles	125–173[1]
Dolphin clicks	194–219[2]
Humpback whale song	144–174[3]
Snapping shrimp	183–189[4]
Sperm whale click	236[5]
Naval mid-frequency active sonar (SQS-53)	235
Lightning strike	260[6]
Seafloor volcanic eruption	255[7]

[1] (Richardson et al. 1995), [2] (Rasmussen et al. 2002), [3] (Payne and Payne 1985; Thompson et al. 1979), [4] (Au and Banks 1998), [5] (Levenson 1974; Watkins 1980), [6] (Hill 1985),[7] (Northrop 1974)
Notes: dB = decibel, m = meters, µPa = micro Pascal

3.0.4.6.1 Physical Sources of Underwater Sound

Physical processes that create sound in the ocean include rain, wind, waves, sea ice, lightning strikes at the sea surface, undersea earthquakes, and eruptions from undersea volcanoes. Generally, these sound sources contribute to a rise in the ambient sound levels on an intermittent basis. Underwater sound from rain typically is between 1 and 3 kHz. Wind produces frequencies between 100 Hz and 30 kHz, while wave-generated sound is a significant contributor in the infrasonic range (i.e., 1 - 20 Hz) (Simmonds et al. 2003). Seismic activity results in the production of low-frequency sounds that can be heard for great distances.



From National Research Council (2003), adapted from Wenz (1962)

Figure 3.0-14: Oceanic Ambient Noise Levels from 1 Hertz to 100,000 Hertz, Including Frequency Ranges for Prevalent Noise Sources

3.0.4.6.2 Biological Sources of Underwater Sound

Marine animals use sound both passively and actively in order to navigate, communicate, locate food, reproduce, and detect predators and other important environmental cues. Sounds produced by marine species can increase ambient sound levels by nearly 20 dB over the range of a few kHz (e.g., crustaceans and fish) or over the range of tens to hundreds of kHz (e.g., dolphin clicks and whistles). In fishes, reproductive activity, including courtship and spawning, accounts for the majority of sounds produced. During the spawning season, croakers (family Sciaenidae) vocalize for many hours and often dominate the acoustic environment (Ramcharitar et al. 2006). Other species, including baleen whales (Mysticetes) and toothed whales and dolphins (Odontocetes) produce a wide variety of sounds in many different behavioral contexts. These sounds can include tonal calls, clicks, whistles, and pulsed sounds, which cover a wide range of frequencies depending on the species and sound type produced. Bottlenose dolphin clicks and whistles, for instance, have a dominant frequency range of 110–130 kHz and 3.5–14.5 kHz, respectively (Au 1993). In addition, sperm whale clicks range in frequency from 0.1 kHz to 30 kHz, with dominant energy in two bands (2–4 kHz and 10–16 kHz) (Richardson et al. 1995). Blue and fin whales produce low-frequency moans at frequencies of 10–25 Hz. Colonies of snapping shrimp can generate sounds at frequencies of 2–15 kHz.

3.0.4.6.3 Anthropogenic Sources of Underwater Sound

In addition to sounds generated during Navy training and testing, other non-Navy activities also introduce similar types of anthropogenic (human-generated) sound into the ocean from a number of sources, including non-military vessel traffic, industrial operations onshore (pile driving), seismic profiling for oil exploration, oil drilling, and underwater explosions. Noise levels resulting from human activities in coastal and offshore areas are increasing; however, there are few historical records of ambient noise data to substantiate the level of increase, but see Andrew et al. (2002) and McDonald et al. (2006, 2008).

Commercial shipping is the most widespread source of human-made, low-frequency (0–1,000 Hz) noise in the oceans and may contribute more than 75 percent of all human-made sound in the sea (International Council for the Exploration of the Sea 2005), particularly in coastal areas and near shipping lanes (see Figures 3.11-1 and 3.11-2 for commercial shipping lanes in the Study Area). There are approximately 20,000 large commercial vessels at sea worldwide at any given time. Because low-frequency sounds carry for long distances, a large vessel emitting sound at 6.8 Hz can be detected 75–250 nm away (Polefka 2004). The dominant component of low-frequency ambient noise is commercial tankers, which contribute twice as much noise as cargo vessels and at least 100 times as much noise as research vessels (Hatch et al. 2008). Most of these sounds are produced as a result of propeller cavitation (when air spaces created by the motion of propellers collapse) (Southall et al. 2007).

High-intensity, low-frequency impulsive sounds are emitted during seismic surveys to determine the structure and composition of the geological formations below the sea bed to identify potential hydrocarbon reservoirs (i.e., oil and gas exploration) (Simmonds et al. 2003).

3.0.4.7 Aerial Sounds

Aerial sounds may be produced by physical, biological, or anthropogenic sources. These sounds may be transmitted across the air-water interface as well. Of the physical sources of sound, surf noise is one of the most dominant. The highest sound levels from surf are typically low frequency (below 100 Hz). Biological sources of sound can be a significant contribution to the noise level in coastal environments such as areas occupied by highly vocal sea lions. Anthropogenic noise sources like ships, industrial sites, cars, and airplanes are also potential contributors.

3.0.5 OVERALL APPROACH TO ANALYSIS

The overall approach to analysis in this EIS/OEIS included the following general steps:

- Identification of resources for analysis
- Resource-specific impacts analysis for individual stressors
- Resource-specific impacts analysis for multiple stressors
- Examination of potential population-level impacts
- Cumulative impacts analysis
- Consideration of mitigations to reduce identified potential impacts

Navy training and testing activities in the Proposed Action may cause one or more stimuli that cause stress on a resource. Each proposed Navy activity was examined to determine its potential stressors (Table 3.0-6). Not all stressors affect every resource, nor do all proposed Navy activities produce all stressors (Table 3.0-7). The potential direct, indirect, and cumulative impacts of the Proposed Action were analyzed based on these potential stressors being present with the resource. Direct impacts are caused by the action and occur at the same time and place. Indirect impacts result when a direct impact on one resource induces an impact on another resource (referred to as a secondary stressor). Indirect impacts would be reasonably foreseeable because of a functional relationship between the directly impacted resource and the secondarily impacted resource. For example, a significant change in water quality could secondarily impact those resources that rely on water quality such as marine animals and public health and safety. Cumulative effects or impacts are the incremental impacts of the action added to other past, present, and reasonably foreseeable future actions.

First, a preliminary analysis was conducted to determine the environmental resources potentially impacted and associated stressors. The term stressor is broadly used in this document to refer to an agent, condition, or other stimulus that causes stress to an organism or alters physical, socioeconomic, or cultural resources. Secondly, each resource was analyzed for potential impacts of individual stressors, followed by an analysis of the combined impacts of all stressors related to the Proposed Action. A cumulative impact analysis was conducted to evaluate the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions. Mitigation measures are discussed in detail in Chapter 5.

In this phased approach, the initial analyses were used to develop each subsequent step so the analysis focused on relevant issues (defined during scoping) that warranted the most attention. The systematic nature of this approach allowed the Proposed Action with the associated stressors and potential impacts to be effectively tracked throughout the process. This approach provides a comprehensive analysis of applicable stressors and potential impacts. Each step is described in more detail below.

Table 3.0-6: List of Stressors Analyzed

Components and Stressors for Physical Resources	
Sediments and Water Quality	
• Explosives and explosive byproducts • Metals	• Chemicals other than explosives • Other materials
Air Quality	
• Criteria pollutants	• Hazardous air pollutants
Components and Stressors for Biological Resources	
Acoustic Stressors	
• Sonar and other active sources • Explosives • Pile driving • Swimmer defense airguns	• Weapons firing, launch and impact noise • Vessel noise • Aircraft noise
Energy Stressors	
• Electromagnetic devices	
Physical Disturbance and Strike Stressors	
• Aircraft and aerial targets • Vessels • In-water devices	• Military expended materials • Seafloor devices
Entanglement Stressors	
• Fiber optic cables and guidance wires	• Parachutes
Ingestion Stressors	
• Military expended materials from munitions • Military expended materials other than munitions	
Secondary Stressors	
• Habitat (sediment and water quality; air quality) • Prey availability	
Components and Stressors for Human Resources	
Cultural Resources Stressors	
• Acoustic • Physical disturbance	
Socioeconomic Stressors	
• Accessibility • Airborne acoustics • Physical disturbance and strikes • Secondary impacts from availability of resources	
Public Health and Safety Stressors	
• Underwater energy • In-air energy • Physical interactions • Secondary stressors (sediments and water quality)	

Table 3.0-7: Stressors by Warfare and Testing Area

Warfare Area/Testing Area	Acoustic Stressors	Energy Stressors	Physical Disturbance and Strike Stressors	Entanglement Stressors	Ingestion Stressors	Accessibility	Underwater Energy	In-Air Energy	Physical Interactions	Secondary Stressors	
										Sediments and Water Quality	Air Quality
Training Activities											
Anti-Air Warfare	✓		✓	✓	✓	✓		✓	✓	✓	✓
Amphibious Warfare	✓		✓		✓	✓			✓	✓	✓
Strike Warfare	✓		✓		✓	✓		✓	✓	✓	✓
Anti-Surface Warfare	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
Anti-Submarine Warfare	✓		✓	✓	✓	✓	✓		✓	✓	✓
Electronic Warfare	✓		✓		✓			✓	✓	✓	✓
Mine Warfare	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Naval Special Warfare	✓		✓		✓	✓	✓	✓	✓	✓	✓
Major Exercises	✓		✓	✓	✓	✓	✓		✓	✓	✓
Other Training Activities	✓		✓		✓	✓	✓		✓	✓	✓
Testing Activities											
Anti-Air Warfare	✓		✓	✓	✓	✓			✓	✓	✓
Anti-Surface Warfare	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Electronic Warfare	✓		✓		✓				✓	✓	✓
Anti-Submarine Warfare	✓		✓	✓	✓	✓	✓		✓	✓	✓
Mine Warfare	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
New Ship Construction	✓		✓	✓	✓	✓	✓		✓	✓	✓
Life Cycle Activities	✓		✓	✓	✓	✓	✓		✓	✓	✓
Shipboard Protection Systems and Swimmer Defense Testing	✓		✓		✓	✓	✓		✓	✓	✓
Unmanned Vehicle Testing	✓		✓	✓	✓	✓	✓		✓	✓	✓
SPAWAR RDT&E Testing	✓		✓		✓	✓	✓		✓	✓	✓
Office of Naval Research RDT&E	✓		✓		✓	✓	✓		✓	✓	✓
Other Testing Activities	✓		✓			✓	✓		✓	✓	✓

Notes: SPAWAR = Space and Naval Warfare Systems Command; RDT&E = Research, Development, Test, and Evaluation

3.0.5.1 Resources and Issues Evaluated

Physical resources and issues evaluated include marine sediments, marine water quality, and air quality. Biological resources (including threatened and endangered species) evaluated include marine habitats, marine mammals, sea turtles, seabirds, marine vegetation, marine invertebrates, and fish. Human resources evaluated in this EIS/OEIS include cultural resources, socioeconomics, and public health and safety.

3.0.5.2 Resources and Issues Eliminated from Further Consideration

Resources and issues considered but not carried forward for further consideration include land use, demographics, environmental justice, and children's health and safety. Land use was eliminated from further consideration because the offshore activities in the Proposed Action would not be relevant to land use issues and no new actions are being proposed that would include relevant land use. Demographics were eliminated from further consideration because implementation of the Proposed Action would not result in a change in the demographics within the Study Area of the counties of the coastal states that abut the Study Area. Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, was eliminated as an issue for further consideration because all of the proposed activities occur in the ocean where there are no minority or low-income populations present. Therefore, there are no disproportionately high and adverse human health or environmental impacts from the Proposed Action on minority populations or low-income populations. Similarly, EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, was eliminated as an issue for further consideration because all of the proposed activities occur in the ocean where there are no child populations present. Therefore, the Proposed Action would not lead to disproportionate risks to children that result from environmental health risks or safety risks.

3.0.5.3 Identification of Stressors for Analysis

The proposed training and testing activities were evaluated to identify specific components that could act as stressors (Table 3.0-6) by having direct or indirect impacts on the environment. This analysis included identification of the spatial variation of the identified stressors. The warfare and testing areas along with their associated environmental stressors are identified in Table 3.0-7. Matrices were prepared to identify associations between stressors, resources, training and testing activities, warfare and testing areas, range complexes, and alternatives. The following subsections describe the environmental stressors for biological resources in more detail. Each description contains a list of activities in which the stressor may occur. Refer to Appendix F (Training and Testing Activities Matrices) for more information on stressors associated with each training and testing activity. Resources that may occur or are known to occur within the Study Area and that may be exposed to the identified stressors are also listed in Appendix F. Stressors for physical resources (sediment and water quality, air quality) and human resources (cultural resources, socioeconomic resources, and public health and safety) are described in their respective sections of Chapter 3 (Affected Environment and Environmental Consequences).

A preliminary analysis identified the stressor/resource interactions that warrant further analysis in the EIS/OEIS based on scoping, previous NEPA analyses, and opinions of subject matter experts. Stressor/resource interactions that were determined to have negligible or no impacts were not carried forward for analysis in the EIS/OEIS.

3.0.5.3.1 Acoustic Stressors

This section describes the characteristics of sounds produced during naval training and testing and the relative magnitude and location of these sound-producing activities. This provides the basis for analysis of acoustic and explosive impacts to resources in the remainder of Chapter 3 (Affected Environment and Environmental Consequences). For additional details on the properties of sound and explosives, see Section 3.0.4 (Acoustic and Explosives Primer).

3.0.5.3.1.1 Sonar and Other Active Acoustic Sources

Sonar and other non-impulsive sound sources emit sound waves into the water to detect objects, safely navigate, and communicate. Most systems operate within specific frequencies (although some harmonic frequencies may be emitted at lower sound pressure levels). Sonar use associated with anti-submarine warfare would emit the most non-impulsive sound underwater during training and testing activities. Sonar use associated with mine warfare would also contribute a notable portion of overall non-impulsive sound. Other sources of non-impulsive sound include acoustic communications, sonar used in navigation, and other sound sources used in testing. General categories of sonar systems are described in Section 2.3.1 (Sonar and Other Acoustic Sources). Table 3.0-8 summarizes the source classes proposed for use in the Study Area during training and testing for an annual maximum year (a notional 12-month period when all annual and non-annual events could occur) under each alternative.

Table 3.0-8: Sonar and Other Active Source Classes for Each Alternative

For Annual Training and Testing Activities								
Source Class Category	Source Class	Units	Annual Hours					
			No Action Alternative		Alternative 1		Alternative 2	
			Training	Testing	Training	Testing	Training	Testing
Low-Frequency (LF) Sources that produce signals less than 1 kHz	LF4	Hours	0	2	0	42	0	52
	LF5	Hours	0	1,680	0	1,920	0	2,160
	LF6	Hours	0	0	0	192	0	192
Mid-Frequency (MF) Tactical and nontactical sources that produce signals from 1 to 10 kHz	MF1	Hours	3,461	25	11,588	169	11,588	180
	MF1K	Hours	83	0	88	17	88	18
	MF2	Hours	898	0	3,060	84	3,060	84
	MF2K	Hours	27	0	34	0	34	0
	MF3	Hours	1,036	119	2,336	350	2,336	392
	MF4	Hours	607	66	888	643	888	693
	MF5	Items	6,379	2,813	13,718	4,596	13,718	5,024
	MF6	Items	0	507	0	507	0	540
	MF8	Hours	0	2	0	2	0	2
	MF9	Hours	0	270	0	2,743	0	3,039
	MF10	Hours	0	0	0	34	0	35
	MF11	Hours	0	0	1,120	0	1,120	0
	MF12	Hours	0	0	1,094	336	1,094	336
High-Frequency (HF) Tactical and nontactical sources that produce signals greater than 10kHz but less than 180kHz	HF1	Hours	590	15	1,754	778	1,754	1,025
	HF3	Hours	0	0	0	233	0	273
	HF4	Hours	5,121	23	4,848	1,026	4,848	1,336
	HF5	Hours	0	0	0	966	0	1,094
	HF6	Hours	0	2,280	0	2,960	0	3,460
Anti-Submarine Warfare (ASW) Tactical sources used during anti-submarine warfare training and testing activities	ASW1	Hours	0	0	224	224	224	224
	ASW2[1]	Hours	0	0	0	191	0	255
	ASW2[1]	Items	1,046	2,090	1,800	2,090	1,800	2,260
	ASW3	Hours	4,492	25	16,561	1,133	16,561	1,278
	ASW4	Items	974	340	1,540	426	1,540	477

[1] The ASW2 bin contains sources that are analyzed by hours and some that are analyzed by count. There is no overlap of the numbers in the two rows.

Table 3.0-8: Sonar and Other Active Source Classes for Each Alternative (continued)

For Annual Training and Testing Activities								
Source Class Category	Source Class	Units	Annual Hours					
			No Action Alternative		Alternative 1		Alternative 2	
			Training	Testing	Training	Testing	Training	Testing
Torpedoes (TORP) Source classes associated with active acoustic signals produced by torpedoes	TORP1	Items	92	186	170	668	170	701
	TORP2	Items	321	275	400	672	400	732
Acoustic Modems (M) Transmit data acoustically through the water	M3	Hours	0	3,294	0	4,375	0	4,995
Swimmer Detection Sonar (SD) Used to detect divers and submerged swimmers	SD1	Hours	0	38	0	30	0	38
Airguns (AG) Used during swimmer defense and diver deterrent training and testing activities	AG	Items	0	5	0	4	0	5
Synthetic Aperture Sonar (SAS): Sonar in which active acoustic signals are post-processed to form high-resolution images of the seafloor	SAS1	Hours	0	1,740	0	2,280	0	2,700
	SAS2	Hours	0	2,280	0	4,320	0	4,956
	SAS3	Hours	0	2,280	0	2,880	0	3,360

Underwater sound propagation is highly dependent upon environmental characteristics such as bathymetry, bottom type, water depth, temperature, and salinity. The sound received at a particular location will be different than near the source due to the interaction of many factors, including propagation loss; how the sound is reflected, refracted, or scattered; the potential for reverberation; and interference due to multi-path propagation (see Section 3.0.4.4, Predicting How Sound Travels).

A very simple estimate of sonar transmission loss can be calculated using the spherical spreading law, $TL = 20 \log_{10} r$, where r is the distance from the sound source and TL is the transmission loss in decibels (see Section 3.0.4.4.1 on Sound Attenuation and Transmission Loss). While a simple example is provided here for illustration, the Navy Acoustic Effects Model takes into account the influence of multiple factors to predict acoustic propagation (Marine Species Modeling Team 2012).The simplified estimate of spreading loss for a ping from a hull-mounted tactical sonar with a representative source level of 235 dB re 1 µPa is shown in Figure 3.0-15. The figure shows that sound levels drop off significantly near the source, followed by a more steady reduction with distance. Most non-impulsive sound sources used during training and testing have sound source levels lower than this example.

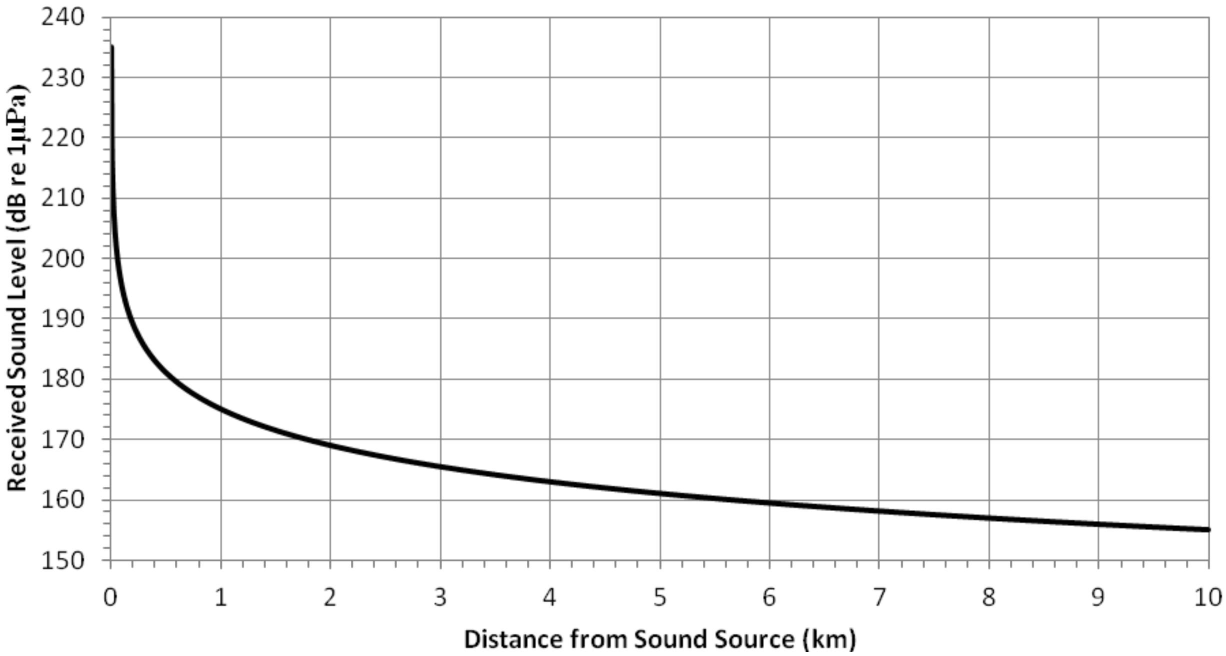


Figure 3.0-15: Estimate of Spreading Loss for a 235 dB re 1 µPa Sound Source Assuming Simple Spherical Spreading Loss

Most use of active acoustic sources involves a single unit or several units (ship, submarine, aircraft, or other platform) employing a single active sonar source in addition to sound sources used for communication, navigation, and measuring oceanographic conditions. Anti-submarine warfare activities may also use an acoustic target or an acoustic decoy.

Anti-Submarine Warfare Sonar

Sonar used in anti-submarine warfare is deployed on many platforms and are operated in various ways. Anti-submarine warfare active sonar is usually mid-frequency (1–10 kHz) because mid-frequency sound balances sufficient resolution to identify targets and distance within which threats can be identified.

- Ship tactical hull-mounted sonar contributes the largest portion of overall non-impulsive sound. Duty cycle can vary from about a ping per minute to continuously active. Sonar can be wide-ranging in a search mode or highly directional in a track mode.
- A submarine‘s mission revolves around its stealth; therefore, a submarine's mid-frequency sonar is used infrequently because its use would also reveal a submarine's location.
- Aircraft-deployed, mid-frequency, anti-submarine warfare systems include omnidirectional dipping sonar (deployed by helicopters) and omnidirectional sonobuoys (deployed from various aircraft), which have a typical duty cycle of several pings per minute.
- Acoustic decoys that continuously emulate broadband vessel sound or other vessel acoustic signatures may be deployed by ships and submarines.
- Torpedoes use directional high-frequency sonar when approaching and locking onto a target. Practice targets emulate the sound signatures of submarines or repeat received signals.

Most anti-submarine warfare events occur more than 12 nm from shore and within areas of the HRC and SOCAL Range Complex designated for anti-submarine warfare activities.

Most events usually occur over a limited area and are completed in less than one day, often within a few hours. Multi-day anti-submarine warfare events requiring coordination of movement and effort between multiple platforms with active sonar over a larger area occur less often, but constitute a large portion of the overall non-impulsive underwater noise that would be impacted by Navy activities. For example, the largest event, a composite training unit exercise, would have periods of concentrated, near-continuous anti-submarine warfare sonar use by several platforms during a several-week period.

Mine Warfare Sonar

Sonar used to locate mines and other small objects is typically high frequency, which provides higher resolution. Mine detection sonar is deployed at variable depths on moving platforms to sweep a suspect mined area (towed by ships, helicopters, or unmanned underwater vehicles). Mid-frequency hull-mounted sonar can also be used in an object detection mode known as "Kingfisher" mode. Mine detection sonar use would be concentrated in areas where practice mines are deployed, typically in water depths less than 200 ft. (61 m). Most events usually occur over a limited area and are completed in less than one day, often within a few hours.

Other Active Acoustic Sources

Active sound sources used for navigation and obtaining oceanographic information (e.g., depth, bathymetry, and speed) are typically directional, have high duty cycles, and cover a wide range of frequencies, from mid frequency to very high frequency. These sources are similar to the navigation systems on standard large commercial and oceanographic vessels. Sound sources used in communications are typically high frequency or very high frequency. These sound sources could be used by vessels during most activities and while transiting throughout the Study Area.

Use of Sonar During Training and Testing

While most non-impulsive sound sources are used beyond nearshore waters, some use would occur nearshore in inland waters such as bays, while pierside, or while in transit in and out of port. These activities include sonar maintenance, object detection/mine countermeasures, and navigation.

Most non-impulsive sound stressors associated with testing events, and about half of non-impulsive sound stressors associated with training events, involve a single unit or several units (ship, submarine, aircraft, or other platform) employing a single active sonar source in addition to sound sources used for communication, navigation, and measuring oceanographic conditions. Anti-submarine warfare activities may also use an acoustic target or an acoustic decoy. These events usually occur over a limited area and are completed in less than one day, often within a few hours.

Multiday anti-submarine warfare events requiring coordination of movement and effort between multiple platforms with active sonar over a larger area occur less often, but constitute a large portion of overall non-impulsive underwater noise imparted by Navy activities. Approximately half of the non-impulsive sound stressors generated during training events occur during multiplatform anti-submarine warfare events. One event of this type, the submarine commander's course training event, occurs up to two times per year in the Hawaii OPAREA off of Maui.

3.0.5.3.1.2 Explosives

Explosive detonations during training and testing activities are associated with high-explosive ordnance, including bombs, missiles, naval gun shells, torpedoes, mines, demolition charges, and explosive sonobuoys. Most explosive detonations during training and testing involving the use of high-explosive ordnance, including bombs, missiles, and naval gun shells, would occur in the air or near the water's surface. Explosives associated with torpedoes and explosive sonobuoys would occur in the water column; mines and demolition charges could occur near the surface, in the water column, or the ocean bottom. Most detonations would occur in waters greater than 200 ft. (61 m) in depth, and greater than 3 nm from shore, although mine warfare, demolition, and some testing detonations could occur in shallow water close to shore. Detonations associated with Anti-Submarine Warfare would typically occur in waters greater than 600 ft. (182.9 m) depth. The numbers of explosions in each explosive source class proposed under each alternative are shown in Table 3.0-9 based on an annual maximum year (a notional 12-month period when all annual and non-annual events could occur) under each alternative.

Table 3.0-9: Explosives for Training and Testing Activities in the Hawaii-Southern California Training and Testing Study Area

Explosives	Location – Range Complex	Training Activities (Annual In-Water Detonations)			Testing Activities (Annual In-Water Detonations)		
		No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
E1 (0.1 lb.–0.25 lb. NEW)	Hawaii	310	6,340	6,340	0	1,400	1,750
	Southern California	1,498	13,180	13,180	1,501	11,400	12,751
	Transit Corridor	0	320	320	0	0	0
	Total	**1,808**	**19,840**	**19,840**	**1,501**	**12,800**	**14,501**
E2 (0.26 lb.–0.5 lb. NEW)	Hawaii	258	302	302	0	0	0
	Southern California	864	742	742	0	0	0
	Transit Corridor	0	0	0	0	0	0
	Total	**1,122**	**1,044**	**1,044**	**0**	**0**	**0**
E3 (0.6 lb.–2.5 lb. NEW)	Hawaii	3,621	564	564	139	288	379
	Southern California	15,325	2,456	2,456	2,203	2,400	2,611
	Transit Corridor	0	0	0	0	0	0
	Total	**18,946**	**3,020**	**3,020**	**2,342**	**2,688**	**2,990**
E4 (>2.5 lb.–5 lb. NEW)	Hawaii	638	482	482	174	168	204
	Southern California	82	186	186	529	480	549
	Transit Corridor	0	0	0	0	0	0
	Total	**720**	**668**	**668**	**703**	**648**	**753**
E5 (>5 lb.–10 lb. NEW)	Hawaii	5,828	2,490	2,490	0	0	0
	Southern California	10,987	5,644	5,644	0	184	202
	Transit Corridor	0	20	20	0	0	0
	Total	**16,815**	**8,154**	**8,154**	**0**	**184**	**202**
E6 (>10 lb.–20 lb. NEW)	Hawaii	39	59	59	0	7	7
	Southern California	226	479	479	5	27	30
	Transit Corridor	0	0	0	0	0	0
	Total	**265**	**538**	**538**	**5**	**34**	**37**

Table 3.0-9: Explosives for Training and Testing Activities in the Hawaii-Southern California Training and Testing Study Area (continued)

Explosives	Location – Range Complex	Training Activities (Annual In-Water Detonations)			Testing Activities (Annual In-Water Detonations)		
		No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
E7 (>20 lb.–60 lb. NEW)	Hawaii	33	40	40	0	18	21
	Southern California	258	367	367	0	0	0
	Transit Corridor	0	0	0	0	0	0
	Total	**291**	**407**	**407**	**0**	**18**	**21**
E8 (>60 lb.–100 lb. NEW)	Hawaii	20	46	46	3	4	4
	Southern California	9	18	18	0	7	8
	Transit Corridor	0	0	0	0	0	0
	Total	**29**	**64**	**64**	**3**	**11**	**12**
E9 (>100 lb.–250 lb. NEW)	Hawaii	12	12	12	0	0	0
	Southern California	4	4	4	0	0	0
	Transit Corridor	0	0	0	0	0	0
	Total	**16**	**16**	**16**	**0**	**0**	**0**
E10 (>250 lb.–500 lb. NEW)	Hawaii	2	6	6	4	4	5
	Southern California	9	13	13	0	24	26
	Transit Corridor	0	0	0	0	0	0
	Total	**11**	**19**	**19**	**4**	**28**	**31**
E11 (>500 lb.–650 lb. NEW)	Hawaii	6	6	6	3	4	4
	Southern California	2	2	2	0	9	10
	Transit Corridor	0	0	0	0	0	0
	Total	**8**	**8**	**8**	**3**	**13**	**14**
E12 (>650 lb.–1000 lb. NEW)	Hawaii	44	62	62	0	0	0
	Southern California	162	162	162	0	0	0
	Transit Corridor	0	0	0	0	0	0
	Total	**206**	**224**	**224**	**0**	**0**	**0**
E13 (>1000 lb.–1,740 lb. NEW)	Hawaii	0	0	0	0	0	0
	Southern California	9	9	9	0	0	0
	Transit Corridor	0	0	0	0	0	0
	Total	**9**	**9**	**9**	**0**	**0**	**0**

Notes: NEW = Net Explosive Weight, lb. = pounds

Explosives in the water introduce loud, impulsive, broadband sounds into the marine environment. Three source parameters influence the effect of an explosive: (1) the weight of the explosive warhead, (2) the type of explosive material, and (3) the detonation depth. The net explosive weight, the explosive power of a charge expressed as the equivalent weight of TNT, accounts for the first two parameters. The properties of explosive detonations are discussed in Section 3.04 (Acoustic and Explosives Primer). Table 3.0-10 shows the depths at which representative explosive source classes are assumed to detonate underwater for purposes of analysis.

Table 3.0-10: Representative Ordnance, Net Explosive Weights, and Detonation Depths

Representative Ordnance	Explosive Source Class (Net Explosive Weight)	Representative Underwater Detonation Depth[1]
Medium-caliber projectiles	E1 (0.1-0.25 lb.)	1 m (3 ft.)
Medium-caliber projectiles	E2 (0.26-0.5 lb.)	1 m (3 ft.)
Large-caliber projectiles	E3 (0. 6-2.5 lb.)	1 m (3 ft.)
Improved extended echo ranging sonobuoy	E4 (2.6-5 lb.)	20 m (66 ft.), 198 m (650 ft.)
5 in. projectiles	E5 (6-10 lb.)	1 m (3 ft.)
demo block/shaped charge	E7 (21-60 lb.)	15 m (50 ft.)
500 lb. bomb	E9 (101-250 lb.)	1 m (3 ft.)
650 lb. mine	E11 (501-650 lb.)	6 m (20 ft.), 10 m (33 ft.)
2,000 lb. bomb	E12 (651-1,000 lb.)	1 m (3 ft.)

[1] Underwater detonation depths listed are those assumed for purposes of acoustic impacts modeling. Detonations assumed to occur at a depth of 3 ft. (1 m) include detonations that would actually occur at or just above the water surface.
Notes: ft. = feet, lb. = pounds, m = meters

In general, explosive events would consist of a single explosion or multiple explosions over a short period. During training, all large, high-explosive bombs would be detonated near the surface over deep water. Bombs with high-explosive ordnance would be fused to detonate on contact with the water. Other detonations would occur near but above the surface upon impact with a target; these detonations are conservatively assumed to occur at a depth of 3.3 ft. (1 m) for purposes of analysis. Detonations of projectiles during anti-air warfare would occur far above the water surface.

Since most explosive sources used in military activities are munitions that detonate essentially upon impact, the effective source depths are quite shallow and, therefore, the surface-image interference effect can be pronounced (see Section 3.04, Acoustic and Explosives Primer). This effect would reduce peak pressures and potential impacts near the water surface.

3.0.5.3.1.3 Pile Driving

Construction during training of the elevated causeway system, a temporary pier allowing offloading of supply ships, would require pile driving and pile removal. This training activity would occur four times per year under the No Action Alternative, Alternative 1, and Alternative 2 at the Silver Strand Training Complex or Camp Pendleton Amphibious Assault Area. The length of the pier, and therefore the number of piles required, would be determined by the distance from shore to the appropriate water depth for ship off-loading. Construction of the elevated causeway system would involve intermittent impact pile driving of 24-inch (in.), uncapped, steel pipe piles over approximately two weeks. Crews work 24 hours a day and can drive approximately eight piles in that period. Each pile takes about 10 minutes to drive. When training events that use the elevated causeway system are complete, the structure would be removed, using vibratory methods over approximately 6 days. Crews can remove about 14 piles per 24-hour period, each taking about 6 minutes to remove.

Impact pile driving creates repetitive impulsive sound. An impact pile driver generally operates in the range of 36 to 50 blows per minute. Vibratory pile driving creates a nearly continuous sound made up of a series of short duration rapid impulses at a much lower source level than impact pile driving. The sounds are emitted both in the air and in the water.

The intensity of pile driving sounds is influenced by the type of piles, hammers, and the physical environment in which the activity takes place. Table 3.0-11 shows representative airborne pile driving sound pressure levels that have been recorded from other construction activities in recent years. Although the airborne sound emitted during pile driving and removal would be influenced by site characteristics, these represent reasonable sound pressure levels that could be anticipated.

Table 3.0-11: Airborne Sound Pressure Levels from Similar Pile Driving Events

Project & Location	Pile Size & Type	Installation Method	Water Depth	Measured Sound Pressure Levels
Friday Harbor Ferry Terminal, WA[1]	24 in. Steel Pipe Pile	Impact	~12 m (40 ft.)	112 dB re: 20 µPa (rms) at 160 ft.
Keystone Ferry Terminal, WA[2]	30 in. Steel Pipe Pile	Vibratory	~9 m (30 ft.)	98 dB re: 20 µPa (rms) at 36 ft.

[1] Laughlin 2005, [2] Laughlin 2010
Notes: dB = decibel, in. = inch, rms = root mean square, WA = Washington, m = meters, ft. = feet, µPa = micro Pascal

Pile driving for elevated causeway system training would occur in shallower water, and sound could be transmitted on direct paths through the water, be reflected at the water surface or bottom, or travel through bottom substrate. Soft substrates such as sand bottom at the proposed elevated causeway system locations, would absorb or attenuate the sound more readily than hard substrates (rock), which may reflect the acoustic wave. Most acoustic energy would be concentrated below 1,000 Hz. Average underwater sound levels for driving piles similar to those that would be installed for elevated causeway systems are shown in Table 3.0-12.

Table 3.0-12: Average Pile Driving Underwater Sound Levels

Pile Size &Type	Installation Method	Water Depth	Average Sound Pressure Level (peak)*	Average Sound Pressure Level (rms)*
0.61 m (24 in.) Steel Pipe Pile	Impact	5 m (15 ft.)	203 dB re: 1 µPa (peak) at 10 m	190 dB re: 1 µPa (rms) at 10 m
1 m (36 in.) Steel Pipe Pile	Vibratory	5 m (15 ft.)	180 dB re: 1 µPa (peak) at 10 m	170 dB re: 1 µPa (rms) at 10 m

* California Department of Transportation (CALTRANS) 2009
Notes: dB = decibel, ft. = foot, in. = inch, m = meter, µPa = micro Pascal, re:referenced to, rms = root mean square

3.0.5.3.1.4 Swimmer Defense Airguns

Swimmer defense airguns would be used for pierside integrated swimmer defense testing at pierside locations at Naval Base San Diego. Pierside integrated swimmer defense testing involves a limited number of impulses from a small airgun in inland waters around Navy piers. Airguns would be fired a limited number of times (up to 100) during each activity at an irregular interval as required for the testing objectives. These areas adjacent to Navy pierside integrated swimmer defense testing are industrialized, and the waterways carry a high volume of vessel traffic in addition to Navy vessels using the pier.

Underwater impulses would be generated using small (approximately 60 cubic inch [$in.^3$]) airgun, which are essentially a stainless steel tube charged with high-pressure air via a compressor. An impulsive sound is generated when the air is almost instantaneously released into the surrounding water, an effect similar to popping a balloon in air. Generated impulses would have short durations, typically a few hundred milliseconds. The root-mean-squared sound pressure level and sound exposure level at a distance 1 m from the airgun would be approximately 200–210 dB re 1 µPa and 185–195 dB re 1 $µPa^2$-s, respectively. Swimmer defense airguns lack the strong shock wave and rapid pressure increase that would be expected from explosive detonations.

3.0.5.3.1.5 Weapons Firing, Launch, and Impact Noise

Noise associated with weapons firing and the impact of non-explosive practice munitions could happen at any location within the Study Area but generally would occur at locations greater than 12 nm from shore for safety reasons. These training and testing events would occur in areas of the HRC and SOCAL Range Complex designated for anti-surface warfare and similar activities as well as in the Transit Corridor during ship transits between the HRC and SOCAL Range Complex. Testing activities involving weapons firing noise would be those events involved with testing weapons and launch systems. These activities would also take place throughout the Study Area primarily in the same locations as the training events occur, but with fewer events taking place in the Transit Corridor.

The firing of a weapon may have several components of associated noise. Firing of guns could include sound generated by firing the gun (muzzle blast), vibration from the blast propagating through a ship's hull, and sonic booms generated by the projectile flying through the air (Table 3.0-13). Missiles and targets would produce noise during launch. In addition, the impact of non-explosive practice munitions at the water surface can introduce sound into the water. Detonations of high-explosive projectiles are considered in Section 3.0.4.1.4 (Categories of Sound).

Table 3.0-13: Representative Weapons Noise Characteristics

Noise Source	Sound Level
In-Water	
Naval Gunfire Muzzle Noise (5-inch/54-caliber)	Approximately 200 dB re 1 µPa directly under gun muzzle at 5 ft. (1.5 m) below the water surface[1]
Airborne	
Naval Gunfire Muzzle Noise (5-inch/54-caliber)	178 dB re 20 µPa directly below the gun muzzle above the water surface[1]
Hellfire Missile Launch from Aircraft	149 dB re 20 µPa at 15 ft. (4.5 m)[2]
7.62-millimeter M-60 Machine Gun	90 dBA re 20 µPa at 50 ft. (15 m)[3]
0.50-caliber Machine Gun	98 dBA re 20 µPa at 50 ft. (15 m)[3]

[1] Yagla and Stiegler 2003
[2] U.S Department of the Army 1999
[3] Investigative Science and Engineering, Inc. 1997
Notes: db = decibel; dBA = decibel, A-weighted; ft. = feet; µPa = micro Pascal; re = referenced to; m = meters

Naval Gunfire Noise

Firing a ship deck gun produces a muzzle blast in air that propagates away from the muzzle in all directions, including toward the water surface. As explained in Section 3.0.4 (Acoustic and Explosives Primer) most sound enters the water in a narrow cone beneath the sound source (within 13° of vertical). In-water sound levels were measured during the muzzle blast of a 5 in. deck-mounted gun, the largest caliber gun currently used in proposed Navy activities. The highest sound level in the water (on average 200 dB re 1 µPa measured 5 ft. below the surface) was obtained when the gun was fired at the lowest angle, placing the blast closest to the water surface (U.S. Department of the Navy 2000; Yagla and Stiegler 2003). The average impulse at that location was 19.6 Pa-s. The corresponding average peak in-air pressure was 178 dB re 20 µPa, measured at the water surface below the firing point.

Gunfire also sends energy through the ship structure, into the water, and away from the ship. This effect was investigated in conjunction with the measurement of 5-in. gun blasts described above. The energy transmitted through the ship to the water for a typical round was about 6 percent of that from the air blast impinging on the water. Therefore, sound transmitted from the gun through the hull into the water is a minimal component of overall weapons firing noise.

The projectile shock wave in air by a shell in flight at supersonic speeds propagates in a cone (generally about 65°) behind the projectile in the direction of fire (Pater 1981). Measurements of a 5 in. projectile shock wave ranged from 140 to 147 dB re 20 µPa taken at the surface at 0.59 nm distance from the firing location and 10° off the line of fire for safety (approximately 623 ft. [190 m] from the shell's trajectory). Sound level intensity decreases with increased distance from the firing location and increased angle from the line of fire (Pater 1981). Like sound from the gun firing blast, sound waves from a projectile in flight would enter the water primarily in a narrow cone beneath the sound source. The region of underwater sound influence from a single traveling shell would be relatively narrow, the duration of sound influence would be brief at any point, and sound level would diminish as the shell gains altitude and loses speed. Multiple, rapid gun firings would occur from a single firing point toward a target area. Vessels participating in gunfire activities would maintain enough forward motion to maintain steerage, normally at speeds of a few knots. Acoustic impacts from weapons firing would often be concentrated in space and duration.

Launch Noise

Missiles can be rocket or jet propelled. Sound due to missile and target launches is typically at a maximum at initiation of the booster rocket. It rapidly fades as the missile or target reaches optimal thrust conditions and the missile or target reaches a downrange distance where the booster burns out and the sustainer engine continues. Launch noise level for the Hellfire missile, which is launched from aircraft, is about 149 dB re 20 µPa at 14.8 ft. (4.5 m) (U.S Department of the Army 1999).

Non- Explosive Munitions Impact Noise

Large-caliber non-explosive projectiles, non-explosive bombs, and intact missiles and targets could produce a large impulse upon impact with the water surface (McLennan 1997). Sounds of this type are produced by the kinetic energy transfer of the object with the target surface and are highly localized to the area of disturbance. Sound associated with impact events is typically of low frequency (less than 250 Hz) and of short duration.

3.0.5.3.1.6 Vessel Noise

Naval vessels (including ships, small craft, and submarines) would produce low-frequency, broadband underwater sound. In the West Coast Exclusive Economic Zone, Navy ships contribute approximately 1 percent of the broadband noise generated by large military and non-military vessels. The vast majority (89 percent) of broadband noise is produced by non-military foreign flagged vessels. In the SOCAL OPAREA, U.S. Navy vessels contribute only 4 percent of the broadband noise generated in the OPAREA by large vessels (Mintz and Filadelfo 2011). Overall, naval traffic is often a minor component of total vessel traffic (Mintz and Filadelfo 2011; Mintz and Parker 2006).

Exposure to vessel noise would be greatest in the areas of highest naval vessel traffic. In an attempt to determine traffic patterns for Navy and non-Navy vessels for the SOCAL portion of the Study Area, a review by the Center for Naval Analysis (Mintz and Parker 2006) was conducted on commercial vessels, coastal shipping patterns, and Navy vessels. Commercial and non-Navy traffic, which included cargo vessels, bulk carriers, passenger vessels, and oil tankers (all over 65 ft. [20 m] in length), was heaviest near the major shipping port of Los Angeles and could be seen in the east to west and north to south international shipping lanes (Figure 3.0-16).

Subsequent recent analysis by Mintz (2012) demonstrated that in 2009, within the boundaries of the Study Area, there was a total of 971,214 vessel hours and the Navy accounted for 96,685 of those hours or approximately 10 percent of the total. Military vessels would comprise an even smaller proportion of total vessels if smaller vessels (less than 65 ft. [20 m] in length) were included (Mintz and Filadelfo 2011).

Commercial vessel traffic, which included cargo vessels, bulk carriers, passenger vessels, and oil tankers (all over 65 ft. [20 m] in length), was heaviest near and between the major shipping ports along the U.S. west coast, including San Diego, Los Angles, San Francisco, and Seattle. Vessel traffic continued to be heavy along the Mexican coast as commercial vessels transited to the Panama Canal. Well defined commercial transit routes extend from the U.S. west coast to Hawaii and international destinations (e.g., Japan). Commercial vessel traffic between the Panama Canal and the Hawaiian Islands is heavier than commercial traffic between the U.S. west coast and Hawaii (Mintz 2012). Compared to coastal vessel activity, there was relatively little concentration of vessels in the other portions of the Study Area (Mintz and Parker 2006).

Radiated noise from Navy ships ranges over several orders of magnitude. The quietest Navy warships radiate much less broadband noise than a typical fishing vessel, while the loudest Navy ships are almost on par with large oil tankers (Mintz and Filadelfo 2011). For comparison, a typical commercial cargo vessel radiates broadband noise at a source level around 172 dB re 1 µPa and a typical fishing vessel radiates noise at a source level of about 158 dB re 1 µPa (Richardson et al. 1995; Urick 1983). Typical large vessel ship-radiated noise is dominated by tonals related to blade and shaft sources at frequencies below about 50 Hz and by broadband components related to cavitation and flow noise at higher frequencies (approximately around the one-third octave band centered at 100 Hz) (Richardson et al. 1995; Urick 1983).

The acoustic signatures of naval vessels is classified information. Anti-submarine warfare platforms (such as DDGs and CGs) and submarines make up a large part of Navy traffic but contribute little noise to the overall sound budget of the oceans as these vessels are designed to be quiet to minimize detection. These platforms are much quieter than Navy oil tankers, for example, which have a smaller presence but contribute substantially more broadband noise than anti-submarine warfare platforms (Mintz and Filadelfo 2011). Sound produced by vessels will typically increase with speed. During training, speeds of most larger naval vessels generally range from 10 to 15 knots; however, ships will, on occasion, operate at higher speeds within their specific operational capabilities.

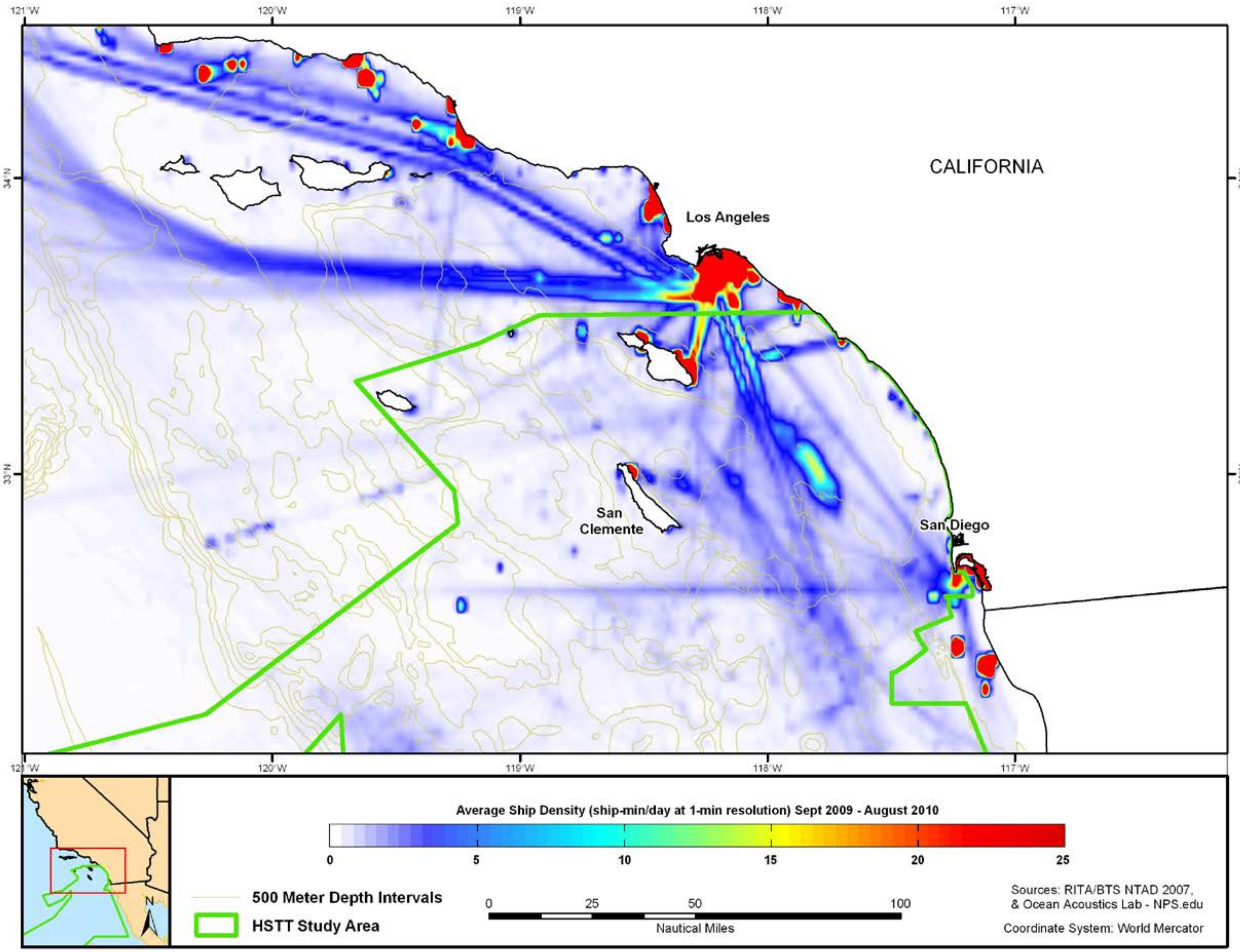


Figure 3.0-16: Average Ship Density in Southern California, September 2009 to August 2010

A variety of smaller craft, such as service vessels for routine operations and opposition forces used during training events, would be operating within the Study Area. These small craft types, sizes, and speeds vary, but in general, they will emit higher-frequency noise than larger ships.

While commercial traffic (and, therefore, broadband noise generated by it) is relatively steady throughout the year, Navy traffic is episodic in the ocean. Vessels engaged in training and testing may consist of a single vessel involved in unit-level activity for a few hours or multiple vessels involved in a major training exercise that could last a few days within a given area. Activities involving vessel movements occur intermittently and are variable in duration, ranging from a few hours to up to two weeks. Navy vessels do contribute to the overall increased ambient noise in inland waters near Navy ports, although their contribution to the overall noise in these environments is minimal because these areas typically have large amounts of commercial and recreational vessel traffic.

3.0.5.3.1.7 Aircraft Overflight Noise

Fixed- and rotary-wing aircraft are used for a variety of training and testing activities throughout the Study Area, contributing both airborne and underwater sound to the ocean environment. Aircraft used in training and testing generally have reciprocating, turboprop, or jet engines. Motors, propellers, and rotors produce the most noise, with some noise contributed by aerodynamic turbulence. Aircraft sounds have more energy at lower frequencies. Takeoffs and landings occur at established airfields as well as on vessels at sea throughout the Study Area. Most aircraft noise would be produced around air stations in the range complexes. Military activities involving aircraft generally are dispersed over large expanses of open ocean but can be highly concentrated in time and location. Source levels for some typical aircraft used during training and testing in the Study Area are shown in Table 3.0-14.

Table 3.0-14: Representative Aircraft Sound Characteristics

Noise Source	Sound Level
In-Water	
F/A-18 Subsonic at 1,000 ft. (300 m) Altitude	148 dB re 1 µPa at 6 ft. (2 m) below water surface[1]
F/A-18 Subsonic at 10,000 ft. (3,000 m) Altitude	128 dB re 1 µPa at 6 ft. (2 m) below water surface[1]
H-60 Helicopter Hovering at 50 ft. (15 m) Altitude	Approximately 125 dB re 1 µPa at 3 ft. (1 m) below water surface
Airborne	
Jet Aircraft under Military Power	144 dBA re 20 µPa at 50 ft. (15 m) from source[2]
Jet Aircraft under Afterburner	148 dBA re 20 µPa at 50 ft. (15 m) from source[2]
H-60 Helicopter Hovering	90 dBA re 20 µPa at 50 ft. (15 m) from source[3]

[1] Eller and Cavanagh 2000
[2] U.S. Department of the Navy 2009
[3] Bousman and Kufeld 2005
Notes: dB = decibel; dBA = decibel, A-weighted; ft. = foot; m = meter; µPa = micro Pascal; re = referenced to

Fixed-Wing Aircraft

Noise generated by fixed-wing aircraft is transient in nature and extremely variable in intensity. Most fixed-wing aircraft sorties would occur above 3,000 ft. (900 m). Air combat maneuver altitudes generally range from 5,000 to 30,000 ft. (1.5 to 9.1 km) and typical airspeeds range from very low (less than 100 knots) to high subsonic (less than 600 knots). Sound exposure levels at the sea surface from most air combat maneuver overflights are expected to be less than 85 dBA (based on an FA-18 aircraft flying at an altitude of 5,000 ft. [1,500 m] and at a subsonic airspeed [400 knots]) (U.S. Department of the Navy 2009). Exposure to fixed-wing aircraft noise would be brief (seconds) as an aircraft quickly passes overhead.

Helicopters

Noise generated from helicopters is transient in nature and extremely variable in intensity. In general, helicopters produce lower-frequency sounds and vibration at a higher intensity than fixed-wing aircraft (Richardson et al. 1995). Helicopter sounds contain dominant tones from the rotors that are generally below 500 Hz. Helicopters often radiate more sound forward than backward. The underwater noise produced is generally brief when compared with the duration of audibility in the air.

Helicopter unit level training typically entails a high volume of single-aircraft sorties over water that start and end at an air station, although flights may occur from ships at sea. Individual flights typically last about two to four hours. Some events require low-altitude flights over a defined area, such as mine countermeasure activities deploying towed systems. Most helicopter sorties associated with mine countermeasures would occur at altitudes as low as 75 to 100 ft. (23 to 31 m). Likewise, in some anti-submarine warfare events, a dipping sonar is deployed from a line suspended from a helicopter hovering at low altitudes over the water.

Underwater Transmission of Aircraft Noise

Sound generated in air is transmitted to water primarily in a narrow area directly below the aircraft (see Section 3.0.4 Acoustic and Explosives Primer). A sound wave propagating from an aircraft must enter the water at an angle of incidence of 13° or less from the vertical for the wave to continue propagating under the water's surface. At greater angles of incidence, the water surface acts as an effective reflector of the sound wave and allows very little penetration of the wave below the water (Urick 1983). Water depth and bottom conditions strongly influence propagation and levels of underwater noise from passing aircraft. For low-altitude flights, sound levels reaching the water surface would be higher, but the transmission area would be smaller. As an aircraft gains altitude, sound reaching the water surface will diminishes, but the possible transmission area increases. Estimates of underwater sound pressure level are provided for representative aircraft in Table 3.0-14.

Underwater sound from aircraft overflights has been modeled for some airframes. Eller and Cavanagh (2000) modeled underwater sound pressure level as a function of time at various depths (2, 10, and 50 m) for F/A-18 Hornet aircraft subsonic overflights (250 knots) at various altitudes (300, 1,000, and 3,000 m). For the worst modeled case of an F/A-18 at the lowest altitude (300 m), the sound level at 2 m below the surface peaked at 152 dB re 1 µPa, and the sound level at 50 m below the surface peaked at 148 dB re 1 µPa. When F/A-18 flight was modeled at 3,000 m altitude, peak sound level at 2 m depth dropped to 128 dB re 1 µPa.

Sonic Booms

An intense but infrequent type of aircraft noise is the sonic boom, produced when an aircraft exceeds the speed of sound. Supersonic aircraft flights are usually limited to altitudes above 30,000 ft. (9,100 m) or locations more than 30 nm from shore. Several factors influence sonic booms: weight, size, shape of aircraft or vehicle; altitude; flight paths; and atmospheric conditions. A larger and heavier aircraft must displace more air and create more lift to sustain flight, compared with small, light aircraft. Therefore, larger aircraft create sonic booms that are stronger and louder than those of smaller, lighter aircraft. Consequently, the larger and heavier the aircraft, the stronger the shock waves (U.S. Department of the Navy 2007).

Of all the factors influencing sonic booms, increasing altitude is the most effective method of reducing sonic boom intensity. The width of the boom "carpet" or area exposed to sonic boom beneath an aircraft is about 1 mi. (1.6 km) for each 1,000 ft. (300 m) of altitude. For example, an aircraft flying supersonic straight and level at 50,000 ft. (15,000 m) can produce a sonic boom carpet about 50 miles (80 km) wide. The sonic boom, however, would not be uniform, and its intensity at the water surface would decrease with greater aircraft altitude. Maximum intensity is directly beneath the aircraft and decreases as the lateral distance from the flight path increases until shock waves refract away from the ground and the sonic boom attenuates. The lateral spreading of the sonic boom depends only on altitude, speed, and the atmosphere and is independent of the vehicle's shape, size, and weight. The ratio of the aircraft length to maximum cross-sectional area also influences the intensity of the sonic boom. The longer and more slender the aircraft, the weaker the shock waves. The wider and more blunt the aircraft, the stronger the shock waves can be (U.S. Department of the Navy 2007).

F/A-18 Hornet supersonic flight was modeled to obtain peak sound pressure levels and energy flux density at the water surface and at depth (Laney and Cavanagh 2000). These results are shown in Table 3.0-15.

Table 3.0-15: Sonic Boom Underwater Sound Levels Modeled for F/A-18 Hornet Supersonic Flight

Mach Number*	Aircraft Altitude (km)	Peak Pressure (dB re 1 μPa)			Energy Flux Density (dB re 1 μPa^2-s)		
		At surface	50 m Depth	100 m Depth	At surface	50 m Depth	100 m Depth
1.2	1	176	138	126	160	131	122
	5	164	132	121	150	126	117
	10	158	130	119	144	124	115
2	1	178	146	134	161	137	128
	5	166	139	128	150	131	122
	10	159	135	124	144	127	119

* Mach number equals aircraft speed divided by the speed of sound
Notes: dB = decibel, km = kilometer, m = meter, μPa = micro Pascal, μPa^2-s = squared micro Pascal-second, re = referenced to

3.0.5.3.2 Energy Stressors

This section describes the characteristics of energy introduced into the water through naval training and testing and the relative magnitude and location of these activities to provide the basis for analysis of potential electromagnetic and laser impacts to resources in the remainder of Chapter 3.

3.0.5.3.2.1 Electromagnetic Devices

Electromagnetic energy emitted from magnetic influence mine neutralization systems is analyzed in this document. The training and testing activities that involve the use of magnetic influence mine neutralization systems are detailed in Table 3.0-16 through Table 3.0-18.

Table 3.0-16: Training Activities That Involve the Use of Electromagnetic Devices

Training
Mine Warfare
• Mine Countermeasure – Towed Mine Neutralization • Civilian Port Defense

Table 3.0-17: Testing Activities That Involve the Use of Electromagnetic Devices

Testing
Mine Warfare
• Airborne Towed Minesweeping Test • Mine Countermeasure/Neutralization Testing

Table 3.0-18: Annual Number and Location of Electromagnetic Energy Events

Activity Area	Training			Testing		
	No Action	Alternative 1	Alternative 2	No Action	Alternative 1	Alternative 2
HRC	0	1	1	0	0	0
SOCAL	240	241	241	15	27	31
SSTC	100	100	100	0	0	0
Total	**340**	**342**	**342**	**15**	**27**	**31**

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California (Range Complex), SSTC = Silver Strand Training Complex

The majority of devices involved in the activities described above include towed or unmanned mine warfare systems that simply mimic the electromagnetic signature of a vessel passing through the water. None of the devices include any type of electromagnetic "pulse." An example of a representative device is the Organic Airborne and Surface Influence Sweep that would be used by a MH-60S helicopter at sea. The Organic Airborne and Surface Influence Sweep is towed from a forward flying helicopter and works by emitting an electromagnetic field and mechanically generated underwater sound to simulate the presence of a ship. The sound and electromagnetic signature cause nearby mines to detonate.

Generally, voltage used to power these systems is around 30 volts relative to seawater. This amount of voltage is comparable to two automobile batteries. Since saltwater is an excellent conductor, only very moderate voltages of 35 volts (capped at 55 volts) are required to generate the current. These small levels represent no danger of electrocution in the marine environment, because the difference in electric charge is very low in saltwater.

The static magnetic field generated by the electromagnetic devices is of relatively minute strength. Typically, the maximum magnetic field generated would be approximately 23 gauss (G). This level of electromagnetic density is very low compared to magnetic fields generated by other everyday items. The magnetic field generated is between the levels of a refrigerator magnet (150–200 G) and a standard household can opener (up to 4 G at 4 in.). The strength of the electromagnetic field decreases quickly away from the cable. The magnetic field generated at a distance of 13.12 ft. (4 m) from the source is comparable to the earth's magnetic field, which is approximately 0.5 G. The strength of the field at just under 26 ft. (8 m) is only 40 percent of the earth's field, and only 10 percent at 79 ft. (24 m). At a radius of 656 ft. (200 m) the magnetic field would be approximately 0.002 G (U.S. Department of the Navy 2005).

The kinetic energy weapon (commonly referred to as the rail gun) is under development and will likely be tested and eventually used in training events aboard surface vessels, firing non-explosive projectiles at land or sea-based targets. The system uses stored electrical energy to accelerate the projectiles, which are fired at supersonic speeds over great distances. The system charges for two minutes, and fires in less than a second, therefore, any electromagnetic energy released would be done so over a very short period. Also, the system would likely be shielded so as not to affect shipboard controls and systems. The amount of electromagnetic energy released from this system would likely be low and contained on the surface vessel. Therefore, this device is not expected to result in any impacts and will not be further analyzed for biological resources in this document.

3.0.5.3.2.2 Lasers

Laser devices can be organized into two categories: (1) low energy lasers and (2) high energy lasers. Low energy lasers are used to illuminate or designate targets, to guide weapons, and to detect or classify mines. High energy lasers are used as weapons to disable surface targets. No high energy lasers would be used in the Study Area as part of the Proposed Action, and are not discussed further.

Low Energy Lasers

Within the category of low energy lasers, the highest potential level of exposure would be from an airborne laser beam directed at the ocean's surface. An assessment on the use of low energy lasers by the Navy determined that low energy lasers, including those involved in the training and testing activities in this EIS/OEIS, have an extremely low potential to impact marine biological resources (Swope 2010). The assessment determined that the maximum potential for laser exposure is at the ocean's surface, where laser intensity is greatest (Swope 2010). As the laser penetrates the water, 96 percent of a laser beam is absorbed, scattered, or otherwise lost (Ulrich 2004). Based on the parameters of the low energy lasers and the behavior and life history of major biological groups, it was determined the greatest potential for impact would be to the eye of a marine mammal or sea turtle. However, an animal's eye would have to be exposed to a direct laser beam for at least 10 seconds or longer to sustain damage. Swope (2010) assessed the potential for damage based on species specific eye/vision parameters and the anticipated output from low energy lasers and determined that no animals were predicted to incur damage. Therefore, low energy lasers are not analyzed further in this document as a stressor to biological resources.

3.0.5.3.3 Physical Disturbance and Strike Stressors

This section describes the characteristics of physical disturbance and strike stressors from Navy training and testing activities. It also describes the relative magnitude and location of these activities to provide the basis for analyzing the potential physical disturbance and strike impacts to resources in the remainder of Chapter 3.

3.0.5.3.3.1 Vessels

Vessels used as part of the Proposed Action include ships (e.g. aircraft carriers, surface combatants), support craft, and submarines ranging in size from 5 to over 300 meters. Table 3.0-19 provides examples of the types of vessels, length, and speeds used in both testing and training activities. The U.S. Navy Fact Files on the World Wide Web provide the latest information on the quantity and specifications of the vessels operated by the Navy.

Navy ships transit at speeds that are optimal for fuel conservation or to meet operational requirements. Large Navy ships generally operate at speeds in the range of 10 to 15 knots, and submarines generally operate at speeds in the range of 8 to 13 knots. Small craft (for purposes of this discussion, less than 40 ft. [12 m] in length), which are all support craft, have much more variable speeds (dependent on the mission). While these speeds are representative of most events, some vessels need to operate outside of these parameters. For example, to produce the required relative wind speed over the flight deck, an aircraft carrier vessel group engaged in flight operations must adjust its speed through the water accordingly. Conversely, there are other instances such as launch and recovery of a small rigid hull inflatable boat, vessel boarding, search, and seizure training events or retrieval of a target when vessels would be dead in the water or moving slowly ahead to maintain steerage. There are a few specific events including high speed tests of newly constructed vessels such as aircraft carriers, amphibious assault ships and the joint high speed vessel (which will operate at an average speed of 35 knots) where vessels would operate at higher speeds.

Table 3.0-19: Representative Vessel Types, Lengths, and Speeds

Type	Example(s)	Length	Typical Operating Speed	Max Speed
Aircraft Carrier	Aircraft Carrier (CVN)	>300 m	10–15 knots	30+ knots
Surface Combatant	Cruisers (CG), Destroyers (DDG), Frigates (FFG), Littoral Combat Ships (LCS)	100–200 m	10–15 knots	30+ knots
Amphibious Warfare Ship	Amphibious Assault Ship (LHA, LHD), Amphibious Transport Dock (LPD), Dock Landing Ship (LSD)	100–300 m	10–15 knots	20+ knots
Support Craft/Other	Amphibious Assault Vehicle (AAV); Combat Rubber Raiding Craft (CRRC); Landing Craft, Mechanized (LCM); Landing Craft, Utility (LCU); Submarine Tenders (AS); Yard Patrol Craft (YP)	5–45 m	Variable	20 knots
Support Craft/Other – Specialized High Speed	High Speed Ferry/Catamaran; Patrol Coastal Ships (PC); Rigid Hull Inflatable Boat (RHIB)	20–40 m	Variable	50+ knots
Submarines	Fleet Ballistic Missile Submarines (SSBN), Attack Submarines (SSN), Guided Missile Submarines (SSGN)	100–200 m	8–13 knots	20+ knots

Notes: > greater than, m = meters

The number of Navy vessels in the Study Area at any given time varies and is dependent on local training or testing requirements. Most activities include either one or two vessels and may last from a few hours up to two weeks. Vessel movement as part of the Proposed Action would be widely dispersed throughout the Study Area, but more concentrated in portions of the Study Area near ports, naval installations, range complexes and testing ranges.

In an attempt to determine traffic patterns for Navy and non-Navy vessels, the Center for Naval Analysis (Mintz and Parker 2006) conducted a review of historic data for commercial vessels, coastal shipping patterns, and Navy vessels. Commercial and non-Navy traffic, which included cargo vessels, bulk carriers, passenger vessels and oil tankers (all over 65 ft. [20 m] in length), was heaviest along the U.S. west coast between San Diego and Seattle (Puget Sound) and between the Hawaiian Islands (Mintz and Parker 2006). Well defined International shipping lanes within the Study Area are also heavily traveled. Compared to coastal vessel activity, there was relatively little concentration of vessels in the other portions of the Study Area (Mintz and Parker 2006). Navy traffic in the Study Area was heaviest offshore of the naval ports at San Diego and Pearl Harbor.

Data from 2009 were analyzed by Mintz and Filadelfo (2011) and indicated that along the Pacific U.S. Exclusive Economic Zone, Navy vessels accounted for slightly less than 6 percent of the total large vessel traffic (from estimated vessel hours) in that area. In the SOCAL Range Complex where Navy vessel activity is concentrated within the Exclusive Economic Zone, the Navy vessels accounted for 24 percent of the total large vessel traffic.

The training and testing activities listed in Table 3.0-20 through Table 3.0-29 involve the use of vessels. Major training events involving multiple vessels are not accounted for in Table 3.0-20 through Table 3.0-29 as these events are accounted for elsewhere within the warfare areas and not as stand-alone activities.

Table 3.0-20: Training Activities that Involve the Use of Aircraft Carriers

Training
Anti-Air Warfare
• Air Defense Exercises
Anti-Submarine Warfare
• Anti-Submarine Warfare for Composite Training Unit Exercise • Anti-Submarine Warfare for Joint Task Force Exercise/Sustainment Exercise

Table 3.0-21: Testing Activities that Involve the Use of Aircraft Carriers

Testing
Other Testing Activities
• Test and Evaluation Catapult Launch
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Countermeasure Testing

Table 3.0-22: Training Activities that Involve the Use of Surface Combatants

Training
Anti-Air Warfare
• Air Defense Exercises • Gunnery Exercise (Surface-to-Air) – Large-Caliber • Gunnery Exercise (Surface-to-Air) – Medium-Caliber • Missile Exercise (Surface-to-Air)
Amphibious Warfare
• Fire Support Exercise-Land-based target • Fire Support Exercise – At Sea • Expeditionary Fires Exercise/Supporting Arms Coordination Exercise
Anti-Surface Warfare
• Maritime Security Operations • Gunnery Exercise Surface-to-Surface (Ship) – Small-Caliber; Medium-Caliber; Large-Caliber • Missile Exercise (Surface-to-Surface) • Laser Targeting • Sinking Exercise

Table 3.0-22: Training Activities that Involve the Use of Surface Combatants (continued)

Training
Anti-Submarine Warfare
• Tracking Exercise/Torpedo Exercise – Surface • Tracking Exercise/Torpedo Exercise – Helicopter • Tracking Exercise/Torpedo Exercise – Maritime Patrol Aircraft • Multi-Strike Group Exercise • Rim of the Pacific Exercise • Integrated Anti-Submarine Warfare Course • Group Sail • Submarine Command Course • Anti-Submarine Warfare for Composite Training Unit Exercise • Anti-Submarine Warfare for Joint Task Force Exercise/Sustainment Exercise
Electronic Warfare
• Electronic Warfare Operations • Counter Targeting Chaff Exercise – Ship
Mine Warfare
• Mine Countermeasures Exercise – Ship Sonar • Mine Countermeasures Exercise – Surface • Airborne Mine Countermeasures – Towed Mine Neutralization • Mine Countermeasures – Mine Detection • Mine Countermeasures – Mine Neutralization Small-Caliber - and Medium-Caliber • Mine Countermeasures – Mine Neutralization – Remotely Operated Vehicle • Civilian Port Defense
Other Training Exercises
• Precision Anchoring • Offshore Petroleum Discharge System • Salvage Operations • Surface Ship Sonar Maintenance (in Operating Areas and Ports)

Table 3.0-23: Testing Activities that Involve the Use of Surface Combatants

Testing
Anti-Submarine Warfare
• Sonobuoy Lot Acceptance test
New Ship Construction
• Surface Combatant Sea Trials – Propulsion Testing • Surface Combatant Sea Trials – Gun Testing – Large-Caliber • Surface Combatant Sea Trials – Missile Testing • Surface Combatant Sea Trials – Decoy Testing • Surface Combatant Sea Trials – Surface Warfare Testing – Large-Caliber • Surface Combatant Sea Trials – Anti-Submarine Warfare Testing • Other Class Ship Sea Trial – Propulsion Testing • Other Class Ship Sea Trial – Gun Testing Small-Caliber • Anti-Submarine Warfare Mission Package Testing • Surface Warfare Mission Package Testing – Gun Testing Small-Caliber; Medium-Caliber; Large-Caliber • Surface Warfare Mission Package Testing – Missile/Rocket Testing • Mine Countermeasure Mission Package Testing • Post-Homeporting Testing (all classes)
Life Cycle Activities
• Ship Signature Testing • Surface Ship Sonar Testing/Maintenance (in Operating Areas and Ports) • Combat System Ship Qualification Trial – Air Defense • Combat System Ship Qualification Trial – Surface Warfare • Combat System Ship Qualification Trial – Undersea Warfare
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Missile Testing • Kinetic Energy Weapon Testing • Torpedo (Non-Explosive) Testing • Torpedo (Explosive) Testing • Countermeasure Testing • At-Sea Sonar Testing
Mine Warfare Testing
• Mine Detection and Classification • Mine Countermeasure/Neutralization Testing
Shipboard Protection Systems and Swimmer Defense Testing
• Shipboard Protection Systems Testing • Chemical/Biological Simulant Testing
Other
• Acoustic Communications Testing

Table 3.0-24: Training Activities That Involve the Use of Amphibious Warfare Ships

Training
Anti-Air Warfare
• Air Defense Exercises
Amphibious Warfare
• Expeditionary Fires Exercise/Supporting Arms Coordination Exercise • Amphibious Assault • Amphibious Raid • Amphibious Assault-Battalion Landing • Humanitarian Assistance Operations

Table 3.0-25: Testing Activities That Involve the Use of Amphibious Warfare Ships

Testing
New Ship Construction
• Other Class Ship Sea Trial – Propulsion Testing • Other Class Ship Sea Trial – Gun Testing Small-Caliber • Post-Homeporting Testing (All Classes)
Life Cycle Activities
• Combat System Ship Qualification Trial – Air Defense • Combat System Ship Qualification Trial – Surface Warfare
Mine Warfare Testing
• Mine Detection and Classification • Mine Countermeasure/Neutralization Testing

Table 3.0-26: Training Activities That Involve the Use of Support Craft

Training
Amphibious Warfare
• Naval Surface Fire Support Exercise – At Sea • Amphibious Assault • Amphibious Raid
Strike Warfare
• High-Speed Anti-Radiation Missile Exercise (Air - to - Surface)
Anti-Surface Warfare
• Maritime Security Operations • Gunnery Exercise Surface-to-Surface (Boat) – Small-Caliber; Medium-Caliber • Laser Targeting

Table 3.0-26: Training Activities That Involve the Use of Support Craft (continued)

Training
Anti-Submarine Warfare
• Tracking Exercise/Torpedo Exercise – Submarine • Tracking Exercise/Torpedo Exercise – Surface • Tracking Exercise/Torpedo Exercise – Maritime Patrol Aircraft
Mine Warfare
• Mine Neutralization/Explosive Ordnance Disposal • Mine Countermeasure – Mine Detection • Civilian Port Defense
Naval Special Warfare
• Underwater Demolition Multiple Charge – Mat Weave and Obstacle Loading • Underwater Demolition Qualification/Certification
Major Training Events
• Composite Training Unit Exercise
Other Training Exercises
• Small Boat Attack • Offshore Petroleum Discharge System • Elevated Causeway System • Salvage Operations

Table 3.0-27: Testing Activities That Involve the Use of Support Craft

Testing
New Ship Construction
• Surface Combatant Sea Trials – Missile Testing • Other Class Ship Sea Trial – Propulsion Testing • Other Class Ship Sea Trial – Gun Testing Small-Caliber • Post-Homeporting Testing (All Classes)
Life Cycle Activities
• Ship Signature Testing
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Torpedo (Non-Explosive) Testing • Torpedo (Explosive) Testing
Shipboard Protection Systems and Swimmer Defense Testing
• Pierside Integrated Swimmer Defense
Unmanned Vehicle Testing
• Unmanned Vehicle Development and Payload Testing

Table 3.0-27: Testing Activities That Involve the Use of Support Craft (continued)

Testing
Other Testing
• Special Warfare • Fixed System Underwater Communications • Fixed Autonomous Oceanographic Research and Meteorology and Oceanography • Fixed Intelligence, Surveillance, and Reconnaissance Sensor Systems • Fixed Sensor Systems Test

Table 3.0-28: Training Activities That Involve the Use of Submarines

Training
Anti-Surface Warfare
• Sinking Exercise
Anti-Submarine Warfare
• Tracking Exercise/Torpedo Exercise – Submarine • Tracking Exercise/Torpedo Exercise – Surface • Tracking Exercise/Torpedo Exercise – Maritime Patrol Aircraft • Tracking Exercise – Maritime Patrol Aircraft Extended Echo Ranging Sonobuoys • Anti-Submarine Warfare Tactical Development Exercise • Submarine Command Course
Mine Warfare
• Submarine Mine Exercise
Naval Special Warfare
• Personnel Insertion/Extraction-Submarine
Major Training Events
• Composite Training Unit Exercise • Joint Task Force Exercise/Sustainment Exercise • Rim of the Pacific Exercise • Multi-Strike Group Exercise • Integrated Anti-Submarine Warfare Course • Group Sail • Undersea Warfare Exercise • Ship Anti-Submarine Warfare Readiness and Evaluation Measuring
Other Training Exercises
• Submarine Navigational • Submarine Under Ice Certification • Submarine Sonar Maintenance (in Operating Areas and Ports)

Table 3.0-29: Testing Activities That Involve the Use of Submarines

Testing
Life Cycle Activities
• Submarine Sonar Testing/Maintenance (in Operating Areas and Ports) • Ship Signature Testing
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Anti-submarine Warfare Tracking Test – Helicopter • Anti-submarine Warfare Tracking Test – Maritime Patrol Aircraft • Missile Testing • Electronic Warfare Testing • Torpedo (Non-Explosive) Testing • Torpedo (Explosive) Testing • At-Sea Sonar Testing
Unmanned Vehicle Testing
• Underwater Deployed Unmanned Aerial System Testing
Other
• Special Warfare • Acoustic Communications Testing

Table 3.0-30 provides the estimated number of events that include the use of vessels for each alternative. The location and hours of Navy vessel usage for testing and training are most dependent upon the locations of Navy ports, piers and established at-sea testing and training areas. These areas have not appreciably changed in the last decade and are not expected to change in the foreseeable future.

Table 3.0-30: Annual Number and Location of Events Including Vessel Movement

Activity Area	Training			Testing		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
HRC	846	1,856	1,856	4,587	4,957	5,677
SOCAL	6,732	7,287	7,287	4,761	5,196	5,729
SSTC	268	268	268	71	78	87
Transit Corridor	0	79	79	0	2	3
Total	**7,846**	**9,490**	**9,490**	**9,419**	**10,233**	**11,496**

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California (Range Complex), SSTC = Silver Strand Training Complex

While these estimates provide the average distribution of vessels; actual locations and hours of Navy vessel usage are dependent upon requirements, deployment schedules, annual budgets and other unpredictable factors. Consequently, vessel use can be highly variable. The difference between the No Action Alternative and Alternatives 1 and 2 includes an expansion of the Study Area and an increase in the number of activities. Because multiple activities usually occur from the same vessel, the increased activities would not necessarily result in an increase in vessel use or transit. The concentration of use in and the manner in which the Navy uses vessels to accomplish its testing and training activities is likely to remain consistent with the range of variability observed over the last decade. Consequently, the Navy is not proposing appreciable changes in the levels, frequency or locations where vessels have been used over the last decade.

3.0.5.3.3.2 In-Water Devices

In-water devices as discussed in this analysis are unmanned vehicles, such as remotely operated vehicles, unmanned surface vehicles, unmanned undersea vehicles, and towed devices. These devices are self-propelled and unmanned or towed through the water from a variety of platforms, including helicopters and surface ships. In-water devices are generally smaller than most Navy vessels ranging from several inches to about 15 m. See Table 3.0-31 for a range of in-water devises used.

Table 3.0-31: Representative Types, Sizes, and Speeds of In-water Devices

Type	Example(s)	Length	Typical Operating Speed
Towed Device	Minehunting SONAR AQS Systems; Improved Surface Tow Target; Towed SONAR System; MK-103, MK-104 and MK-105 Minesweeping Systems; OASIS, Orion, Shallow Water Intermediate Search System, Towed Pinger Locator 30	< 10 m	10–40 knots
Unmanned Surface Vehicle	MK-33 SEPTAR Drone Boat, QST-35A Seaborne Powered Target, Ship Deployable Seaborne Target, Small Waterplane Area Twin Hull, Unmanned Influence Sweep System (UISS)	< 15 m	Variable, up to 50+ knots
Unmanned Undersea Vehicle	Acoustic Mine Targeting System, Airborne Mine Neutralization System (AMNS), AN/ASQ Systems, Archerfish Common Neutralizer, Crawlers, CURV 21, Deep Drone 8000, Deep Submergence Rescue Vehicle, Gliders, EMATTs, Light and Heavy Weight Torpedoes, Large Diameter Unmanned Underwater Vehicle, Magnum ROV, Manned Portables, MINIROVs, MK 30 ASW Targets, RMMV, Remote Minehunting System (RMS), Unmanned Influence Sweep System (UISS)	< 15 m	1–15 knots

Notes: EMATT = Expendable Mobile Anti-Submarine Warfare Training Target, ROV = Remotely Operated Vehicle, MINIROV = miniature ROV , RMMV = Remote Multi-Mission Vehicle

These devices can operate anywhere from the water surface to the benthic zone. Certain devices do not have a realistic potential to strike living marine resources because they either move slowly through the water column (e.g. most unmanned undersurface vehicles) or are closely monitored by observers manning the towing platform (e.g. most towed devices). Because of their size and potential operating speed, in-water devices that operate in a manner with the potential to strike living marine resources are the Unmanned Surface Vehicles.

Training and testing activities that employ towed in-water devices are listed in Table 3.0-32 through Table 3.0-37.

Table 3.0-32: Training Activities That Involve the Use of Towed Devices

Training
Anti-Surface Warfare
• Gunnery Exercise Surface-to-Surface (Ship) – Small-Caliber; Medium-Caliber • Gunnery Exercise Surface-to-Surface (Boat) – Medium-Caliber • Missile Exercise (Surface-to-Surface) • Gunnery Exercise (Air-to-Surface) – Small-Caliber; Medium-Caliber • Missile Exercise (Air-to-Surface) – Rocket • Missile Exercise (Air-to-Surface)
Anti-Submarine Warfare
• Integrated Anti-Submarine Warfare Course • Group Sail
Mine Warfare
• Mine Countermeasures Exercise – Ship Sonar • Mine Countermeasure – Towed Mine Neutralization • Mine Countermeasure – Mine Detection • Civilian Port Defense

Table 3.0-33: Testing Activities That Involve the Use of Towed Devices

Testing
Mine Warfare
• Airborne Towed Minesweeping Test • Airborne Towed Minehunting Sonar Test
New Ship Construction
• Mine Countermeasure Mission Package Testing
Life Cycle Activities
• Combat System Ship Qualification Trial – Surface Warfare
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Countermeasure Testing

Table 3.0-34: Training Activities That Involve the Use of Unmanned Surface Vehicles

Training
Amphibious Warfare
• Amphibious Raid
Anti-Surface Warfare
• Maritime Security Operations • Gunnery Exercise Surface-to-Surface (Ship) – Small-Caliber; Medium-Caliber; Large-Caliber • Missile Exercise (Surface-to-Surface) • Gunnery Exercise (Air-to-Surface) – Small-Caliber; Medium-Caliber • Missile Exercise (Air-to-Surface)

Table 3.0-34: Training Activities That Involve the Use of Unmanned Surface Vehicles (continued)

Training
Mine Warfare
• Mine Countermeasure – Towed Mine Neutralization • Mine Countermeasure – Mine Detection • Civilian Port Defense
Major Range Events
• Composite Training Unit Exercise

Table 3.0-35: Testing Activities That Involve the Use of Unmanned Surface Vehicles

Testing
New Ship Construction
• Surface Combatant Sea Trials – Surface Warfare Testing – Large-Caliber
Life Cycle Activities
• Combat System Ship Qualification Trial – Anti-Surface Warfare
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Missile Testing
Shipboard Protection Systems and Swimmer Defense Testing
• Shipboard Protection Systems Testing
Unmanned Vehicle Testing
• Unmanned Vehicle Development and Payload Testing

Table 3.0-36: Training Activities That Involve the Use of Unmanned Underwater Vehicles

Training
Anti-Surface Warfare
• Sinking Exercise
Anti-Submarine Warfare
• Tracking Exercise/Torpedo Exercise – Submarine • Tracking Exercise/Torpedo Exercise – Surface • Tracking Exercise/Torpedo Exercise – Maritime Patrol Aircraft • Integrated Anti-Submarine Warfare Course • Group Sail • Submarine Command Course Operations • Anti-Submarine Warfare for Composite Training Unit Exercise • Anti-Submarine Warfare for Joint Task Force Exercise/Sustainment Exercise
Mine Warfare
• Mine Countermeasures Exercise – Ship Sonar • Mine Countermeasure – Towed Mine Neutralization • Mine Countermeasure – Mine Detection • Mine Countermeasures – Mine Neutralization – Remotely Operated Vehicle • Civilian Port Defense

Table 3.0-37: Testing Activities That Involve the Use of Unmanned Underwater Vehicles

Testing
Anti-Submarine Warfare
• Anti-Submarine Warfare Torpedo Test • Anti-Submarine Tracking Test – Helicopter • Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft
Mine Warfare
• Airborne Mine Neutralization Systems Test – ASQ-235 • Mine Countermeasure/Neutralization Testing
New Ship Construction
• Surface Combatant Sea Trials – Anti-Submarine Warfare Testing • Anti-Submarine Warfare Mission Package Testing • Mine Countermeasure Mission Package Testing
Life Cycle Activities
• Combat System Ship Qualification Trial – Undersea Warfare
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Torpedo (Non-Explosive) Testing • Torpedo (Explosive) Testing • Countermeasure Testing – Surface Ship Defense System Testing
Unmanned Vehicle Testing
• Underwater Deployed Unmanned Aerial System Testing

Table 3.0-38 provides estimates of relative in-water device use and location, for each of the alternatives. These are based on the estimated number of events that include the use of in-water devices for each alternative. While these estimates provide the average distribution of in-water devices, actual locations and hours of Navy in-water device usage are dependent upon military training and testing requirements, deployment schedules, annual budgets and other unpredictable factors.

Table 3.0-38: Annual Number and Location of Events Including In-Water Devices

Activity Area	Training			Testing		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
HRC	1,065	1,625	1,625	43	240	266
SOCAL	2,627	3,061	3,061	210	517	581
SSTC	308	308	308	53	58	65
Total	**4,000**	**5,055**	**5,055**	**306**	**815**	**912**

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California (Range Complex), SSTC = Silver Strand Training Complex

3.0.5.3.3.3 Military Expended Materials

Military expended materials include: (1) all sizes of non-explosive practice munitions; (2) fragments from high explosive munitions; and (3) expended materials other than ordnance, such as sonobuoys, ship hulks, expendable targets and unrecovered aircraft stores (fuel tanks, carriages, dispensers, racks, or similar types of support systems on aircraft).

While disturbance or strike from any material as it falls through the water column is possible, it is not likely because the objects will slow in velocity as it sinks toward the bottom and can be avoided by highly mobile organisms. For living marine resources in the water column, the discussion of military expended material strikes focuses on the potential of a strike at the surface of the water. The effect of materials settling on the bottom will be discussed as an alteration of the bottom substrate and associated organisms (i.e., invertebrates and vegetation).

Training and testing activities that involve the use of non-explosive practice munitions (small-, medium-, and large-caliber missiles, rockets, bombs, torpedoes, and neutralizers), fragments from high explosives, and materials other than munitions (flares, chaff, sonobuoys, parachutes, aircraft stores and ballast, and targets) are detailed in Table 3.0-39 through Table 3.0-64. Table 3.0-65 through Table 3.0-67 provide the number and location of munitions and targets.

Table 3.0-39: Training Activities That Expend Non-Explosive Small-Caliber Projectiles

Training
Strike Warfare
• Gunnery Exercise (Air-to-Ground)
Anti-Surface Warfare
• Gunnery Exercise Surface-to-Surface (Ship) – Small-Caliber • Gunnery Exercise Surface-to-Surface (Boat) – Small-Caliber • Gunnery Exercise Air-to-Surface – Small-Caliber
Mine Warfare
• Mine Countermeasures – Mine Neutralization – Small-Caliber and Medium-Caliber
Other
• Small Boat Attack

Table 3.0-40: Testing Activities That Expend Non-Explosive Small-Caliber Projectiles

Testing
New Ship Construction
• Other Class Ship Sea Trials – Gun Testing – Small-Caliber • Surface Warfare Mission Package Testing – Gun Testing – Small-Caliber
Shipboard Protection Systems and Swimmer Defense Testing
• Shipboard Protection Systems Testing

Table 3.0-41: Training Activities That Expend Non-Explosive Medium-Caliber Projectiles

Training
Anti-Air Warfare
• Gunnery Exercise (Air-to-Air) – Medium-Caliber • Gunnery Exercise (Surface-to-Air) – Medium-Caliber
Strike Warfare
• Gunnery Exercise (Air-to-Ground)

Table 3.0-41: Training Activities That Expend Non-Explosive Medium-Caliber Projectiles (continued)

Training
Anti-Surface Warfare
• Gunnery Exercise Surface-to-Surface (Ship) – Medium-Caliber • Gunnery Exercise Surface-to-Surface (Boat) – Medium-Caliber • Gunnery Exercise (Air-to-Surface) – Medium-Caliber • Sinking Exercise
Mine Warfare
• Mine Countermeasure – Mine Neutralization

Table 3.0-42: Testing Activities That Expend Non-Explosive Medium-Caliber Projectiles

Testing
Anti-Air Warfare
• Air Platform Weapons Integration Test
Anti-Surface Warfare
• Air-to-Surface Gunnery Test – Medium-Caliber
Mine Warfare
• Airborne Projectile-Based Mine Clearance System
New Ship Construction
• Surface Warfare Mission Package Testing – Gun Testing – Medium-Caliber
Life Cycle Activities
• Combat System Ship Qualification Trial – Air Defense • Combat System Ship Qualification Trial – Surface Warfare

Table 3.0-43: Training Activities That Expend Non-Explosive Large-Caliber Projectiles

Training
Anti-Air Warfare
• Gunnery Exercise (Surface-to-Air) – Large-Caliber
Amphibious Warfare
• Naval Surface Fire Support Exercise – At Sea • Expeditionary Fires Exercise/Supporting Arms Coordination Exercise
Anti-Surface Warfare
• Gunnery Exercise Surface-to-Surface (Ship) – Large-Caliber • Sinking Exercise

Table 3.0-44: Testing Activities That Expend Non-Explosive Large-Caliber Projectiles

Testing
New Ship Construction
• Surface Combatant Sea Trials – Gun Testing – Large-Caliber • Surface Combatant Sea Trials – Surface Warfare Testing – Large-Caliber • Surface Warfare Mission Package Testing – Gun Testing, Large-Caliber
Life Cycle Activities
• Combat System Ship Qualification Trial – Air Defense • Combat System Ship Qualification Trial – Surface Warfare
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Kinetic Energy Weapon Testing

Table 3.0-45: Training Activities That Expend Non-Explosive Bombs

Training
Strike Warfare
• Bombing Exercise (Air-to-Ground)
Anti-Surface Warfare
• Bombing Exercise (Air-to-Surface) • Sinking Exercise

Table 3.0-46: Testing Activities That Expend Non-Explosive Bombs

Testing
NONE

Table 3.0-47: Training Activities That Expend Non-Explosive Missiles or Rockets

Training
Anti-Air Warfare
• Missile Exercise (Air-to-Air)
Anti-Surface Warfare
• Missile Exercise (Surface-to-Surface) • Missile Exercise (Air-to-Surface) – Rocket • Sinking Exercise

Table 3.0-48: Testing Activities That Expend Non-Explosive Missiles or Rockets

Testing
Anti-Air Warfare
• Air Platform Weapons Integration Test
Anti-Surface Warfare
• Air-to-Surface Missile Test • Rocket Test

Table 3.0-48: Testing Activities That Expend Non-Explosive Missiles or Rockets (continued)

Testing
New Ship Construction
• Surface Combatant Sea Trials – Missile Testing • Surface Warfare Mission Package Testing – Missile/Rocket Testing
Life Cycle Activities
• Combat System Ship Qualification Trial – Air Defense • Combat System Ship Qualification Trial – Surface Warfare
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Missile Testing

Table 3.0-49: Training Activities That Expend Aircraft Stores or Ballast

Training
Anti-Submarine Warfare
• Tracking Exercise/Torpedo Exercise – Submarine • Tracking Exercise/Torpedo Exercise – Surface • Tracking Exercise/Torpedo Exercise – Maritime Patrol Aircraft • Tracking Exercise/Torpedo Exercise – Helicopter • Submarine Command Course Operations

Table 3.0-50: Testing Activities That Expend Aircraft Stores or Ballast

Testing
Anti-Air Warfare
• Air Platform/Vehicle Test
Anti-Surface Warfare
• Rocket Test
Anti-Submarine Warfare
• Anti-Submarine Warfare Torpedo Test
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Torpedo (Non-Explosive) Testing
Unmanned Vehicle Testing
• Underwater Deployed Unmanned Aerial System Testing

Table 3.0-51: Training Activities That Expend Non-Explosive Sonobuoys

Training
Anti-Submarine Warfare
• Tracking Exercise/Torpedo Exercise – Helicopter • Tracking Exercise/Torpedo Exercise – Maritime Patrol Aircraft • Tracking Exercise – Maritime Patrol Advanced Extended Echo Ranging Sonobuoys • Integrated Anti-Submarine Warfare Course • Group Sail • Anti-Submarine Warfare for Composite Training Unit Exercise • Anti-Submarine Warfare for Joint Task Force Exercise/Sustainment Exercise

Table 3.0-52: Testing Activities That Expend Non-Explosive Sonobuoys

Testing
Anti-Submarine Warfare
• Anti-Submarine Warfare Torpedo Test • Sonobuoy Lot Acceptance Test • Anti-Submarine Tracking Test – Helicopter • Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft
New Ship Construction
• Surface Combatant Sea Trials – Anti-Submarine Warfare Testing • Anti-Submarine Warfare Mission Package Testing
Life Cycle Activities
• Combat System Ship Qualification Trial – Undersea Warfare
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Torpedo (Non-Explosive) Testing • Torpedo (Explosive) Testing

Table 3.0-53: Training Activities That Expend Parachutes

Training
Anti-Air Warfare
• Missile Exercise (Air-to-Air)
Anti-Submarine Warfare
• Tracking Exercise/Torpedo Exercise – Maritime Patrol Aircraft • Tracking Exercise – Maritime Patrol Aircraft Extended Echo Ranging Sonobuoys • Tracking Exercise/Torpedo Exercise-Helicopter

Table 3.0-53: Training Activities That Expend Parachutes (continued)

Training
Major Training Events
• Anti-Submarine Warfare for Composite Training Unit Exercise • Anti-Submarine Warfare for Joint Task Force Exercise/Sustainment Exercise • Rim of the Pacific Exercise • Multi-Strike Group Exercise • Integrated Anti-Submarine Warfare Course • Group Sail • Undersea Warfare Exercise • Ship Anti-Submarine Warfare Readiness and Evaluation Measuring

Table 3.0-54: Testing Activities That Expend Parachutes

Testing
Anti-Submarine Warfare
• Anti-Submarine Warfare Torpedo Test • Sonobuoy Lot Acceptance test • Anti-Submarine Tracking Test – Helicopter • Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft
New Ship Construction
• Anti-Submarine Warfare Mission Package Testing • Surface Combatant Sea Trials – Anti-Submarine Warfare Testing
Life Cycle Activities
• Combat System Ship Qualification Trial – Undersea Warfare
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Torpedo (Non-Explosive) Testing • Torpedo (Explosive) Testing • Countermeasure Testing

Table 3.0-55: Training Activities That Expend Chaff

Training
Electronic Warfare
• Counter Targeting Chaff Exercise – Ship • Counter Targeting Chaff Exercise – Aircraft

Table 3.0-56: Testing Activities That Expend Chaff

Testing
Anti-Air Warfare
• Air Combat Maneuver Test
New Ship Construction
• Surface Combatant Sea Trials – Decoy Testing
Lifecycle Activities
• Combat System Ship Qualification Trial – Air Defense

Table 3.0-57: Training Activities That Expend Flares

Training
Anti-Air Warfare
• Missile Exercise (Air-to-Air)
Electronic Warfare
• Counter Targeting Flare Exercise

Table 3.0-58: Testing Activities That Expend Flares

Testing
• Air Platform/Vehicle Test

Table 3.0-59: Training Activities That Expend Fragments from High-Explosive Munitions

Training
Anti-Air Warfare
• Gunnery Exercise (Surface-to-Air) – Large-Caliber • Missile Exercise (Surface-to-Air) • Missile Exercise (Air-to-Air) • Missile Exercise – Man-portable Air Defense System
Amphibious Warfare
• Naval Surface Fire Support Exercise – At Sea
Anti-Surface Warfare
• Gunnery Exercise Surface-to-Surface (Ship) – Medium-Caliber • Gunnery Exercise Surface-to-Surface (Ship) – Large-Caliber • Gunnery Exercise Surface-to-Surface (Boat) – Medium-Caliber • Gunnery Exercise (Air-to-Surface) – Medium-Caliber • Missile Exercise (Air-to-Surface) – Rocket • Missile Exercise (Air-to-Surface) • Bombing Exercise (Air-to-Surface) • Sinking Exercise
Anti-Submarine Warfare
• Tracking Exercise – Maritime Patrol Aircraft Extended Echo Ranging Sonobuoys • Anti-Submarine Warfare for Composite Training Unit Exercise • Anti-Submarine Warfare for Joint Task Force Exercise/Sustainment Exercise

Table 3.0-59: Training Activities That Expend Fragments from High-Explosives (continued)

Training
Mine Warfare
• Mine Neutralization/Explosive Ordnance Disposal • Mine Countermeasure – Mine Neutralization – Remotely Operated Vehicles • Marine Mammal System • Civilian Port Defense

Table 3.0-60: Testing Activities That Expend Fragments from High-Explosive Munitions

Testing
Anti-Surface Warfare
• Air-to-Surface Missile Test • Air-to-Surface Gunnery Test – Medium-Caliber • Rocket Test
Anti-Submarine Warfare
• Sonobuoy Lot Acceptance Test • Anti-Submarine Tracking Test – Helicopter • Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft
Mine Warfare
• Airborne Mine Neutralization Systems Test – ASQ-235 • Airborne Projectile-Based Mine Clearance System
New Ship Construction
• Surface Combatant Sea Trials – Missile Testing • Surface Warfare Mission Package Testing – Missile/Rocket Testing • Surface Warfare Mission Package Testing – Gun Testing, Medium-Caliber • Surface Warfare Mission Package Testing – Gun Testing, Large-Caliber • Mine Countermeasure Mission Package Testing
Life Cycle Activities
• Combat System Ship Qualification Trial – Air Defense • Combat System Ship Qualification Trial – Surface Warfare
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Torpedo (Explosive) Testing • Countermeasure Testing
Mine Warfare
• Mine Countermeasure/Neutralization Testing
Other Testing – Naval Sea Systems Command
• At-Sea Explosives Testing

Table 3.0-61: Training Activities That Expend Fragments from Targets

Training
Anti-Air Warfare
• Missile Exercise (Air-to-Air) • Gunnery Exercise (Surface-to-Air) – Large-Caliber • Missile Exercise – Man-portable Air Defense System
Anti-Surface Warfare
• Gunnery Exercise (Surface to-Surface) – Ship Small-Caliber, Medium-Caliber, and Large-Caliber • Gunnery Exercise (Surface-to-Surface) – Boat Small- and Medium-Caliber • Missile Exercise (Surface-to-Surface) • Gunnery Exercise (Air-to-Surface) – Small-Caliber; Medium-Caliber • Missile Exercise (Air-to-Surface) – Rocket • Missile Exercise (Air-to-Surface) • Bombing Exercise (Air-to-Surface)
Mine Warfare
• Mine Neutralization – Explosive Ordnance Disposal • Mine Countermeasure – Mine Neutralization – Remotely Operated Vehicle
Major Training Events
• Composite Training Unit Exercise • Integrated Anti-Submarine Warfare Course • Rim of the Pacific Exercise • Multi-Strike Group Exercise • Integrated Anti-Submarine Warfare Course • Group Sail • Undersea Warfare Exercise • Ship Anti-Submarine Warfare Readiness and Evaluation Measuring

Table 3.0-62: Testing Activities That Expend Fragments from Targets

Testing
Anti-Surface Warfare
• Air-to-Surface Missile Test • Air-to-Surface Gunnery Test – Medium-Caliber • Rocket Test
Mine Warfare
• Airborne Mine Neutralization Systems Test – AQS-235 • Airborne Projectile-Based Mine Clearance System
New Ship Construction
• Surface Combatant Sea Trials – Surface Warfare Testing – Large-Caliber • Mine Countermeasure Mission Package Testing

Table 3.0-62: Testing Activities That Expend Fragments from Targets (continued)

Testing
Life Cycle Activities
• Combat System Ship Qualification Trial – Air Defense • Combat System Ship Qualification Trial – Surface Warfare
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Torpedo (Explosive) Testing • Kinetic Energy Weapon Testing
Mine Warfare Testing
• Mine Countermeasure/Neutralization Testing
Shipboard Protection Systems and Swimmer Defense Testing
• Shipboard Protection Systems Testing

Table 3.0-63: Training Activities That Expend Torpedo Accessories

Training
Anti-Surface Warfare
• Sinking Exercise
Anti-Submarine Warfare
• Tracking Exercise/Torpedo Exercise – Submarine • Tracking Exercise/Torpedo Exercise – Surface • Tracking Exercise/Torpedo Exercise – Helicopter • Tracking Exercise/Torpedo Exercise – Maritime Patrol Aircraft • Submarine Command Course Operations

Table 3.0-64: Testing Activities That Expend Torpedo Accessories

Testing
Anti-Submarine Warfare
• Anti-Submarine Warfare Torpedo Test
New Ship Construction
• Anti-Submarine Warfare Mission Package Testing
Life Cycle Activities
• Combat System Ship Qualification Trial – Undersea Warfare
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Torpedo (Non-explosive) Testing • Torpedo (Explosive) Testing • Countermeasure Testing

Table 3.0-65: Annual Number and Location of Non-Explosive Practice Munitions Expended

Location	Training			Testing		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
Mine Neutralization System Neutralizers						
HRC	0	0	0	0	48	64
SOCAL	360	360	360	100	348	394
Total	**360**	**360**	**360**	**100**	**396**	**458**
Torpedoes[1]						
HRC	530	625	625	186	382	591
SOCAL	398	509	509	260	460	640
Total	**928**	**1,134**	**1,134**	**446**	**842**	**1,231**
Bombs						
HRC	477	399	399	0	0	0
SOCAL	640	1,120	1,120	0	0	0
Transit Corridor	0	90	90	0	0	0
Total	**1,117**	**1,609**	**1,609**	**0**	**0**	**0**
Rockets						
SOCAL	0	0	0	15	696	781
Total	**0**	**0**	**0**	**15**	**696**	**781**
Missiles						
HRC	60	64	64	4	68	70
SOCAL	26	30	30	74	138	148
Total	**86**	**94**	**94**	**78**	**206**	**218**
Large-Caliber Projectiles						
HRC	7,500	1,464	1,464	0	9,182	9,592
SOCAL	16,900	5,596	5,596	0	2,897	3,107
Transit Corridor	0	380	380	0	0	0
Total	**24,400**	**7,440**	**7,440**	**0**	**12,079**	**12,699**
Medium-Caliber Projectiles						
HRC	97,600	195,360	195,360	0	26,800	27,150
SOCAL	281,000	435,160	417,640	6,500	57,100	61,480
Transit Corridor	0	6,080	6,080	0	0	0
Total	**378,600**	**636,600**	**636,600**	**6,500**	**83,900**	**88,630**
Small-Caliber Projectiles						
HRC	68,300	422,000	422,000	0	6,600	8,250
SOCAL	913,000	2,559,800	2,559,800	0	13,600	15,550
Transit Corridor	0	84,000	84,000	0	0	0
Total	**981,300**	**3,065,800**	**3,065,800**	**0**	**20,200**	**23,800**

[1]All exercise torpedoes listed here are recovered.

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California (Range Complex), SSTC = Silver Strand Training Complex

Table 3.0-65: Annual Number and Location of Non-Explosive Practice Munitions Expended (continued)

Location	Training			Testing		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
Sonobuoys						
HRC	25,000	24,500	24,500	1,817	4,032	4,343
SOCAL	17,250	26,800	26,800	5,322	8,047	8,896
Transit Corridor	0	200	200	0	0	0
Total	**42,250**	**51,500**	**51,500**	**7,139**	**12,079**	**13,239**

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California (Range Complex), SSTC = Silver Strand Training Complex

Table 3.0-66: Annual Number and Location of High-Explosives that May Result in Fragments

Location	Training			Testing		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
Torpedoes						
HRC	6	6	6	8	26	29
SOCAL	2	2	2	8	8	8
Total	**8**	**8**	**8**	**16**	**34**	**37**
Sonobuoys						
HRC	0	480	480	314	408	500
SOCAL	0	120	120	2,652	2,760	2,892
Total	**0**	**600**	**600**	**2,996**	**3,168**	**3,392**
Neutralizers						
SOCAL	0	0	0	40	40	44
Total	**0**	**0**	**0**	**40**	**40**	**44**
Rockets						
HRC	0	760	760	0	0	0
SOCAL	0	3,800	3,800	0	284	297
Total	**0**	**4,560**	**4,560**	**0**	**284**	**297**
Anti-Swimmer Grenades						
HRC	0	100	100	0	0	0
SOCAL	0	140	140	0	0	0
Total	**0**	**240**	**240**	**0**	**0**	**0**
Missiles						
HRC	160	146	146	4	54	56
SOCAL	142	330	330	29	64	70
Total	**302**	**476**	**476**	**33**	**118**	**126**

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California (Range Complex)

Table 3.0-66: Annual Number and Location of High-Explosives that May Result in Fragments (continued)

Location	Training			Testing		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
Large-Caliber Projectiles						
HRC	11,200	1,894	1,894	0	2,690	3,680
SOCAL	16,400	4,244	4,244	0	3,470	4,460
Transit Corridor	0	20	20	0	0	0
Total	**27,600**	**6,158**	**6,158**	**0**	**6,160**	**8,140**
Medium-Caliber Projectiles						
HRC	3,100	6,640	6,640	0	1,400	1,750
SOCAL	15,000	13,920	13,920	2,500	16,400	18,250
Transit Corridor	0	320	320	0	0	0
Total	**18,100**	**20,880**	**20,880**	**2,500**	**17,800**	**20,000**

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California (Range Complex)

Table 3.0-67: Annual Number and Location of Targets Expended

Location	Training			Testing		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
Sub-surface Targets						
HRC	370	405	405	32	165	177
SOCAL	670	550	550	24	225	243
Transit Corridor	0	10	10	0	0	0
Total	**1,040**	**965**	**965**	**56**	**390**	**420**
Surface Targets						
HRC	200	450	450	8	40	43
SOCAL	400	1,150	1,150	109	178	197
SSTC	0	0	0	0	0	0
Transit Corridor	0	65	65	0	0	0
Total	**600**	**1,665**	**1,665**	**117**	**218**	**240**
Air Targets						
HRC	24	26	26	0	41	52
SOCAL	45	45	45	0	13	24
Total	**69**	**71**	**71**	**0**	**54**	**76**
Mine Shapes						
HRC	336	384	384	0	0	0
SOCAL	216	216	216	0	0	0
Total	**552**	**600**	**600**	**0**	**0**	**0**

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California (Range Complex), SSTC = Silver Strand Training Complex

Table 3.0-67 Annual Number and Location of Targets Expended (continued)

Location	Training			Testing		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
Ship Hulk						
HRC	6	6	6	0	0	0
SOCAL	2	2	2	0	0	0
Total	8	8	8	0	0	0

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California (Range Complex), SSTC = Silver Strand Training Complex

3.0.5.3.3.4 Seafloor Devices

Seafloor devices represent items used during training or testing activities that are deployed onto the seafloor and recovered. These items include moored mine shapes, anchors, bottom placed instruments, and robotic vehicles referred to as “crawlers.” Seafloor devices are either stationary or move very slowly along the bottom and do not pose a threat to highly mobile organisms. The effect of devices on the bottom will be discussed as an alteration of the bottom substrate and associated living resources (i.e., invertebrates and vegetation).

Training and testing activities that include the deployment of sea floor devices are listed in Table 3.0-68 and Table 3.0-69.

Table 3.0-68: Training Activities That Deploy Sea Floor Devices

Training
Mine Warfare
• Mine Countermeasures Exercise – Ship Sonar • Mine Neutralization/Explosive Ordnance Disposal • Mine Countermeasure – Towed Mine Neutralization • Mine Countermeasure – Mine Detection • Mine Countermeasure – Mine Neutralization, Small-Caliber and Medium-Caliber • Mine Countermeasure – Mine Neutralization – Remotely Operated Vehicles • Civilian Port Defense
Other Training Exercises
• Precision Anchoring

Table 3.0-69: Testing Activities That Deploy Sea Floor Devices

Testing
Mine Warfare
• Airborne Mine Neutralization Systems Test – ASQ-235 • Airborne Projectile-Based Mine Clearance System • Airborne Towed Minesweeping Test • Mine Laying Test
Shipboard Protection Systems and Swimmer Defense Testing
• Pierside Integrated Swimmer Defense
Unmanned Vehicle Testing
• Unmanned Vehicle Development and Payload Testing

The location and number of events including seafloor devices are summarized in Table 3.0-70.

Table 3.0-70: Annual Number and Location of Events Including Seafloor Devices

Activity Area	Training			Testing		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
HRC	133	73	73	0	15	17
SOCAL	1,317	1,241	1,241	35	59	65
SSTC	587	587	587	0	0	0
Transit Corridor	0	0	0	0	0	0
Total	**2,037**	**1,901**	**1,901**	**35**	**74**	**82**

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California (Range Complex), SSTC = Silver Strand Training Complex

3.0.5.3.3.5 Aircraft Strikes

Aircraft involved in Navy training and testing activities are separated into three categories: (1) fixed-wing aircraft, (2) rotary-wing aircraft, and (3) unmanned aerial systems. Fixed-wing aircraft include, but are not limited to, planes such as F-35, P-8, F/A-18, and E/A-18G. Rotary-wing aircraft are generally helicopters, such as MH-60. Unmanned aerial systems include a variety of platforms, including but not limited to, the Small Tactical Unmanned Aerial System – Tier II, Broad Area Maritime Surveillance unmanned aircraft, Fire Scout Vertical Take-off and Landing Unmanned Aerial Vehicle, and the Unmanned Combat Air System. Aircraft strikes are only applicable to birds.

Table 3.0-71 through Table 3.0-76 list the training and testing activities that include the use of various types of aircraft.

Table 3.0-71: Training Activities That Include Fixed-Wing Aircraft

Training
Anti-Air Warfare
• Air Combat Maneuver • Air Defense Exercises • Gunnery Exercise (Air-to-Air) – Large-Caliber and Medium-Caliber • Missile Exercise (Air-to-Air)
Amphibious Warfare
• Humanitarian Assistance Operations • Expeditionary Fires Exercise/Supporting Arms Coordination Exercise
Strike Warfare
• Bombing Exercise (Air-to-Ground)
Anti-Surface Warfare
• Gunnery Exercise (Air-to-Surface) – Medium-Caliber • Missile Exercise (Air-to-Surface) – Rocket • Missile Exercise (Air-to-Surface) • Bombing Exercise (Air-to-Surface) • Laser Targeting • Sinking Exercise
Anti-Submarine Warfare
• Tracking Exercise/Torpedo Exercise – Maritime Patrol Aircraft • Tracking Exercise – Maritime Patrol Aircraft Extended Echo Ranging Sonobuoys • Anti-Submarine Warfare Tactical Development Exercise • Integrated Anti-Submarine Warfare Course • Anti-Submarine Warfare for Joint Task Force Exercise/Sustainment Exercise
Electronic Warfare
• Electronic Warfare Operations • Counter Targeting – Flare Exercise • Counter Targeting Chaff Exercise – Aircraft
Mine Warfare
• Mine Laying
Naval Special Warfare
• Personnel Insertion/Extraction – Non-submarine
Major Training Events
• Composite Training Unit Exercise • Integrated Anti-Submarine Warfare Course • Rim of the Pacific Exercise • Multi-Strike Group Exercise • Integrated Anti-Submarine Warfare Course • Undersea Warfare Exercise • Ship Anti-Submarine Warfare Readiness and Evaluation Measuring

Table 3.0-72: Testing Activities That Include Fixed-Wing Aircraft

Testing
Anti-Air Warfare
• All Activities
Anti-Surface Warfare
• Air-to-Surface Missile Test • Air-to-Surface Gunnery Test – Medium-Caliber • Rocket Test • Air-to-Surface Bombing Test • Laser Targeting
Electronic Warfare
• Electronic Systems Evaluation
Anti-Submarine Warfare
• Anti-Submarine Warfare Torpedo Test • Sonobuoy Lot Acceptance Test • Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft
Other Testing – Naval Air Systems Command
• Test and Evaluation Catapult Launch • Air Platform Shipboard Integrate Test • Shipboard Electronic Systems Evaluation
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Torpedo (Non-Explosive) Testing • Torpedo (Explosive) Testing
Shipboard Protection Systems and Swimmer Defense Testing
• Chemical/Biological Simulant Testing

Table 3.0-73: Training Activities That Include Rotary-Wing Aircraft

Training
Amphibious Warfare
• Expeditionary Fires Exercise/Supporting Arms Coordination Exercise • Amphibious Assault • Humanitarian Assistance Operations
Strike Warfare
• Gunnery Exercise (Air-to-Ground)
Anti-Surface Warfare
• Maritime Security Operations • Gunnery Exercise (Air-to-Surface) – Small-Caliber • Gunnery Exercise (Air-to-Surface) – Medium-Caliber • Missile Exercise (Air-to-Surface) – Rocket • Missile Exercise (Air-to-Surface) • Laser Targeting • Sinking Exercise

Table 3.0-73: Training Activities That Include Rotary-Wing Aircraft (continued)

Training
Anti-Submarine Warfare
• Tracking Exercise/Torpedo Exercise – Helicopter • Kilo Dip
Electronic Warfare
• Electronic Warfare Operations • Counter Targeting – Flare Exercise • Counter Targeting Chaff Exercise – Aircraft
Mine Warfare
• Mine Neutralization/Explosive Ordnance Disposal • Mine Countermeasure – Towed Mine Neutralization • Mine Countermeasure – Mine Detection • Mine Countermeasures – Mine Neutralization • Mine Countermeasures – Mine Neutralization – Remotely Operated Vehicles • Civilian Port Defense
Naval Special Warfare
• Personnel Insertion/Extraction – Non-submarine
Major Training Events
• Integrated Anti-Submarine Warfare Course • Group Sail • Composite Training Unit Exercise • Joint Task Force Exercise/Sustainment Exercise • Multi-Strike Group Exercise • Rim of the Pacific Exercise • Undersea Warfare Exercise • Ship Anti-Submarine Warfare Readiness and Evaluation Measuring

Table 3.0-74: Testing Activities That Include Rotary-Wing Aircraft

Testing
Anti-Air Warfare
• Air Platform/Vehicle Test • Air Platform Weapons Integration Test • Intelligence, Surveillance, and Reconnaissance Test
Anti-Surface Warfare
• Air-to-Surface Missile Test; Gunnery Test • Rocket Test • Laser Targeting
Electronic Warfare
• Electronic Systems Evaluation

Table 3.0-74: Testing Activities That Include Rotary-Wing Aircraft (continued)

Testing
Anti-Submarine Warfare
• Anti-Submarine Warfare Torpedo Test • Kilo Dip • Sonobuoy Lot Acceptance Test • Anti-Submarine Tracking Test – Helicopter
Mine Warfare
• Airborne Mine Neutralization Systems Test – ASQ-235 • Airborne Projectile-Based Mine Clearance System • Airborne Towed Minesweeping Test • Airborne Towed Minehunting Sonar Test • Airborne Laser-Based Mine Detection System Test • Mine Detection and Classification • Mine Countermeasure/Neutralization Testing
Other Testing – Naval Sea Systems Command
• Shipboard Electronic Systems Evaluation
New Ship Construction
• Anti-Submarine Warfare Mission Package Testing • Surface Warfare Mission Package Testing • Mine Countermeasure Mission Package Testing
Life Cycle Activities
• Combat System Ship Qualification Trial – Undersea Warfare
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Torpedo (Non-Explosive) Testing • Torpedo (Explosive) Testing

Table 3.0-75: Training Activities That Include Unmanned Aerial Systems

Training
Anti-Air Warfare
• Air Defense Exercises • Missile Exercise (Air-to-Air) • Missile Exercise (Surface-to-Air) • Missile Exercise – Man-portable Air Defense System
Amphibious Warfare
• Naval Surface Fire Support Exercise – Land-Based Target • Amphibious Raid
Anti-Surface Warfare
• Maritime Security Operations • Missile Exercise (Air-to-Surface) – Rocket

Table 3.0-75: Training Activities That Include Unmanned Aerial Systems (continued)

Training
Anti-Submarine Warfare
• Anti-Submarine Warfare for Composite Training Unit Exercise • Anti-Submarine Warfare for Joint Task Force Exercise/Sustainment Exercise

Table 3.0-76: Testing Activities That Include Unmanned Aerial Systems

Testing
Anti-Air Warfare
• Air Platform/Vehicle Test • Air Platform Weapons Integration Test • Intelligence, Surveillance, and Reconnaissance Test
New Ship Construction
• Surface Combatant Sea Trials – Missile Testing
Life Cycle Activities
• Combat System Ship Qualification Trial – Air Defense
Mine Warfare Testing
• Mine Detection and Classification Testing
Unmanned Vehicle Testing
• Underwater Deployed Unmanned Aerial System Testing • Unmanned Vehicle Development and Payload Testing
Other
• Shipboard Electronic Systems Evaluation

The location and number of events including aircraft movement is summarized in Table 3.0-77.

Table 3.0-77: Annual Number and Location of Events Including Aircraft Movement

Activity Area	Training			Testing		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
HRC	1,982	2,842	2,842	4,655	4,730	5,208
SOCAL	8,105	8,895	8,895	5,517	6,271	6,914
SSTC	536	536	536	0	0	0
Transit Corridor	0	11	11	0	0	0
Total	**10,623**	**12,284**	**12,284**	**10,172**	**11,001**	**12,122**

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California (Range Complex), SSTC = Silver Strand Training Complex

3.0.5.3.4 Entanglement Stressors

This section describes the entanglement stressors introduced into the water through naval training and testing and the relative magnitude and location of these activities to provide the basis for analysis of potential impacts to resources in the remainder of Chapter 3. To assess the entanglement risk of materials expended during training and testing, the Navy examined the characteristics of these items (such as size and rigidity) for their potential to entangle marine animals. For a constituent of military expended materials to entangle a marine animal, it must be long enough to wrap around the appendages of marine animals. Another critical factor is rigidity; the item must be flexible enough to wrap around appendages or bodies. This analysis includes the potential impacts from two types of military expended materials including: (1) fiber optic cables and guidance wires, and (2) parachutes.

Unlike typical fishing nets and lines, the Navy's equipment is not designed for trapping or entanglement purposes. The Navy deploys equipment designed for military purposes and strives to reduce the risk of accidental entanglement posed by any item it releases into the sea.

3.0.5.3.4.1 Fiber Optic Cables and Guidance Wires

Fiber Optic Cables

The only type of cable expended during Navy training and testing are fiber optic cables. Fiber optic cables are flexible, durable, and abrasion or chemical-resistant and the physical characteristics of the fiber optic material render the cable brittle and easily broken when kinked, twisted, or bent sharply (i.e., to a radius greater than 360 degrees). The cables are often designed with controlled buoyancy to minimize the cable's effect on vehicle movement. The fiber optic cable would be suspended within the water column during the activity, and then be expended to sink to the sea floor.

Table 3.0-78 and Table 3.0-79 list the training and testing activities that include the use of fiber optic cables.

Table 3.0-78: Training Activities That Expend Fiber Optic Cables

Training
Mine Warfare
• Mine Countermeasure – Mine Neutralization – Remotely Operated Vehicle

Table 3.0-79: Testing Activities That Expend Fiber Optic Cables

Testing
Mine Warfare
• Airborne Mine Neutralization Systems Test • Mine Countermeasure/Neutralization Testing

The estimated location and number of expended fiber optic cables are detailed below in Table 3.0-80.

Table 3.0-80: Annual Number and Location of Events that Expend Fiber Optic Cable

Activity Area	Training			Testing		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
SOCAL	36	40	40	15	16	17
SSTC	208	208	208	0	0	0
Total	**244**	**248**	**248**	**15**	**16**	**17**

Notes: SOCAL = Southern California (Range Complex), SSTC = Silver Strand Training Complex

Guidance Wires

The only types of wires expended during Navy training and testing activities are guidance wires from heavy-weight torpedoes and tube-launched, optically tracked, wire guided missiles. Guidance wires are used to help the firing platform control and steer the torpedo or missile. They trail behind the torpedo or missile as it moves through the water or air. Finally, the guidance wire is released from both the firing platform and the torpedo or tube-launched, optically tracked, wire guided missile and sinks to the ocean floor.

The torpedo guidance wire is a single-strand, thin gauge, coated copper alloy. The tensile breaking strength of the wire is a maximum of 42 lb. (19 kg) and can be broken by hand (Environmental Sciences Group 2005), contrasting with the rope or lines associated with commercial fishing towed gear (trawls), stationary gear (traps), or entanglement gear (gillnets) that utilize lines with substantially higher (up to 500–2,000 lb. [227–907 kg]) breaking strength as their “weak links” to minimize entanglement of marine animals (National Marine Fisheries Service 2008). The physical characteristics of the wire prevent it from tangling, unlike the monofilament fishing lines and polypropylene ropes identified in the literature (U.S. Department of the Navy 1996). Torpedo guidance wire sinks at an estimated rate of 0.7 ft. (0.2 m) per second.

The tube-launched, optically tracked, wire guided missile system has two thin (5.75 mils or 0.146 mm diameter) wires. Two wire dispensers containing several thousand meters each of single-strand wire with a minimum tensile strength of 10 lbs. are mounted on the rear of the missile. The length of wire dispensed would generally be equal to the distance the missile travels to impact the target and any undispensed wire would be contained in the dispensers upon impact. While degradation rates for the wire may vary because of changing environmental conditions in seawater, assuming a sequential failure or degradation of the enamel coating (degradation time is about two months), the copper plating (degradation time is about 1.5–25 months), and the carbon-steel core (degradation time is about 8–18 months), degradation of the tube-launched, optically tracked, wire guided missile guide wire would take 12–45 months. Table 3.0-81 and Table 3.0-82 list the training and testing activities that include the use of guidance wires.

Table 3.0-81: Training Activities That Expend Guidance Wires

Training
Anti-Surface Warfare
• Missile Exercise (Air-to-Surface) • Sinking Exercise
Anti-Submarine Warfare
• Tracking Exercise/Torpedo Exercise – Submarine • Submarine Command Course Operations
Major Training Events
• Joint Task Force Exercise/Sustainment Exercise • Rim of the Pacific Exercise

Table 3.0-82: Testing Activities That Expend Guidance Wires

Testing
Anti-Submarine Warfare
• Anti-Submarine Warfare Torpedo Test
Anti-Surface Warfare/Anti-Submarine Warfare Testing
• Torpedo (Non-Explosive) Testing • Torpedo (Explosive) Testing

The overall number of events per year that expend guidance wire and locations where they occur are detailed below in Table 3.0-83.

Table 3.0-83: Annual Number and Location of Events that Expend Guidance Wire

Activity Area	Training			Testing		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
HRC	142	135	135	160	232	249
SOCAL	64	65	65	240	248	291
Total	**206**	**200**	**200**	**400**	**480**	**540**

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California Range Complex

3.0.5.3.4.2 Parachutes

Aircraft-launched sonobuoys, lightweight torpedoes (such as the MK 46 and MK 54), illumination flares, and targets use nylon parachutes ranging in size from 18 to 48 in. (46 to 122 cm) in diameter. The majority of expended parachutes are relatively small cruciform decelerators associated with sonobuoys (Figure 3.0-17). Parachutes are made of cloth and nylon, many with weights attached to their short attachment lines to speed their sinking. Parachutes are made of cloth and nylon, and many have weights attached to the lines for rapid sinking. At water impact, the parachute assembly is expended, and it sinks away from the unit. The parachute assembly may remain at the surface for 5 to 15 seconds before the parachute and its housing sink to the seafloor, where it becomes flattened (Environmental Sciences Group 2005). Some parachutes are weighted with metal clips that facilitate their descent to the seafloor. Once settled on the bottom the canopy may temporarily billow if bottom currents are present.

Figure 3.0-17: Sonobuoy Launch Depicting the Relative Size of a Decelerator/Parachute

Training and testing activities that expend parachutes are listed in Table 3.0-53 and Table 3.0-54.

The estimated number of parachutes and locations where they would be expended are detailed below in Table 3.0-84.

Table 3.0-84: Annual Number and Location of Expended Parachutes

Activity Area	Training			Testing		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
HRC	26,250	26,000	26,000	1,859	4,217	4,542
SOCAL	18,250	28,000	28,000	5,371	8,361	9,234
Transit Corridor	0	200	200	0	0	0
Total	**44,500**	**54,200**	**54,200**	**7,230**	**12,578**	**13,776**

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California (Range Complex)

3.0.5.3.5 Ingestion Stressors

This section describes the ingestion stressors introduced into the water through naval training and testing and the relative magnitude and location of these activities to provide the basis for analysis of potential impacts to resources in the remainder of Chapter 3. To assess the ingestion risk of materials expended during training and testing, the Navy examined the characteristics of these items (such as buoyancy and size) for their potential to be ingested by marine animals in the Study Area. The Navy expends the following types of materials that could become ingestion stressors during training and testing in the Study Area: non-explosive practice munitions (small- and medium-caliber), fragments from high-explosives, fragments from targets, chaff, flare casings (including plastic end caps and pistons), and parachutes. Other military expended materials such as targets, large-caliber projectiles, intact training and testing bombs, guidance wires, 55-gallon drums, sonobuoy tubes, and marine markers are too large for marine organisms to consume and are eliminated from further discussion.

Solid metal materials, such as small-caliber projectiles, or fragments from high-explosive munitions, sink rapidly to the seafloor. Lighter items may be caught in currents and gyres or entangled in floating *Sargassum* and could remain in the water column for hours to weeks or indefinitely before sinking (e.g., plastic end caps or pistons).

3.0.5.3.5.1 Non-Explosive Practice Munitions

Only small- or medium-caliber projectiles would be small enough for marine animals to ingest. This would vary depending on the resource and will be discussed in more detail within each resource section. Small- and medium-caliber projectiles include all sizes up to and including those that are 2.25 in. (57 mm) in diameter. These solid metal materials would quickly move through the water column and settle to the sea floor.

The training and testing activities that involve the use of small- and medium-caliber non-explosive practice munitions are listed in Table 3.0-39 through Table 3.0-42.

The overall number of expended small- and medium-caliber non-explosive practice munitions and locations where they occur can be found above in Table 3.0-65.

3.0.5.3.5.2 Fragments from High-Explosive Munitions

Many different types of high-explosive munitions can result in fragments that are expended at sea during training and testing activities.

Types of high-explosive munitions that can result in fragments include demolition charges, grenades, projectiles, missiles, and bombs. Fragments would result from fractures in the munitions casing and would vary in size depending on the size of the net explosive weight and munition type; however, typical sizes of fragments are unknown. These solid metal materials would quickly sink through the water column and settle to the seafloor.

The training and testing activities that involve fragments from high-explosives are listed in Table 3.0-59 and Table 3.0-60. The overall number of high-explosive munitions that may result in fragments, and the locations where they occur were detailed above in Table 3.0-66.

3.0.5.3.5.3 Military Expended Materials Other Than Munitions

Several different types of materials other than munitions are expended at sea during training and testing activities.

<u>Target-Related Materials</u>

At-sea targets are usually remotely-operated airborne, surface, or subsurface traveling units, most of which are designed to be recovered for reuse. However, if they are used during activities that utilize high-explosives then they may result in fragments. Expendable targets that may result in fragments would include air-launched decoys, surface targets (such as marine markers, paraflares, cardboard boxes, and 10 ft. diameter red balloons), and mine shapes. Most target fragments would sink quickly to the seafloor. Floating material, such as Styrofoam, may be lost from target boats and remain at the surface for some time (see Section 2.3.3 for additional information on targets). Only targets that may result in smaller fragments are included in the analyses of ingestion potential.

The training and testing activities that may expend targets are listed in Table 3.0-61 and Table 3.0-62. The number and location per year of targets used during training and testing activities with the potential to result in small fragments were detailed above in Table 3.0-67.

Chaff

Chaff consists of reflective, aluminum-coated glass fibers used to obscure ships and aircraft from radar-guided systems. Chaff, which is stored in canisters, is either dispensed from aircraft or fired into the air from the decks of surface ships when an attack is imminent. The glass fibers create a radar cloud that mask the position of the ship or aircraft. Chaff is composed of an aluminum alloy coating on glass fibers of silicon dioxide (U.S. Air Force 1997). Chaff is released or dispensed in cartridges or projectiles that contain millions of fibers. When deployed, a diffuse cloud of fibers is formed that is undetectable to the human eye. Chaff is a very light material, similar to fine human hair. It can remain suspended in air anywhere from 10 minutes to 10 hours and can travel considerable distances from its release point, depending on prevailing atmospheric conditions (U.S. Air Force 1997; Arfsten 2002). Doppler radar has tracked chaff plumes containing approximately 900 g of chaff drifting 200 mi. (322 km) from the point of release, with the plume covering greater than 400 $mi.^3$ (1,667 km^3) (Arfsten 2002).

The chaff concentrations that marine animals could be exposed to following release of multiple cartridges (e.g., following a single day of training) is difficult to accurately estimate because it depends on several variable factors. First, specific release points are not recorded and tend to be random, and chaff dispersion in air depends on prevailing atmospheric conditions. After falling from the air, chaff fibers would be expected to float on the sea surface for some period, depending on wave and wind action. The fibers would be dispersed farther by sea currents as they float and slowly sink toward the bottom. Chaff concentrations in benthic habitats following the release of a single cartridge would be lower than the values noted in this section, based on dispersion by currents and the dilution capacity of the ocean.

Several literature reviews and controlled experiments indicate that chaff poses little risk to organisms, except at concentrations substantially higher than those that could reasonably occur from military training (U.S. Air Force 1997; Hullar 1999; Arfsten 2002). Nonetheless, some marine animal species within the Study Area could be exposed to chaff through direct body contact, inhalation, and ingestion. Chemical alteration of water and sediment from decomposing chaff fibers is not expected to occur. Based on the dispersion characteristics of chaff, it is likely that marine animals would occasionally come in direct contact with chaff fibers while either at the water’s surface or while submerged, but such contact would be inconsequential. Because of the flexibility and softness of chaff, external contact would not be expected to impact most wildlife (U.S. Air Force 1997) and the fibers would quickly wash off shortly after contact. Given the properties of chaff, skin irritation is not expected to be a problem (U.S. Air Force 1997). The potential exists for marine animals to inhale chaff fibers if they are at the surface while chaff is airborne. Arfsten et al. (2002), Hullar et al. (1999), and U.S. Air Force (1997) reviewed the potential impacts of chaff inhalation on humans, livestock, and other animals and concluded that the fibers are too large to be inhaled into the lungs. The fibers were predicted to be deposited in the nose, mouth, or trachea and are either swallowed or expelled.

In laboratory studies conducted by the University of Delaware (Hullar 1999), blue crabs and killifish were fed a food-chaff mixture daily for several weeks and no significant mortality was observed at the highest exposure treatment. Similar results were found when chaff was added directly to exposure chambers containing filter-feeding menhaden. Histological examination indicated no damage from chaff exposures. A study on cow calves that were fed chaff found no evidence of digestive disturbance or other clinical symptoms (U.S. Air Force 1997).

Chaff cartridge plastic end caps and pistons would also be released into the marine environment, where they would persist for long periods and could be ingested by marine animals. Chaff end caps and pistons sink in saltwater (Spargo 2007).

The training and testing activities that involve chaff are listed in Table 3.0-55 and Table 3.0-56. The estimated number of events per year that would involve expending chaff and locations where they occur are detailed below in Table 3.0-85.

Table 3.0-85: Annual Number and Location of Events Involve the Use of Expended Chaff

Activity Area	Training			Testing		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
HRC	200	2,600	2,600	0	300	300
SOCAL	20,750	20,750	20,750	0	204	254
Total	**20,950**	**23,350**	**23,350**	**0**	**504**	**554**

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California (Range Comple)x

Flares

Flares are pyrotechnic devices used to defend against heat-seeking missiles, where the missile seeks out the heat signature from the flare rather than the aircraft's engines. Similar to chaff, flares are also dispensed from aircraft and fired from ships. The flare device consists of a cylindrical cartridge approximately 1.4 in. (3.6 cm) in diameter and 5.8 in. (14.7 cm) in length. Flares are designed to burn completely. The only material that would enter the water would be a small, round, plastic end cap (approximately 1.4 in. [3.6 cm] in diameter).

An extensive literature review and controlled experiments conducted by the U.S. Air Force revealed that self-protection flare use poses little risk to the environment or animals (U.S. Air Force 1997).

The training and testing activities that involve the use of flares are listed in Table 3.0-57 and Table 3.0-58. The overall number of flares expended annually is detailed below in Table 3.0-86.

Table 3.0-86: Annual Number and Location of Expended Flares

Activity Area	Training			Testing		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
HRC	1,750	1,750	1,750	0	45	50
SOCAL	8,300	8,300	8,300	0	350	385
Total	**10,050**	**10,050**	**10,050**	**0**	**395**	**435**

Notes: HRC = Hawaii Range Complex, SOCAL = Southern California (Range Complex)

3.0.5.4 Resource-Specific Impacts Analysis for Individual Stressors

The direct and indirect impacts of each stressor carried forward for further analysis were analyzed for each resource in their respective section. Quantitative and semi-quantitative methods were used to the extent possible, but inherent scientific limitations required the use of qualitative methods for most stressor/resource interactions. Resource-specific methods are described in sections of Chapter 3, where applicable. While specific methods used to analyze the impacts of individual stressors varied by resource, the following generalized approach was used for all stressor/resource interactions:

- The frequency, duration, and spatial extent of exposure to stressors were analyzed for each resource. The frequency of exposure to stressors or frequency of a proposed activity was characterized as intermittent or continuous, and was quantified in terms of number per unit of time when possible. Duration of exposure was expressed as short- or long-term and was quantified in units of time (e.g., seconds, minutes, and hours) when possible. The spatial extent of exposure was generally characterized as widespread or localized, and the stressor footprint or area (e.g., $ft.^2$, nm^2) was quantified when possible.
- An analysis was conducted to determine whether and how resources are likely to respond to stressor exposure or be altered by stressor exposure based upon available scientific knowledge. This step included reviewing available scientific literature and empirical data. For many stressor/resource interactions, a range of likely responses or endpoints was identified. For example, exposure of an organism to sound produced by an underwater explosion could result in no response, a physiological response such as increased heart rate, a behavioral response such as being startled, injury, or mortality.
- The information obtained was used to analyze the likely impacts of individual stressors on a resource and to characterize the type, duration, and intensity (severity) of impacts. The type of impact was generally defined as beneficial or adverse and was further defined as a specific endpoint (e.g., change in behavior, mortality, change in concentration, loss of habitat, loss of fishing time). When possible, the endpoint was quantified. The duration of an impact was generally characterized as short-term (e.g., minutes, days, weeks, months, depending on the resource), long-term (e.g., months, years, decades, depending on the resource), or permanent. The intensity of an impact was then determined. For biological resources, the analysis started with individual organisms and their habitats, and then addressed populations, species, communities, and representative ecosystem characteristics, as appropriate.

3.0.5.5 Resource-Specific Impacts Analysis for Multiple Stressors

The stressors associated with the proposed training and testing activities could affect the environment individually or in combination. The impacts of multiple stressors may be different when considered collectively rather than individually. Therefore, following the resource-specific impacts analysis for individual stressors, the combined impacts of all stressors were analyzed for that resource. This step determines the overall impacts of the alternatives on each resource, and it considers the potential for impacts that are additive (where the combined impacts on the resource are equal to the sum of the individual impacts), synergistic (where impacts combine in such a way as to amplify the effect on the resource), and antagonistic (where impacts will cancel each other out or reduce a portion of the effect on the resource). In some ways, this analysis is similar to the cumulative impacts analysis described below, but it only considers the activities in the alternatives and not other past, present, and reasonably foreseeable future actions. This step helps focus the next steps of the approach (cumulative impacts analysis) and make overall impact conclusions for each resource.

Evaluating the combined impacts of multiple stressors can be complex, especially when the impacts associated with a stressor are hard to measure. Therefore, some general assumptions were used to help determine the potential for individual stressors to contribute to combined impacts. For this analysis, combined impacts were considered more likely to occur in the following situations:

- Stressors co-occur in time and space, causing a resource to be simultaneously affected by more than one stressor.
- A resource is repeatedly affected by multiple stressors or is re-exposed before fully recovering from a previous exposure.
- The impacts of individual stressors are permanent or long-term (years or decades) versus short-term (minutes, days, or months).
- The intensity of the impacts from individual stressors is such that mitigation would be necessary to offset adverse impacts.

The resource-specific impacts analysis for multiple stressors included the following steps:

- Information obtained from the analysis of individual stressors was used to develop a conceptual model to predict the combined impacts of all stressors on each resource. This conceptual model incorporated factors such as the co-occurrence of stressors in space and time; the impacts or assessment endpoints of individual stressors (e.g., mortality, injury, changes in animal behavior or physiology, habitat alteration, changes in human use); and the duration and intensity of the impacts of individual stressors.
- To the extent possible, additive impacts on a given resource were considered by summing the impacts of individual stressors. This summation was only possible for stressors with identical and quantifiable assessment endpoints. For example, if one stressor disturbed 0.25 nm^2 of benthic habitat, a second stressor disturbed 0.5 nm^2, and all other stressors did not disturb benthic habitat, then the total benthic habitat disturbed would be 0.75 nm^2. For stressors with identical but not quantifiable assessment endpoints, available scientific knowledge, best professional judgment, and the general assumptions outlined above were used to evaluate potential additive impacts.
- For stressors with differing impacts and assessment endpoints, the potential for additive, synergistic, and antagonistic effects were evaluated based on available scientific knowledge, professional judgment, and the general assumptions outlined above.

3.0.5.6 Cumulative Impacts

A cumulative impact is the impact on the environment that results when the incremental impact of an action is added to other past, present, and reasonably foreseeable future actions. The cumulative impacts analysis (Chapter 4, Cumulative Impacts) considers other actions regardless of what agency (federal or nonfederal) or person undertakes the actions. Cumulative impacts result when individual actions combine with similar actions taking place over a period of time to produce conditions that frequently alter the historical baseline (40 C.F.R. § 1508.7). The goal of the analysis is to provide the decision makers with information relevant to reasonably foresee potentially significant impacts. See Chapter 4 (Cumulative Impacts) for the specific approach used for determining cumulative impacts.

3.0.5.7 Biological Resource Methods

The analysis of impacts on biological resources focused on the likelihood of encountering the stressor, the primary stimulus, response, and recovery of individual organisms. Where appropriate, the differential potential of biological resources to overlap with stressors was considered at the level of specific geographic areas (large marine ecosystems, open ocean areas, range complexes, operating areas, and other training and testing areas). Additionally, the differential impacts of training versus testing activities that introduce stressors to the resource were considered.

3.0.5.7.1 Conceptual Framework for Assessing Effects from Sound-Producing Activities

This conceptual framework describes the different types of effects that are possible and the potential relationships between sound stimuli and long-term consequences for the individual and population. The conceptual framework is central to the assessment of acoustic-related effects and is consulted multiple times throughout the process. It describes potential effects and the pathways by which an acoustic stimulus or sound-producing activity can potentially affect animals. The conceptual framework qualitatively describes costs to the animal (e.g., expended energy or missed feeding opportunity) that may be associated with specific reactions. Finally, the conceptual framework outlines the conditions that may lead to long-term consequences for the individual and population if the animal cannot fully recover from the short-term effects. Within each biological resource section (e.g., marine mammals, birds, and fish,) the detailed methods to predict effects on specific taxa are derived from this conceptual framework.

An animal is considered "exposed" to a sound if the received sound level at the animal's location is above the background ambient noise level within a similar frequency band. A variety of effects may result from exposure to sound-producing activities. The severity of these effects can vary greatly between minor effects that have no real cost to the animal, to more severe effects that may have lasting consequences. Whether a marine animal is significantly affected must be determined from the best available scientific data regarding the potential physiological and behavioral responses to sound-producing activities and the possible costs and long-term consequences of those responses.

The major categories of potential effects are:

- Direct trauma
- Auditory fatigue
- Auditory masking
- Behavioral reactions
- Physiological stress

Direct trauma refers to injury to organs or tissues of an animal as a direct result of an intense sound wave or shock wave impinging upon or passing through its body. Potential impacts on an animal's internal tissues and organs are assessed by considering the characteristics of the exposure and the response characteristics of the tissues. Trauma can be mild and fully recoverable, with no long-term repercussions to the individual or population, or more severe, with the potential for lasting effects or, in some cases, mortality.

Auditory fatigue may result from over-stimulation of the delicate hair cells and tissues within the auditory system. The most familiar effect of auditory fatigue is hearing loss, also called a noise-induced threshold shift, meaning an increase in the hearing threshold.

Audible natural and artificial sounds can potentially result in auditory masking, a condition that occurs when noise interferes with an animal's ability to hear other sounds and may affect the animal's ability to communicate, such as requiring the animal to adjust the frequency or loudness of its call. Masking occurs when the perception of a sound is interfered with by a second sound, and the probability of masking increases as the two sounds increase in similarity and the masking sound increases in level. It is important to distinguish auditory fatigue, which persists after the sound exposure, from masking, which occurs only during the sound exposure.

Marine animals naturally experience physiological stress as part of their normal life histories. Changing weather and ocean conditions, exposure to diseases and naturally occurring toxins, lack of prey availability, social interactions with conspecifics (members of the same species), and interactions with predators all contribute to the stress a marine animal naturally experiences. The physiological response to a stressor, often termed the stress response, is an adaptive process that helps an animal cope with changing external and internal environmental conditions. However, too much of a stress response can be harmful to an animal, resulting in physiological dysfunction. In some cases, naturally occurring stressors can have profound impacts on animals. Sound-producing activities have the potential to provide additional stress, which must be considered, not only for its direct impact on an animal's behavior but also for contributing to an animal's chronic stress level.

A sound-producing activity can cause a variety of behavioral reactions in animals ranging from very minor and brief, to more severe reactions such as aggression or prolonged flight. The acoustic stimuli can cause a stress reaction (i.e., startle or annoyance); they may act as a cue to an animal that has experienced a stress reaction in the past to similar sounds or activities, or that acquired a learned behavioral response to the sounds from conspecifics. An animal may choose to deal with these stimuli or ignore them based on the severity of the stress response, the animal's past experience with the sound, as well as other stimuli present in the environment. If an animal chooses to react to the acoustic stimuli, then the behavioral responses fall into two categories: alteration of an ongoing behavior pattern or avoidance. The specific type and severity of these reactions helps determine the costs and ultimate consequences to the individual and population.

3.0.5.7.1.1 Flowchart

Figure 3.0-18 is a flowchart that diagrams the process used to evaluate the potential effects on marine animals from sound-producing activities. The shape and color of each box on the flowchart represent either a decision point in the analysis (green diamonds); specific processes such as responses, costs, or recovery (blue rectangles); external factors to consider (purple parallelograms); and final outcomes for the individual or population (orange ovals and rectangles). Each box is labeled for reference throughout the following sections. For simplicity, *sound* is used here to include not only acoustic waves but also shock waves generated from explosive sources. The supporting text clarifies those instances where it is necessary to distinguish between the two phenomena.

Box A1, the *Sound-Producing Activity*, is the source of the sound stimuli and therefore the starting point in the analysis. Each of the five major categories of potential effects (i.e., direct trauma, auditory fatigue, masking, behavioral response, and stress) are presented as pathways that flow from left to right across the diagram. Pathways are not exclusive, and each must be followed until it can be concluded that an animal is not at risk for that specific effect. The vertical columns show the steps in the analysis used to examine each of the effects pathways. These steps proceed from the *Stimuli,* to the *Physiological Responses*, to any potential *Behavioral Responses*, to the *Costs to the Animal*, to the *Recovery* of the animal, and finally to the *Long-Term Consequences* for the *Individual* and *Population*.

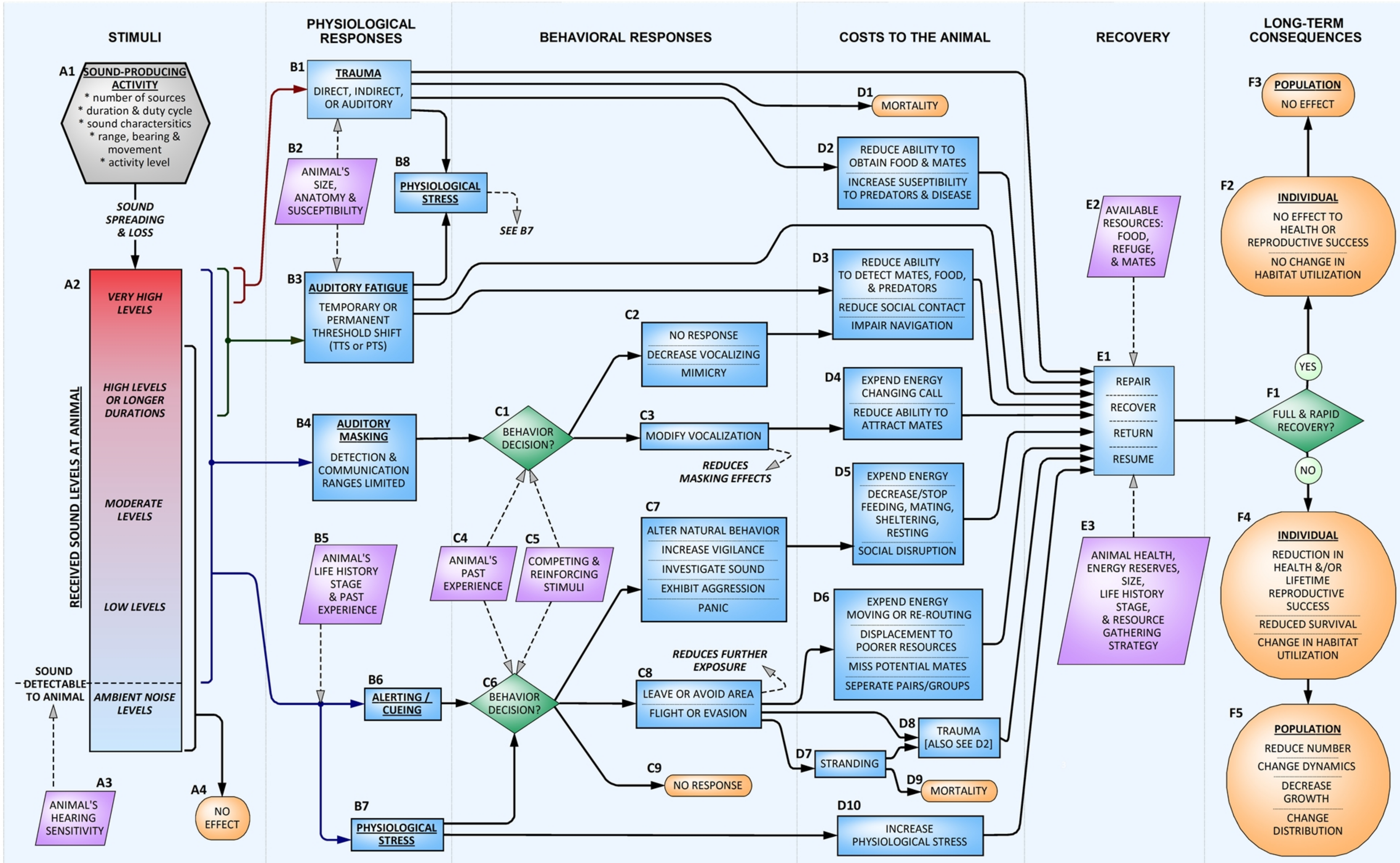


Figure 3.0-18: Flow Chart of the Evaluation Process of Sound-Producing Activities

This Page Intentionally Left Blank

3.0.5.7.1.2 Stimuli

The first step in predicting whether a sound-producing activity is capable of causing an effect on a marine animal is to define the *Stimuli* experienced by the animal. The *Stimuli* include the *sound-producing activity*, the surrounding acoustical environment, and the characteristics of the sound when it reaches the animal, and whether the animal can detect the sound.

Sounds emitted from a *sound-producing activity* (Box A1) travel through the environment to create a spatially variable sound field. There can be any number of individual sound sources in a given activity, each with its own unique characteristics. For example, a Navy training exercise may involve several ships and aircraft, several types of sonar, and several types of ordnance. Each of the individual sound sources has unique characteristics: source level, frequency, duty cycle, duration, and rise-time (i.e., impulsive vs. non-impulsive). Each source also has a range, depth/altitude, bearing and directionality, and movement relative to the animal.

Environmental factors such as temperature, salinity, bathymetry, bottom type, and sea state all impact how sound spreads through the environment and how sound decreases in amplitude between the source and the receiver (individual animal). Mathematical calculations and computer models are used to predict how the characteristics of the sound will change between the source and the animal under a range of realistic environmental conditions for the locations where sound-producing activities occur.

The details of the overall activity may also be important to place the potential effects into context and help predict the range of severity of the probable reactions. The overall activity level (e.g., number of ships and aircraft involved in exercise); the number of sound sources within the activity; the activity duration; and the range, bearing, and movement of the activity relative to the animal are all considered.

The *received sound at the animal* and the number of times the sound is experienced (i.e., repetitive exposures) (Box A2) determines the range of possible effects. Sounds that are higher than the ambient noise level and within an *animal's hearing sensitivity* range (Box A3) have the potential to cause effects. Very high exposure levels may have the potential to cause trauma; high-level exposures, long-duration exposures, or repetitive exposures may potentially cause auditory fatigue; lower-level exposures may potentially lead to masking; all perceived levels may lead to stress; and many sounds, including sounds that are not detectable by the animal, would have *no* e*ffect* (Box A4).

3.0.5.7.1.3 Physiological Responses

Physiological Responses include direct trauma, hearing loss, auditory masking, and stress. The magnitude of the involuntary response is predicted based on the characteristics of the acoustic stimuli and the characteristics of the animal (species, susceptibility, life history stage, size, and past experiences).

Trauma

Physiological responses to sound stimulation may range from mechanical vibration (with no resulting adverse effects) to tissue trauma (injury). Direct *trauma* (Box B1) refers to the direct injury of tissues and organs by sound waves impinging upon or traveling through an animal's body. Marine animals' bodies, especially their auditory systems, are well adapted to large hydrostatic pressures and large, but relatively slow, pressure changes that occur with changing depth. However, mechanical trauma may result from exposure to very-high-amplitude sounds when the elastic limits of the auditory system are exceeded or when animals are exposed to intense sounds with very rapid rise times, such that the tissues cannot respond adequately to the rapid pressure changes. Trauma to marine animals from sound exposure requires high received levels. Trauma effects therefore normally only occur with very-high-amplitude, often impulsive, sources, and at relatively close range, which limits the number of animals likely exposed to trauma-inducing sound levels.

Direct trauma includes both auditory and non-auditory trauma. Auditory trauma is the direct mechanical injury to hearing-related structures, including tympanic membrane rupture, disarticulation of the middle ear ossicles, and trauma to the inner ear structures such as the organ of Corti and the associated hair cells. Auditory trauma differs from auditory fatigue in that the latter involves the overstimulation of the auditory system at levels below those capable of causing direct mechanical damage. Auditory trauma is always injurious but can be temporary. One of the most common consequences of auditory trauma is hearing loss (see Auditory Fatigue below).

Non-auditory trauma can include hemorrhaging of small blood vessels and the rupture of gas-containing tissues such as the lung, swim bladder, or gastrointestinal tract. After the ear (or other sound-sensing organs), these are usually the most sensitive organs and tissues to acoustic trauma. An *animal's size and anatomy* are important in determining its *susceptibility to trauma* (Box B2), especially non-auditory trauma. Larger size indicates more tissue to protect vital organs that might be otherwise susceptible (i.e., there is more attenuation of the received sound before it impacts non-auditory structures). Therefore, larger animals should be less susceptible to trauma than smaller animals. In some cases, acoustic resonance of a structure may enhance the vibrations resulting from noise exposure and result in an increased susceptibility to trauma. Resonance is a phenomenon that exists when an object is vibrated at a frequency near its natural frequency of vibration, or the particular frequency at which the object vibrates most readily. The size, geometry, and material composition of a structure determine the frequency at which the object will resonate. The potential for resonance is determined by comparing the sound frequencies with the resonant frequency and damping of the tissues. Because most biological tissues are heavily damped, the increase in susceptibility from resonance is limited.

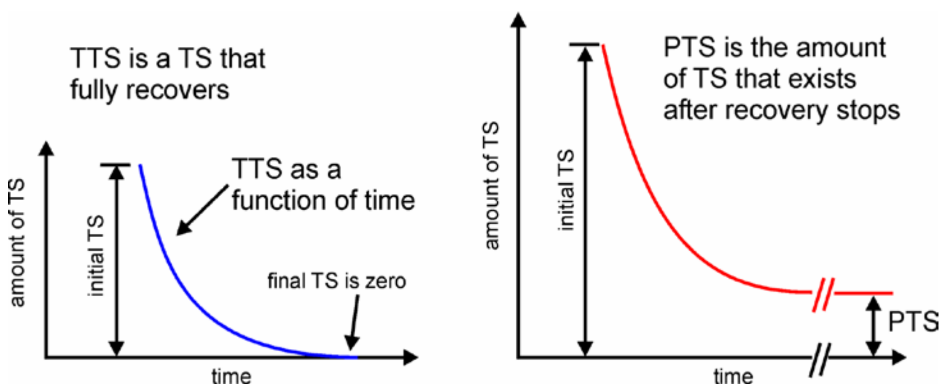
Vascular and tissue bubble formation resulting from sound exposure is a hypothesized mechanism of indirect trauma to marine animals. The risk of bubble formation from one of these processes, called rectified diffusion, is based on the amplitude, frequency, and duration of the sound (Crum and Mao 1996) and an animal's tissue nitrogen gas saturation at the time of the exposure. Rectified diffusion is the growth of a bubble that fluctuates in size because of the changing pressure field caused by the sound wave. An alternative, but related hypothesis, has also been suggested: stable microbubbles could be destabilized by high-level sound exposures such that bubble growth then occurs through static diffusion of gas out of gas-supersaturated tissues. Bubbles have also been hypothesized to result from changes in the dive behavior of marine mammals as a result of sound exposure (Jepson et al. 2003). Vascular bubbles produced by this mechanism would not be a physiological response to the sound exposure, but a cost to the animal because of the change in behavior (Section 3.0.5.7.1.5, Costs to the Animal). Under either of these hypotheses, several things could happen: (1) bubbles could grow to the extent that vascular blockage (emboli) and tissue hemorrhage occur, (2) bubbles could develop to the extent that a complement immune response is triggered or the nervous tissue is subjected to enough localized pressure that pain or dysfunction occurs, or (3) the bubbles could be cleared by the lung without negative consequence to the animal. Although rectified diffusion is a known phenomenon, its applicability to diving marine animals exposed to sound is questionable; animals would need to be highly supersaturated with gas and very close to a high-level sound source (Crum et al. 2005). The other two hypothesized phenomena are largely theoretical and have not been demonstrated under realistic exposure conditions.

Auditory Fatigue

Auditory fatigue is a reduction in hearing ability resulting from overstimulation to sounds. The mechanisms responsible for auditory fatigue differ from auditory trauma and may consist of a variety of mechanical and biochemical processes, including physical damage (not including tympanic membrane rupture) or distortion of the tympanic membrane and cochlear hair cell stereocilia, oxidative stress-related hair cell death, changes in cochlear blood flow, and swelling of cochlear nerve terminals resulting from glutamate excitotoxicity (Henderson et al. 2006; Kujawa and Liberman 2009). Although the outer hair cells are the most prominent target for fatigue effects, severe noise exposures may also result in inner hair cell death and loss of auditory nerve fibers (Henderson et al. 2006). Auditory fatigue is possibly the best studied type of effect from sound exposures in marine and terrestrial animals, including humans. The characteristics of the received sound stimuli are used and compared to the *animal's hearing sensitivity* and susceptibility to noise (Box A3) to determine the potential for auditory fatigue.

Auditory fatigue manifests itself as hearing loss, called a noise-induced threshold shift. A threshold shift may be either permanent threshold shift (PTS), or temporary threshold shift (TTS). Note that the term "auditory fatigue" is often used to mean a TTS; however, in this analysis, a more general meaning to differentiate fatigue mechanisms (e.g., metabolic exhaustion and distortion of tissues) from auditory trauma mechanisms (e.g., physical destruction of cochlear tissues occurring at the time of exposure) is used.

The distinction between PTS and TTS is based on whether there is a complete recovery of hearing sensitivity following a sound exposure. If the threshold shift eventually returns to zero (the animal's hearing returns to pre-exposure value), the threshold shift is a TTS. If the threshold shift does not return to zero but leaves some finite amount of threshold shift, then that remaining threshold shift is a PTS. Figure 3.0-19 shows one hypothetical threshold shift that completely recovers, a TTS, and one that does not completely recover, leaving some PTS.



TTS – temporary threshold shift
TS – threshold shift
PTS – permanent threshold shift

Figure 3.0-19: Two Hypothetical Threshold Shifts

The relationship between TTS and PTS is complicated and poorly understood, even in humans and terrestrial mammals, where numerous studies failed to delineate a clear relationship between the two. Relatively small amounts of TTS (e.g., less than 40–50 dB measured 2 minutes after exposure) will recover with no apparent long-term effects; however, terrestrial mammal studies revealed that large amounts of TTS (e.g., approximately 40 dB measured 24 hours after exposure) can result in permanent neural degeneration, despite the hearing thresholds returning to normal (Kujawa and Liberman 2009). The amounts of TTS induced by Kujawa and Liberman were described as being "at the limits of reversibility." It is unknown whether smaller amounts of TTS can result in similar neural degeneration, or if effects would translate to other species such as marine animals.

The amplitude, frequency, duration, and temporal pattern of the sound exposure are important parameters for predicting the potential for auditory fatigue. Duration is particularly important because auditory fatigue is exacerbated with prolonged exposure time. The frequency of the sound also plays an important role in susceptibility to hearing loss. Experiments show that animals are most susceptible to *fatigue* (Box B3) within their most sensitive hearing range. Sounds outside of an animal's audible frequency range do not cause fatigue.

The greater the degree of threshold shift, the smaller the ocean space within which an animal can detect biologically relevant sounds and communicate. This is referred to as reducing an animal's "acoustic space." This reduction can be estimated given the amount of threshold shift incurred by an animal.

Auditory and Communication Masking

Auditory masking occurs if the noise from an activity interferes with an animal's ability to detect, understand, elicit, or recognize biologically relevant sounds of interest (Box B4). "Noise" refers to unwanted or unimportant sounds that mask an animal's ability to hear "sounds of interest" and affect an animal's ability to generate sounds (or call). A sound of interest refers to a sound that is potentially being detected. Sounds of interest include echolocation clicks; sounds from predators; natural, abiotic sounds that may aid in navigation; and reverberation, which can give an animal information about its location and orientation within the ocean. Sounds of interest are frequently generated by conspecifics such as offspring, mates, and competitors.

The frequency, received level, and duty cycle of the noise determine the potential degree of auditory masking. Similar to hearing loss, the greater the degree of masking, the smaller the ocean space within which an animal can detect biologically relevant sounds.

Physiological Stress

If a sound is detected (i.e., heard or sensed) by an animal, a *stress* response can occur (Box B7); or the sound can *cue or alert* the animal (Box B6) without a direct, measurable stress response. If an animal suffers trauma or auditory fatigue, a *physiological stress* response will occur (Box B8). A stress response is a physiological change resulting from a stressor that is meant to help the animal deal with the stressor. The generalized stress response is characterized by a release of hormones (Reeder and Kramer 2005); however, it is now acknowledged that other chemicals produced in a stress response (e.g., stress markers) exist. For example, a release of reactive oxidative compounds, as occurs in noise-induced hearing loss (Henderson et al. 2006), occurs in response to some acoustic stressors. Stress hormones include those produced by the sympathetic nervous system, norepinephrine and epinephrine (i.e., the catecholamines), which produce elevations in the heart and respiration rate, increase awareness, and increase the availability of glucose and lipid for energy. Other stress hormones are the glucocorticoid steroid hormones cortisol and aldosterone, which are produced by the adrenal gland. These hormones are classically used as an indicator of a stress response and to characterize the magnitude of the stress response (Hennessy et al. 1979). Oxidative stress occurs when reactive molecules, called reactive oxygen species, are produced in excess of molecules that counteract their activity (i.e., antioxidants).

An acute stress response is traditionally considered part of the startle response and is hormonally characterized by the release of the catecholamines. Annoyance type reactions may be characterized by the release of either or both catecholamines and glucocorticoid hormones. Regardless of the physiological changes that make up the stress response, the stress response may contribute to an animal's decision to alter its behavior. Alternatively, a stimulus may not cause a measurable stress response but may act as an alert or cue to an animal to change its behavior. This response may occur because of learned associations; the animal may have experienced a stress reaction in the past to similar sounds or activities (Box C4), or it may have learned the response from conspecifics. The severity of the stress response depends on the *received sound level* at the animal (Box A2); the details of the *sound-producing activity* (Box A1); the *animal's life history stage* (e.g., juvenile or adult; breeding or feeding season) (Box B5); and the *animal's past experience* with the stimuli (Box B5). These factors would be subject to individual variation, as well as variation within an individual over time.

An *animal's life history stage* is an important factor to consider when predicting whether a stress response is likely (Box B5). An animal's life history stage includes its level of physical maturity (i.e., larva, infant, juvenile, sexually mature adult) and the primary activity in which it is engaged such as mating, feeding, or rearing/caring for young. Animals engaged in a critical life activity such as mating or feeding may have a lesser stress response than an animal engaged in a more flexible activity such as resting or migrating (i.e., an activity that does not necessarily depend on the availability of resources). The animal's past experiences with the stimuli or similar stimuli are another important consideration. Prior experience with a stressor may be of particular importance because repeated experience with a stressor may dull the stress response via acclimation (St. Aubin and Dierauf 2001) or increase the response via sensitization.

3.0.5.7.1.4 Behavioral Responses

Any number of *Behavioral Responses* can result from a physiological response. An animal responds to the stimulus based on a number of factors in addition to the severity of the physiological response. An animal's experience with the sound (or similar sounds), the context of the acoustic exposure, and the presence of other stimuli contribute to determining its reaction from a suite of possible behaviors.

Behavioral responses fall into two major categories: alterations in natural behavior patterns and avoidance. These types of reactions are not mutually exclusive, and many overall reactions may be combinations of behaviors or a sequence of behaviors. Severity of behavioral reactions can vary drastically between minor and brief reorientations of the animal to investigate the sound, to severe reactions such as aggression or prolonged flight. The type and severity of the behavioral response will determine the cost to the animal.

Trauma and Auditory Fatigue

Direct trauma and auditory fatigue increases the animal's *physiological stress* (Box B8), which feeds into the *stress* response (Box B7). Direct trauma and auditory fatigue increase the likelihood or severity of a behavioral response and *increase* an animal's overall physiological stress level (Box D10).

Auditory Masking

A behavior decision is made by the animal when the animal detects increased background noise, or possibly when the animal recognizes that biologically relevant sounds are being masked (Box C1). An *animal's past experience* with the sound -producing activity or similar acoustic stimuli can affect its choice of behavior during auditory masking (Box C4). *Competing and reinforcing stimuli* may also affect its decision (Box C5).

An animal may exhibit a passive behavioral response when coping with auditory masking (Box C2). It may simply not respond and keep conducting its current natural behavior. An animal may also stop calling until the background noise decreases. These passive responses do not present a direct energetic cost to the animal; however, auditory masking will continue, depending on the acoustic stimuli.

An animal may actively compensate for auditory masking (Box C3). An animal can vocalize more loudly to make its signal heard over the masking noise. An animal may also shift the frequency of its vocalizations away from the frequency of the masking noise. This shift can actually reduce the masking effect for the animal and other animals that are "listening" in the area. For example, in marine mammals, vocalization changes have been reported from exposure to anthropogenic noise sources such as sonar, vessel noise, and seismic surveying. Changes included mimicry of the sound, cessation of vocalization, increases and decreases in vocalization length, increases and decreases in vocalization rate, and increases in vocalization frequency and level, while other animals showed no significant changes in the presence of anthropogenic sound.

An *animal's past experiences* can be important in determining what behavior decision it may make when dealing with auditory masking (Box C4). Past experience can be with the sound-producing activity itself or with similar acoustic stimuli. For example, an animal may modify its vocalizations to reduce the effects of masking noise.

Other *stimuli* present in the environment can influence an animal's behavior decision (Box C5). These stimuli can be other acoustic stimuli not directly related to the sound-producing activity; they can be visual, olfactory, or tactile stimuli; the stimuli can be conspecifics or predators in the area; or the stimuli can be the strong drive to engage in a natural behavior. In some cases, natural motivations may suppress any behavioral reactions elicited by the acoustic stimulus. For example, an animal involved in mating or foraging may not react with the same degree of severity as it may have otherwise. Reinforcing stimuli reinforce the behavioral reaction caused by acoustic stimuli. For example, awareness of a predator in the area coupled with the acoustic stimuli may elicit a stronger reaction than the acoustic stimuli itself otherwise would have. The visual stimulus of seeing ships and aircraft, coupled with the acoustic stimuli, may also increase the likelihood or severity of a behavioral response.

Behavioral Reactions and Physiological Stress

A *physiological stress* response (Box B7) such as an annoyance or startle reaction, or a *cueing or alerting* reaction (Box B6) may cause an animal to make a *behavior decision* (Box C6). Any exposure that produces an injury or auditory fatigue is also assumed to produce a *stress* response (Box B7) and increase the severity or likelihood of a behavioral reaction. Both an animal's past experience (Box C4) and *competing and reinforcing stimuli* (Box C5) can affect an animal's behavior decision. The decision can result in three general types of behavioral reactions: *no response* (Box C9), *area avoidance* (Box C8), or *alteration of a natural behavior* (Box C7).

Little data exist that correlate specific behavioral reactions with specific stress responses. Therefore, in practice the likely range of behavioral reactions is estimated from the acoustic stimuli instead of the magnitude of the stress response. It is assumed that a stress response must exist to alter a natural behavior or cause an avoidance reaction. Estimates of the types of behavioral responses that could occur for a given sound exposure have been determined from the literature.

An *animal's past experiences* can be important in determining what behavior decision it may make when dealing with a stress response (Box C4). Past experience can be with the sound-producing activity itself or with similar sound stimuli. Bejder et. al (2009) define habituation as, "a process involving a reduction in response over time as individuals learn that there are neither adverse nor beneficial consequences of the occurrence of the stimulus." An animal habituated to a particular stimulus may have a lesser (or no) behavioral response to the stimulus compared to the first time the animal encountered the stimulus. Sensitization is the opposite of habituation, and refers to an increase over time in an animal's behavioral response to a repeated or continuous stimulus (Bejder et. al 2009). An animal sensitized to a particular stimulus exhibits an increasingly intense response to the stimulus (e.g., fleeing faster or farther), because there are significant consequences for the animal. A related behavioral response, tolerance, refers to an animal's ability to endure, or tolerate, a disturbance without a defined response. Habituation and sensitization are measured by the tolerance levels exhibited by animals; habituated animals show a progressively increasing tolerance to stimuli whereas sensitized animals show a progressively decreasing tolerance to stimuli (Bejder et. al 2009).

Other *stimuli* (Box C5) present in the environment can influence an animal's *behavior decision* (Box C6). These stimuli may not be directly related to the sound-producing activity, such as visual stimuli; the stimuli can be conspecifics or predators in the area, or the stimuli can be the strong drive to engage or continue in a natural behavior. In some cases, natural motivations (e.g., competing stimuli) may suppress any behavioral reactions elicited by the acoustic stimulus. For example, an animal involved in mating or foraging may not react with the same degree of severity as an animal involved in less-critical behavior. Reinforcing stimuli reinforce the behavioral reaction caused by acoustic stimuli. For example, the awareness of a predator in the area coupled with the acoustic stimuli may elicit a stronger reaction than the acoustic stimuli themselves otherwise would have.

The visual stimulus of seeing human activities such as ships and aircraft maneuvering, coupled with the acoustic stimuli, may also increase the likelihood or severity of a behavioral response. It is difficult to separate the stimulus of the sound from the visual stimulus of the ship or platform creating the sound. The sound may act as a cue, or as one stimulus of many that the animal is considering when deciding how to react. An activity with several platforms (e.g., ships and aircraft) may elicit a different reaction than an activity with a single platform, both with similar acoustic footprints. The total number of vehicles and platforms involved, the size of the activity area, and the distance between the animal and activity are important considerations when predicting behavioral responses.

An animal may reorient or become more *vigilant* if it detects a sound-producing activity (Box C7). Some animals may *investigate* the sound using other sensory systems (e.g., vision), and perhaps move closer to the sound source. *Reorientation, vigilance, and investigation* all require the animal to divert attention and resources and therefore slow or stop their presumably beneficial natural behavior. This can be a very brief diversion, after which the animal continues its natural behavior, or an animal may not resume its natural behaviors until after a longer period when the animal has habituated to or learned to tolerate the sound or the activity has concluded. An intentional change via an orienting response represents behaviors that would be considered mild disruption. More severe alterations of natural behavior would include *aggression or panic*.

An animal may choose to *leave or avoid an area* where a sound-producing activity is taking place (Box C8). Avoidance is the displacement of an individual from an area. A more severe form of this comes in the form of flight or evasion. A flight response is a dramatic change in normal movement to a directed and rapid movement away from the detected location of a sound source. Avoidance of an area can help the animal avoid further acoustic effects by avoiding or reducing further exposure.

An animal may choose *not to respond* to a sound-producing activity (Box C9). The physiological stress response may not rise to the level that would cause the animal to modify its behavior. The animal may have habituated to the sound or simply learned through past experience that the sound is not a threat. In this case a behavioral effect would not be predicted. An animal may choose not to respond to a sound-producing activity in spite of a physiological stress response. Some combination of competing stimuli may be present such as a robust food patch or a mating opportunity that overcomes the stress response and suppresses any potential behavioral responses. If the noise-producing activity persists over long periods or reoccurs frequently, the stress felt by animals could increase their chronic stress levels.

3.0.5.7.1.5 Costs to the Animal

The potential costs to a marine animal from an involuntary or behavioral response include no measurable cost, expended energy reserves, increased stress, reduced social contact, missed opportunities to secure resources or mates, displacement, and stranding or severe evasive behavior (which may potentially lead to secondary trauma or death). Animals suffer costs on a daily basis from a host of natural situations such as dealing with predator or competitor pressure. If the costs to the animal from an acoustic-related effect fall outside of its normal daily variations, then individuals must recover from significant costs to avoid long-term consequences.

Trauma

Trauma or injury to an animal may *reduce its ability to secure food* by *reducing its mobility* or the efficiency of its sensory systems, make the injured individual *less attractive to potential mates*, or increase *an individual's chances of contracting diseases or falling prey to a predator* (Box D2). A severe trauma can lead to the *death* of the individual (Box D1).

Auditory Fatigue and Auditory Masking

Auditory fatigue and masking can impair an animal's ability to hear biologically important sounds (Box D3), especially fainter and distant sounds. Sounds could belong to conspecifics such as other individuals in a social group (i.e., pod, school, etc.), potential mates, potential competitors, or parents/offspring. Biologically important sounds could also be an animal's own biosonar echoes used to detect prey, sounds from predators, and sounds from the physical environment. Therefore, auditory masking or a hearing loss could reduce an animal's ability to contact social groups, offspring, or parents; and reduce opportunities to detect or attract more distant mates. Animals may also use sounds to gain information about their physical environment by detecting the reverberation of sounds in the underwater space or sensing the sound of crashing waves on a nearby shoreline. These cues could be used by some animals to migrate long distances or navigate their immediate environment. Therefore, an animal's ability to navigate may be impaired if the animal uses acoustic cues from the physical environment to help identify its location. Auditory masking and fatigue both effectively reduce the animal's acoustic space and the ocean volume in which detection and communication are effective.

An animal that modifies its vocalization in response to auditory masking could incur a cost (Box D4). Modifying vocalizations may cost the animal energy from its finite energy budget, interfere with the behavioral function of a call, or reduce a signaler's apparent quality as a mating partner. For example, songbirds that shift their calls up an octave to compensate for increased background noise attract fewer or less-desirable mates, and many terrestrial species advertise body size and quality with low-frequency vocalizations (Slabbekoorn and Ripmeester 2008). Increasing the frequency of these vocalizations could reduce a signaler's attractiveness in the eyes of potential mates even as it improves the overall detectability of the call.

Auditory masking or auditory fatigue may also lead to no measurable costs for an animal. Masking could be of short duration or intermittent so that continuous or repeated biologically important sounds are received by the animal between masking noise. Auditory fatigue could also be inconsequential for an animal if the frequency range affected is not critical for that animal to hear within, or the auditory fatigue is of such short duration (a few minutes) that there are no costs to the individual.

Behavioral Reactions and Physiological Stress

An animal that alters its natural behavior in response to stress or an auditory cue may slow or cease its presumably beneficial natural behavior and instead *expend energy* reacting to the sound-producing activity (Box D5). Beneficial natural behaviors include *feeding, breeding, sheltering, and migrating*. The cost of feeding disruptions depends on the energetic requirements of individuals and the potential amount of food missed during the disruption. Alteration in breeding behavior can result in delaying reproduction. The costs of a brief interruption to migrating or sheltering are less clear. Most behavior alterations also require the animal to expend energy for a nonbeneficial behavior. The amount of energy expended depends on the severity of the behavioral response.

An animal that avoids a sound-producing activity may *expend additional energy moving around the area, be displaced to poorer resources, miss potential mates, or have social interactions* affected (Box D6). Avoidance reactions can cause an animal to expend energy. The amount of energy expended depends on the severity of the behavioral response. Missing potential mates can result in delaying reproduction. Social groups or pairs of animals, such as mates or parent/offspring pairs, could be separated during a severe behavioral response such as flight. Offspring that depend on their parents may die if they are permanently separated. Splitting up an animal group can result in a reduced group size, which can have secondary effects on individual foraging success and susceptibility to predators.

Some severe behavioral reactions can lead to *stranding* (Box D7) or secondary *trauma* (Box D8). Animals that take prolonged flight, a severe avoidance reaction, may injure themselves or strand in an environment for which they are not adapted. Some *trauma* is likely to occur to an animal that strands (Box D8). Trauma can *reduce the animal's ability to secure food and mates*, and *increase the animal's susceptibility to predation and disease* (Box D2). An animal that strands and does not return to a hospitable environment quickly will likely *die* (Box D9).

Elevated stress levels may occur whether or not an animal exhibits a behavioral response (Box D10). Even while undergoing a stress response, competing stimuli (e.g., food or mating opportunities) may overcome an animal's initial stress response during the behavior decision. Regardless of whether the animal displays a behavioral reaction, this tolerated stress could incur a cost to the animal. Reactive oxygen species produced during normal physiological processes are generally counterbalanced by enzymes and antioxidants; however, excess stress can result in an excess production of reactive oxygen species, leading to damage of lipids, proteins, and nucleic acids at the cellular level (Sies 1997; Touyz 2004).

3.0.5.7.1.6 Recovery

The predicted recovery of the animal (Box E1) is based on the cost of any masking or behavioral response and the severity of any involuntary physiological reactions (e.g., direct trauma, hearing loss, or increased chronic stress). Many effects are fully recoverable upon cessation of the sound-producing activity, and the vast majority of effects are completely recoverable over time; whereas a few effects may not be fully recoverable. The availability of resources and the characteristics of the animal play a critical role in determining the speed and completeness of recovery.

Available resources fluctuate by season, location, and year and can play a major role in an animal's rate of recovery (Box E2). Plentiful *food* can aid in a quicker recovery, whereas recovery can take much longer if food resources are limited. If many potential *mates* are available, an animal may recover quickly from missing a single mating opportunity. *Refuge* or shelter is also an important resource that may give an animal an opportunity to recover or repair after an incurred cost or physiological response.

An *animal's health, energy reserves, size, life history stage, and resource gathering strategy* affect its speed and completeness of recovery (Box E3). Animals that are in good health and have abundant energy reserves before an effect will likely recover more quickly. Adult animals with stored energy reserves (e.g., fat reserves) may have an easier time recovering than juveniles that expend their energy growing and developing and have less in reserve. Large individuals and large species may recover more quickly, also due to having more potential for energy reserves. Animals that gather and store resources, perhaps fasting for months during breeding or offspring rearing seasons, may have a more difficult time recovering from being temporarily displaced from a feeding area than an animal that feeds year round.

Damaged tissues from mild to moderate trauma may heal over time. The predicted recovery of direct trauma is based on the severity of the trauma, availability of resources, and characteristics of the animal. After a sustained injury an animal's body attempts to *repair* tissues. The animal may also need to *recover* from any potential costs due to a decrease in resource gathering efficiency and any secondary effects from predators or disease (Box E1). Moderate to severe trauma that does not cause mortality may never fully heal.

Small to moderate amounts of hearing loss may recover over a period of minutes to days, depending on the nature of the exposure and the amount of initial threshold shift. Severe noise-induced hearing loss may not fully recover, resulting in some amount of permanent hearing loss.

Auditory masking only occurs when the sound source is operating; therefore, direct masking effects stop immediately upon cessation of the sound-producing activity (Box E1). Natural behaviors may *resume* shortly after or even during the acoustic stimulus after an initial assessment period by the animal. Any energetic expenditures and missed opportunities to find and secure resources incurred from masking or a behavior alteration may take some time to *recover*.

Animals displaced from their normal habitat due to an avoidance reaction may *return* over time and *resume* their natural behaviors, depending on the severity of the reaction and how often the activity is repeated in the area. In areas of repeated and frequent acoustic disturbance, some animals may habituate to or learn to tolerate the new baseline or fluctuations in noise level. More sensitive species, or animals that may have been sensitized to the stimulus over time due to past negative experiences, may not return to an area. Other animals may return but not resume use of the habitat in the same manner as before the acoustic-related effect. For example, an animal may return to an area to feed or navigate through it to get to another area, but that animal may no longer seek that area as refuge or shelter.

Frequent milder physiological responses to an individual may accumulate over time if the time between sound-producing activities is not adequate to give the animal an opportunity to fully recover. An increase in an animal's chronic stress level is also possible if stress caused by a sound-producing activity does not return to baseline between exposures. Each component of the stress response is variable in time, and stress hormones return to baseline levels at different rates. For example, adrenaline is released almost immediately and is used or cleared by the system quickly, whereas glucocorticoid and cortisol levels may take long periods (i.e. hours to days) to return to baseline.

3.0.5.7.1.7 Long-Term Consequences to the Individual and the Population

The magnitude and type of effect and the speed *and completeness of recovery* must be considered in predicting long-term consequences to the individual animal and its population (Box E). Animals that recover quickly and completely from explosive or acoustic-related effects will likely *not suffer reductions in their health or reproductive success, or experience changes in habitat utilization* (Box F2). *No population-level effects* would be expected if individual animals do not suffer reductions in their lifetime reproductive success or change their habitat utilization (Box G2).

Animals that do not recover quickly and fully could suffer *reductions in their health and lifetime reproductive success*; they could be permanently displaced or *change how they utilize the environment*; or they could *die* (Box F1).

Severe injuries can lead to reduced survivorship (longevity), elevated stress levels, and prolonged alterations in behavior that can reduce an animal’s lifetime reproductive success. An animal with decreased energy stores or a lingering injury may be less successful at mating for one or more breeding seasons, thereby decreasing the number of offspring produced over its lifetime.

An animal whose hearing does not recover quickly and fully could suffer a reduction in lifetime reproductive success, because it may no longer be able to detect the calls of a mate as well as it could prior to losing hearing sensitivity(Box F1). This example underscores the importance of the frequency of sound associated with the hearing loss and how the animal relies on those frequencies (e.g., for mating, navigating, detecting predators). An animal with decreased energy stores or a PTS may be less successful at mating for one or more breeding seasons, thereby decreasing the number of offspring it can produce over its lifetime.

As mentioned above, the direct effects of masking ends when the acoustic stimuli conclude. The direct effects of auditory masking could have long-term consequences for individuals if the activity was continuous or occurred frequently enough; however, most of the proposed training and testing activities are normally spread over vast areas and occur infrequently in a specific area.

Missed mating opportunities can have a direct effect on reproductive success. Reducing an animal's energy reserves over longer periods can directly reduce its health and reproductive success. Some species may not enter a breeding cycle without adequate energy stores, and animals that do breed may have a decreased probability of offspring survival. Animals displaced from their preferred habitat, or those who utilize it differently, may no longer have access to the best resources. Some animals that leave or flee an area during a noise-producing activity, especially an activity that is persistent or frequent, may not return quickly or at all. This can further reduce an individual’s health and lifetime reproductive success.

Frequent disruptions to natural behavior patterns may not allow an animal to fully recover between exposures, which increase the probability of causing long-term consequences to individuals. Elevated chronic stress levels are usually a result of a prolonged or repeated disturbance. Excess stress produces reactive molecules in an animal's body that can result in cellular damage (Sies 1997; Touyz 2004).

Chronic elevations in the stress levels (e.g., cortisol levels) may produce long-term health consequences that can reduce lifetime reproductive success.

These long-term consequences to the individual can lead to consequences for the *population* (Box G1). Population *dynamics and abundance* play a role in determining how many individuals would need to suffer long-term consequences before there was an effect on the population (Box G1). Long-term abandonment or a change in the utilization of an area by enough individuals can *change the distribution* of the population. Death has an immediate effect in that no further contribution to the population is possible, which reduces the animal's lifetime reproductive success.

Carrying capacity describes the theoretical maximum number of animals of a particular species that the environment can support. When a population nears its carrying capacity, the lifetime reproductive success in individuals may decrease due to finite resources or predator-prey interactions. *Population growth* is naturally limited by available resources and predator pressure. If one, or a few animals, in a population are removed or gather fewer resources, then other animals in the population can take advantage of the freed resources and potentially increase their health and lifetime reproductive success. Abundant populations that are near their carrying capacity (theoretical maximum abundance) that suffer effects on a few individuals may not be affected overall.

Populations that exist well below their carrying capacity (e.g., threatened or endangered species populations) may suffer greater consequences from any lasting effects on even a few individuals. Population-level consequences can include a change in the population dynamics, a decrease in the growth rate, or a change in geographic distribution. Changing the dynamics of a population (the proportion of the population within each age group) or their geographic distribution can also have secondary effects on population growth rates.

3.0.5.7.2 Conceptual Framework for Assessing Effects from Energy-Producing Activities

3.0.5.7.2.1 Stimuli

Magnitude of the Energy Stressor

Regulations do not provide threshold criteria to determine the significance of the potential effects from activities that involve the use of varying electromagnetic frequencies or lasers. Many organisms, primarily marine vertebrates, have been studied to determine their thresholds for detecting electromagnetic fields, as reviewed by Normandeau (2011); however, there are no data on predictable responses to exposure above or below detection thresholds. The types of electromagnetic fields discussed are those from mine neutralization activities (magnetic influence minesweeping). The only types of lasers considered for analysis were low to moderate lasers (e.g., targeting systems, detection systems, laser light detection and ranging) that do not pose a risk to organisms (Swope 2010), and therefore; will not be discussed further.

Location of the Energy Stressor

Evaluation of potential energy exposure risks considered the spatial overlap of the resource occurrence and electromagnetic field and high energy laser use. Wherever appropriate, specific geographic areas of potential impact were identified. The greatest potential electromagnetic energy exposure is at the source, where intensity is greatest. The greatest potential for high energy laser exposure is at the ocean’s surface, where high energy laser intensity is greatest. As the laser penetrates the water, 96 percent of the beam is absorbed, scattered, or otherwise lost (Zorn 2000; Ulrich 2004).

Behavior of the Organism

Evaluation of potential energy exposure risk considered the behavior of the organism, especially where the organism lives and feeds (e.g., surface, water column, seafloor). The analysis for electromagnetic devices considered those species with the ability to perceive or detect electromagnetic signals. The analysis for high energy lasers particularly considered those species known to inhabit the surface of the ocean.

3.0.5.7.2.2 Immediate Response and Costs to the Individual

Many different types of organisms (e.g., some invertebrates, fishes, turtles, birds, mammals) are sensitive to electromagnetic fields (Normandeau et al. 2011). An organism that encounters a disturbance in an electromagnetic field could respond by moving toward the source, moving away from it, or not responding at all. The types of electromagnetic devices used in the Proposed Action simulate the electromagnetic signature of a vessel passing through the water column, so the expected response would be similar to that of vessel movement. However, since there would be no actual strike potential, a physiological response would be unlikely in most cases. Recovery of an individual from encountering electromagnetic fields would be variable, but since the physiological response would likely be minimal, as reviewed by Normandeau (2011), any recovery time would also be minimal.

Very little data are available to analyze potential impacts on organisms from exposure to high energy lasers. As with humans, the greatest laser-related concern for marine species is damage to an organism's ability to see. High energy lasers may also burn the skin, but the threshold energy level for eye damage is considerably lower, so the analysis considered that lower threshold. Recovery of the individual from eye damage or skin lesion caused by high energy lasers would be based on the severity of the injury and the incidence of secondary infection. Very few studies of this impact are available.

3.0.5.7.2.3 Long-Term Consequences to the Individual and Population

Long-term consequences are considered in terms of a resource's existing population level, growth and mortality rates, other stressors on the resource from the Proposed Action, cumulative impacts on the resource, and the ability of the population to recover from or adapt to impacts. Impacts of multiple or repeated stressors on individuals are cumulative. When stressors are chronic, an organism may experience reduced growth, health, or survival, which could have population-level impacts (Billard et al. 1981), especially in the case of endangered species.

3.0.5.7.3 Conceptual Framework for Assessing Effects from Physical Disturbance or Strike

3.0.5.7.3.1 Stimuli

Size and Weight of the Objects

To determine the likelihood of a strike and the potential impacts on an organism or habitat that would result from a physical strike, the size and weight of the striking object relative to the organism or habitat must be considered. Most small organisms and early life stages would simply be displaced by the movement generated by a large object moving through, or falling into, the water because they are planktonic (floating organisms) and move with the water; however, animals that occur at or near the surface could be struck. A larger nonplanktonic organism could potentially be struck by an object since it may not be displaced by the movement of the water. Sessile (nonmobile) organisms and habitats could be struck by the object, albeit with less force, on the seafloor. The weight of the object is also a factor that would determine the severity of a strike. A strike by a heavy object would be more severe than a strike by a low-weight object (e.g., a parachute, flare end cap, or chaff canister).

Location and Speed of the Objects

Evaluation of potential physical disturbance or strike risk considered the spatial overlap of the resource occurrence and potential striking objects. Analysis of impacts from physical disturbance or strike stressors focuses on proposed activities that may cause an organism or habitat to be struck by an object moving through the air (e.g., aircraft), water (e.g., vessels, in-water devices, towed devices), or dropped into the water (e.g., non-explosive practice munitions and seafloor devices). The area of operation, vertical distribution, and density of these items also play central roles in the likelihood of impact. Wherever appropriate, specific geographic areas of potential impact are identified. Analysis of potential physical disturbance or strike risk also considered the speed of vessels as a measure of intensity. Some vessels move slowly, while others are capable of high speeds.

Buoyancy of the Objects

Evaluation of potential physical disturbance or strike risk in the ocean considered the buoyancy of targets or expended materials during operation, which will determine whether the object will be encountered at the surface, within the water column, or on the seafloor. Once landed on the water surface, buoyant objects have the potential to strike plants and organisms that occur on the sea surface (e.g., drifting into *Sargassum* mats), and negatively buoyant objects may strike plants and organisms within the water column or on the seafloor.

Behavior of the Organism

Evaluation of potential physical disturbance or strike risk considered where organisms occur and if they occur in the same geographic area and vertical distribution as those objects that pose strike risks.

3.0.5.7.3.2 Immediate Response and Costs to the Individual

Before being struck, some organisms would sense a pressure wave through the water and respond by remaining in place, moving away from the object, or moving toward it. An organism displaced a small distance by movements from an object falling into the water nearby would likely continue on with no response. However, others could be disturbed and may exhibit a generalized stress response. If the object actually hit the organism, direct injury in addition to stress may result. The function of the stress response in vertebrates is to rapidly raise the blood sugar level to prepare the organism to flee or fight. This generally adaptive physiological response can become a liability if the stressor persists and the organism cannot return to its baseline physiological state.

Most organisms would respond to sudden physical approach or contact by darting quickly away from the stimulus. Other species may respond by freezing in place or seeking refuge. In any case, the individual must stop whatever it was doing and divert its physiological and cognitive attention to responding to the stressor. The energy costs of reacting to a stressor depend on the specific situation, but in all cases the caloric requirements of stress reactions reduce the amount of energy available to the individual for other functions such as predator avoidance, reproduction, growth, and metabolism.

The ability of an organism to return to what it was doing following a physical strike (or near miss resulting in a stress response) is a function of fitness, genetic, and environmental factors. Some organisms are more tolerant of environmental or human-caused stressors than others and become acclimated more easily. Within a species, the rate at which an individual recovers from a physical disturbance or strike may be influenced by its age, sex, reproductive state, and general condition. An organism that has reacted to a sudden disturbance by swimming at burst speed would tire after some time; its blood hormone and sugar levels may not return to normal for 24 hours. During the recovery period, the organism may not be able to attain burst speeds and could be more vulnerable to predators. If the individual were not able to regain a steady state following exposure to a physical stressor, it may suffer depressed immune function and even death.

3.0.5.7.3.3 Long-Term Consequences to the Population

Long-term consequences are considered in terms of a resource's existing population level, growth and mortality rates, other stressors on the resource from the Proposed Action, cumulative impacts on the resource, and the ability of the population to recover from or adapt to impacts. Impacts of multiple or repeated stressors on individuals are cumulative. When stressors are chronic, an organism may experience reduced growth, health, or survival, which could have population-level impacts (Billard et al. 1981), especially in the case of endangered species.

3.0.5.7.4 Conceptual Framework for Assessing Effects from Entanglement

3.0.5.7.4.1 Stimuli

Physical Properties of the Objects

For an organism to become entangled in military expended materials, the materials must have certain properties, such as the ability to form loops and a high breaking strength. Some items could have a relatively low breaking strength on their own, but that breaking strength could be increased if multiple loops were wrapped around an entangled organism.

Location of the Objects

Evaluation of potential entanglement risk considered the spatial overlap of the resource occurrence and military expended materials. Distribution and density of expended items play a central role in the likelihood of impact. Wherever appropriate, specific geographic areas of potential impact are identified.

Buoyancy of Objects

Evaluation of potential entanglement risk considered the buoyancy of military expended materials to determine whether the object will be encountered within the water column (including the surface) or on the seafloor. Less buoyant materials, such as torpedo guidance wires, sink rapidly to the seafloor. More buoyant materials include less dense items (e.g., parachutes) that are weighted and would sink slowly to the seafloor and could be entrained in currents.

Behavior of the Organism

Evaluation of potential entanglement risk considered the general behavior of the organism, including where the organism typically occurs (e.g., surface, water column, seafloor). The analysis particularly considered those species known to become entangled in nonmilitary expended materials (e.g., "marine debris") such as fishing lines, nets, rope, and other derelict fishing gear that often entangle marine organisms.

3.0.5.7.4.2 Immediate Response and Costs to the Individual

The potential impacts of entanglement on a given organism depend on the species and size of the organism. Species that have protruding snouts, fins, or appendages are more likely to become entangled than smooth-bodied organisms. Also, items could get entangled by an organism's mouth, if caught on teeth or baleen, with the rest of the item trailing alongside the organism. Materials similar to fishing gear, which is designed to entangle an organism, would be expected to have a greater entanglement potential than other materials. An entangled organism would likely try to free itself of the entangling object and in the process may become even more entangled, possibly leading to a stress response. The net result of being entangled by an object could be disruption of the normal behavior, injury due to lacerations, and other sublethal or lethal impacts.

3.0.5.7.4.3 Long-Term Consequences to the Individual and Population

Consequences of entanglement could range from an organism successfully freeing itself from the object or remaining entangled indefinitely, possibly resulting in lacerations and other sublethal or lethal impacts. Stress responses or infection from lacerations could lead to latent mortality. The analysis will focus on reasonably foreseeable long-term consequences of the direct impact, particularly those that could impact the fitness of an individual. Changes in an individual's growth, survival, annual reproductive success, or lifetime reproductive success could have population-level impacts if enough individuals are impacted. This population-level impact would vary among species and taxonomic groups.

3.0.5.7.5 Conceptual Framework for Assessing Effects from Ingestion

3.0.5.7.5.1 Stimuli

Size of the Objects

To assess the ingestion risk from military expended materials, this analysis considered the size of the object relative to the animal's ability to swallow it. Some items are too large to be ingested (e.g., non-explosive practice bombs and most targets) and impacts from these items are not discussed further. However, these items may potentially break down into smaller ingestible pieces over time. Items that are of ingestible size when they are introduced into the environment are carried forward for analysis within each resource section where applicable.

Location of the Objects

Evaluation of potential ingestion risk considered the spatial overlap of the resource occurrence and military expended materials. The distribution and density of expended items play a central role in the likelihood of impact. Wherever appropriate, specific geographic areas of potential impact were identified.

Buoyancy of the Objects

Evaluation of potential ingestion risk considered the buoyancy of military expended materials to determine whether the object will be encountered within the water column (including the surface) or on the seafloor. Less buoyant materials, such as solid metal materials (e.g., projectiles or ordnance fragments), sink rapidly to the seafloor. More buoyant materials include less dense items (e.g., target fragments and parachutes) that may be caught in currents and gyres or entangled in floating *Sargassum*. These materials can remain in the water column for an indefinite period of time before sinking. However, parachutes are weighted and would generally sink, unless that sinking is suspended, in the scenario described here.

Feeding Behavior

Evaluation of potential ingestion risk considered the feeding behavior of the organism, including where (e.g., surface, water column, seafloor) and how (e.g., filter feeding) the organism feeds and what it feeds on. The analysis particularly considered those species known to ingest nonfood items (e.g., plastic or metal items).

3.0.5.7.5.2 Immediate Response and Costs to the Individual

Potential impacts of ingesting foreign objects on a given organism depend on the species and size of the organism. Species that normally eat spiny hard-bodied invertebrates would be expected to have tougher mouths and guts than those that normally feed on softer prey. Materials similar in size and shape to the normal diet of an organism may be more likely to be ingested without causing harm to the animal; however, some general assumptions were made. Relatively small objects with smooth edges, such as shells or small-caliber projectiles, might pass through the digestive tract without causing harm. A small sharp-edged item may cause the individual immediate physical distress by tearing or cutting the mouth, throat, or stomach. If the object is rigid and large (relative to the individual's mouth and throat), it may block the throat or obstruct digestive processes. An object may even be enclosed by a cyst in the gut lining. The net result of ingesting large foreign objects is disruption of the normal feeding behavior, which could be sublethal or lethal.

3.0.5.7.5.3 Long-Term Consequences to the Individual and Population

The consequences of ingesting nonfood items could be nutrient deficiency, bioaccumulation, uptake of toxic chemicals, compaction, and mortality. The analysis focused on reasonably foreseeable long-term consequences of the direct impact, particularly those that could impact the fitness of an individual. Changes in an individual's growth, survival, annual reproductive success, or lifetime reproductive success could have population-level impacts if enough individuals were impacted. This population-level impact would vary among species and taxonomic groups.

This Page Intentionally Left Blank

REFERENCES

Allen, M. J., Groce, A. K., Diener, D., Brown, J., Steinert, S. A., Deets, G., Mikel, T. (2002). *Southern California Bight 1998 Regional Monitoring Program: V. Demersal Fishes and Megabenthic Invertebrates*. (pp. 572). Westminster, CA: Southern California Coastal Water Research Project.

American National Standards Institute. (1994). ANSI S1.1-1994 (R 2004) American National Standard Acoustical Terminology (Vol. S1.1-1994 (R 2004)). New York, NY: Acoustical Society of America.

Andrew, R. K., Howe, B. M., Mercer, J. A., & Dzieciuch, M. A. (2002). Ocean ambient sound: comparing the 1960s with the 1990s for a receiver off the California coast. Acoustics Research Letters Online, 3, 65.

Arfsten, D., Wilson, C. & Spargo, B. (2002, July 25). Radio Frequency Chaff: The Effects of Its Use in Training on the Environment. *Ecotoxicology and Environmental Safety, 53*, 1-11. 10.1006

Aquarone, M. C. & Adams, S. (2009). XIX-63 Insular Pacific-Hawaiian: LME #10. In *The UNEP Large Marine Ecosystem Report: A Perspective on Changing Conditions in LMEs of the World's Regional Seas* United Nations Environmental Programme (UNEP Regional Seas Report and Studies pp. 829-838). Retrieved from http://www.lme.noaa.gov/index.php?option=com_content&view=article&id=56:lme10&catid=41:briefs&Itemid=72, 15 February 2012.

Au, W. W. L. (1993). The Sonar of Dolphins (pp. 227). New York: Springer-Verlag.

Au, W. W. L. & Banks, K. (1998). The acoustics of the snapping shrimp *Synalpheus parneomeris* in Kaneohe Bay. *Journal of the Acoustical Society of America, 103*(1), 41-47.

Baggeroer, A. & Munk, W. (1992). The Heard Island feasibility test. *Physics Today*, 22-30.

Barber, R. T. & Chavez, F. P. (1983). Biological consequences of El Niño. *Science, 222*(4629), 1203-1210.

Barber, R. T., Kogelschatz, J. E. & Chavez, F. P. (1985). Origin of productivity anomalies during the 1982-83 El Niño. *CalCOFI Reports, 26*, 65-71.

Batteen, M. L., Cipriano, N. J. & Monroe, J. T. (2003). A large-scale seasonal modeling study of the California Current System. *Journal of Oceanography, 59*(5), 545-562.

Bejder, L., Samuels, A., Whitehead, H., Finn, H. & Allen, S. (2009, December 03). Impact assessment research: use and misuse of habituation, sensitisation and tolerance in describing wildlife responses to anthropogenic stimuli. *Marine Ecology Progress Series, 395*, 177-185. 10.3354/meps07979 Retrieved from http://www.int-res.com/abstracts/meps/v395/p177-185/

Billard, R., Bry, C. & Gillet, C. (1981). Stress, environment and reproduction in teleost fish A. D. Pickering (Ed.), *Stress and Fish*. New York: Academic Press Inc.

Blanton, J. & Pattullo, J. G. (1970). The subsurface boundary between subarctic Pacific water and Pacific equatorial water in the trasition zone off Southern California. *Limnology and Oceanography, 15*, 606-614.

Bograd, S. J. (2004). California current. In *Marine Ecosystems of the North Pacific*. (PICES Special Publication 1, pp. 177-191) North Pacific Marine Science Organization. Available from http://www.pices.int/publications/special_publications/NPESR/2005/npesr_2005.aspx

Bograd, S. J., DiGiacomo, P. M., Durazo, R., Hayward, T. L., Hyrenbach, K. D., Lynn, R. J., Moore, C. S. (2000). The State of the California Current, 1999-2000: Forward to a new regime? *CalCOFI Report, 41*, 26-52.

Bousman, W. G. and R. M. Kufeld. (2005). UH-60A Airloads Catalog, NASA TM 2005212827. [August.]

California Department of Transportation (CALTRANS). (2009). Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish ICF Jones & Stokes and Illingworth and Rodkin, Inc. (Eds.). Sacramento, CA.

Campbell, R. R., Yurick, D. B. & Snow, N. B. (1988). Predation on narwhals, *Monodon monoceros*, by killer whales, *Orcinus orca*, in the Eastern Canadian Arctic. *Canadian Field-Naturalist, 102*(4), 689-696.

Castro, C. & Huber, M. E. (2007). Chemical and physical features of seawater and the world Ocean. In *Marine Biology* (6th ed., pp. 45-68). New York, NY: McGraw-Hill.

Chavanne, C., Flament, P., Lumpkin, R., Dousset, B. & Bentamy, A. (2002). Scatterometer observations of wind variations induced by oceanic islands: Implications for wind-driven ocean circulation. *Canadian Journal of Remote Sensing, 28*(3), 466-474.

Chereskin, T. K. & Niiler, P. P. (1994). Circulation in the Ensenada Front - September 1988. *Deep-Sea Research I, 41*(8), 1251-1287. doi: 10.1016/0967-0637(94)90043-4

Coale, K. H., Johnson, K. S., Fitzwater, S. E., Blain, S. P. G., Stanton, T. P. & Coley, T. L. (1998). IronEx-I, an *in situ* iron-enrichment experiment: Experimental design, implementation and results. *Deep-Sea Research II, 45*, 919-945.

Coale, K. H., Johnson, K. S., Fitzwater, S. E., Gordon, R. M., Tanner, S., Chavez, F. P., Kudela, R. (1996). A massive phytoplankton bloom induced by an ecosystem-scale iron fertilization experiment in the Equatorial Pacific. *Nature 383*, 495-501.

Covault, J. A., Normark, W. R., Romans, B. W. & Graham, S. A. (2007). Highstand fans in the California borderland: The overlooked deep-water depositional system. *Geology, 35*(9), 783-786. doi: 10.1130/G23800A.1

Crum, L. & Mao, Y. (1996, May). Acoustically enhanced bubble growth at low frequencies and its implications for human diver and marine mammal safety. *Acoustical Society of America, 99*(5), 2898-2907.

Crum, L., Bailey, M., Guan, J., Hilmo, P., Kargl, S. & Matula, T. (2005, July). Monitoring bubble growth in supersaturated blood and tissue *ex vivo* and the relevance to marine mammal bioeffects. *Acoustics Research Letters Online, 6*(3), 214-220. 10.1121/1.1930987

Di Lorenzo, E. (2003). Seasonal dynamics of the surface circulation in the Southern California Current System. *Deep-Sea Research II, 50*(14-16), 2371-2388. doi: 10.1016/s0967-0645(03)00125-5

Dickson, R. R. & Brown, J. (1994). The production of North Atlantic Deep Water: Sources, rates, and pathways. *Journal of Geophysical Research, 99*(C6), 12319-12341. 10.1029/94jc00530

Dorman, C. E. (1982). Winds between San Diego and San Clemente Island. *Journal of Geophysical Research, 87*(C12), 9636-9646.

Duda, A. M. & Sherman, K. (2002). A new imperative for improving management of large marine ecosystems. *Ocean & Coastal Management, 45*(11-12), 797-833. doi:10.1016/S0964-5691(02)00107-2

Eller, A. I. & Cavanagh, R. C. (15118). (2000). Subsonic aircraft noise at and beneath the ocean surface: estimation of risk for effects on marine mammals. (Vol. AFRL-HE-WP-TR-2000-0156).

Environmental Sciences Group. (2005). *CFMETR Environmental Assessment Update 2005*. (RMC-CCE-ES-05-21, pp. 652). Kingston, Ontario: Environmental Sciences Group, Royal Military College.

Flament, P., Kennan, S., Lumpkin, R., Sawyer, M. & Stroup, E. D. (2009, Last updated 11 August 2009). *Ocean Atlas of Hawaii.* School of Ocean and Earth Science and Technology, University of Hawai'i. Retrieved from http://www.soest.hawaii.edu/hioos/oceanatlas/marclimat.htm, 02 June 2010.

Fletcher, C. H., III, Grossman, E. E., Richmond, B. M. & Gibbs, A. E. (2002). *Atlas of Natural Hazards in the Hawaiian Coastal Zone*. (Geologic Investigations Series I-2761, pp. 182). Denver, CO: U.S. Department of the Interior and U.S. Geological Survey.

Garrison, T. (1998). Seawater chemistry. In *Oceanography: An Invitation to Marine Science* (3rd ed., pp. 138-153). Belmont, CA: Wadsworth Publishing Company.

Gay, P. S. & Chereskin, T. K. (2009). Mean structure and seasonal variability of the poleward undercurrent off Southern California. *Journal of Geophysical Research, 114*, C02007. doi: 10.1029/2008JC004886

Gelpi, C. G. & Norris, K. E. (2008). Seasonal temperature dynamics of the upper ocean in the Southern California Bight. *Journal of Geophysical Research, 113*, C04034. doi: 10.1029/2006JC003820

General Bathymetric Chart of the Oceans. (2010). General Bathymetric Chart of the Oceans (GEBCO) Digital Atlas Undersea Features - Lines [GIS data]. *GEBCO Digital Atlas*. (Centenary ed.). Norfolk, VA: U. S. Department of the Navy, Naval Facilities Engineering Command, Atlantic.

Gergis, J. L. & Fowler, A. M. (2009). A history of ENSO events since A.D.1525: implications for future climate change. *Climatic Change, 92*(3), 343-387. doi: 10.1007/s10584-008-9476-z

Goreau, T. J. & Hayes, R. L. (1994). Coral bleaching and ocean "hot spots". *Ambio, 23*, 176-180.

Gorsline, D. S. (1992). The geological setting of Santa Monica and San Pedro Basins, California Continental Borderland. *Progress in Oceanography, 30*(1-4), 1-36. doi: 10.1016/0079-6611(92)90008-n

Hamernik, R. P. & Hsueh, K. D. (1991, July). Impulse noise: some definitions, physical acoustics and other considerations. [special]. *Journal of the Acoustical Society of America, 90*(1), 189-196.

Hatch, L., Clark, C., Merrick, R., Van Parijs, S., Ponirakis, D., Schwehr, K., Wiley, D. (2008). Characterizing the relative contributions of large vessels to total ocean noise fields: A case study using the Gerry E. Studds Stellwagen Bank National Marine Sanctuary. *Environmental Management, 42*, 735-752. doi:10.1007/s00267-008-9169-4

Hayward, T. L. (2000). El Niño 1997-98 in the coastal waters of Southern California: A timeline of events. *CalCOFl Reports, 41*, 98-116.

Heileman, S. & Mahon, R. (2009). XV-49 Caribbean Sea: TAG: LME #12. In K. Sherman and G. Hempel (Eds.), *The UNEP Large Marine Ecosystem Report: A Perspective on Changing Conditions in LMEs of the World's Regional Seas*. (UNEP Regional Seas Report and Studies No. 182, pp. 657-671). Nairobi, Kenya: United Nations Environmental Programme. Available from http://www.lme.noaa.gov/index.php?option=com_content&view=article&id=58:lme12&catid=41:briefs&Itemid=72

Henderson, D., Bielefeld, E. C., Harris, K. C. & Hu, B. H. (2006). The role of oxidative stress in noise-induced hearing loss. *Ear and Hearing, 27*(1), 1-19.

Hennessy, M.B., Heybach, J.P., Vernikos, J., & Levine, S. (1979). Plasma corticosterone concentrations sensitively reflect levels of stimulus inensity in the rat. *Physiology and Behavior*, 22, 821-825.

Hickey, B. M. (1992). Circulation over the Santa Monica-San Pedro Basin and Shelf. *Progress in Oceanography, 30*(1-4), 37-115. doi: 10.1016/0079-6611(92)90009-o

Hill, R.D. (1985). Investigation of lightning strikes to water surfaces. *Journal of the Acoustical Society of America*, 78(6), 2096-2099.

Howell, E. A., Dutton, P. H., Polovina, J. J., Bailey, H., Parker, D. M. & Balazs, G. H. (2010). Oceanographic influences on the dive behavior of juvenile loggerhead turtles (*Caretta caretta*) in the North Pacific Ocean. *Marine Biology, 157*(5), 1011-1026. doi: 10.1007/s00227-009-1381-0

Hullar, T., Fales, S., Hemond, H., Koutrakis, P., Schlesinger, W., Sobonya, R., Watson, J. (1999). Environmental Effects of RF Chaff A Select Panel Report to the Undersecretary of Defense for Environmental Security U.S. Department of the Navy and N. R. Laboratory (Eds.), [Electronic Version]. (pp. 84).

Hunter, E., Chant, R., Bowers, L., Glenn, S. & Kohut, J. (2007). Spatial and temporal variability of diurnal wind forcing in the coastal ocean. *Geophysical Research Letters, 34*(3), L03607. doi:10.1029/2006gl028945

Intergovernmental Oceanographic Commission. (2009). 2nd Fleet 100m Bathymetric Contour Interval Between 100m and 5000m [CD-ROM]. *GEBCO Digital Atlas*. (Centenary ed.). Liverpool, U.K: International Hydrographic Organization, British Oceanographic Data Centre, and the U. S. Department of the Navy.

International Council for the Exploration of the Sea. (2005). *Answer to DG Environment Request on Scientific Information Concerning Impact of Sonar Activities on Cetacean Populations*. (pp. 6). Copenhagen, Denmark: International Council for the Exploration of the Sea. Available from European Commission website: http://ec.europa.eu/environment/nature/conservation/species/whales_dolphins/

Investigative Science and Engineering, Inc. (1997). Noise Measurements of Various Aircraft and Ordnance at San Clemente Island. 1997.

Itano, D. G. & Holland, K. N. (2000). Movement and vulnerability of bigeye (*Thunnus obesus*) and yellowfin tuna (*Thunnus albacares*) in relation to FADs and natural aggregation points. *Aquatic Living Resources, 13*, 213-223.

Jepson, P., Arbelo, M., Beaville, R., Patterson, I., Castro, P., Baker, J., Fernandez, A. (2003, October). Gas-bubble lesions in stranded cetaceans Was sonar responsible for a spate of whale deaths after an Atlantic military exercise? *Nature, 425*.

Johnson, G. C. (2008). Quantifying Antarctic bottom water and North Atlantic deep water volumes. *Journal of Geophysical Research, 113*, C05027. doi: 10.1029/2007JC004477

Johnson, K. S., Riser, S. C. & Karl, D. M. (2010). Nitrate supply from deep to near-surface waters of the North Pacific subtropical gyre. *Nature, 465*(7301), 1062-1065. doi: 10.1038/nature09170

Kawabe, M. & Fujito, S. (2010). Pacific Ocean circulation based on observation. *Journal of Oceanography, 66*, 389-403.

Kinsler, L. E., Frey, A. R., Coppens, A. B. & Sanders, J. V. (1982). Fundamentals of Acoustics (3rd ed.). New York, NY: Wiley.

Krishnamurthy, A., Moore, J. K., Mahowald, N., Luo, C., Doney, S. C., Lindsay, K. & Zender, C. S. (2009). Impacts of increasing anthropogenic soluble iron and nitrogen deposition on ocean biogeochemistry. *Global Biogeochemical Cycles, 23*, 15. doi: 10.1029/2008GB003440

Kujawa, S. G. & Liberman, M. C. (2009, November 11). Adding insult to injury: cochlear nerve degeneration after "temporary" noise-induced hearing loss. *J Neurosci, 29*(45), 14077-14085. 29/45/14077 [pii] 10.1523/JNEUROSCI.2845-09.2009 Retrieved from http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=19906956

Laney, H. & Cavanagh, R. C. (15117). (2000). Supersonic aircraft noise at and beneath the ocean surface: estimation of risk for effects on marine mammals. (Vol. AFRL-HE-WP-TR-2000-0167, pp. 1-38).

Langmann, B., Zaksek, K., Hort, M. & Duggen, S. (2010). Volcanic ash as fertiliser for the surface ocean. *Atmospheric Chemistry and Physics, 10*, 3891-3899. doi:10.5194/acp-10-3891-2010

Laughlin, J. (2005). Underwater Sound Levels Associated with Pile Driving at the Bainbridge Island Ferry Terminal Preservation Project *WSF Bainbridge Island Ferry Terminal Preservation Project*. Washington State Department of Transportation.

Laughlin, J. (2010, 4 May). Keystone Ferry Terminal - Vibratory Pile Monitoring Technical Memorandum. J. Callahan and R. Huey, Washington State Department of Transportation (WSDOT).

Leet, W. S., Dewees, C. M., Klingbeil, R. & Larson, E. J. (2001). *California's Living Marine Resources: A Status Report*. (SG 01-11, pp. 593) California Department of Fish and Game. Available from www.dfg.ca.gov/mrd

Levenson, C. (1974). Source level and bistatic target strength of the sperm whale (*Physeter catodon*) measured from an oceanographic aircraft. *Journal of the Acoustical Society of America, 55*(5), 1100-1103.

Libes, S. M. (1992). *An Introduction to Marine Biogeochemistry* (pp. 734). New York, NY: John Wiley and Sons, Inc.

Loh, A. N. & Bauer, J. E. (2000). Distribution, partitioning and fluxes of dissolved and particulate organic C, N and P in the eastern North Pacific and Southern Oceans. *Deep-Sea Research I, 47*(12), 2287-2316. doi: 10.1016/s0967-0637(00)00027-3

Lynn, R. J., Bograd, S. J., Chereskin, T. K. & Huyer, A. (2003). Seasonal renewal of the California Current: The spring transition off California. *Journal of Geophysical Research, 108*(C8), 3279. doi: 10.1029/2003JC001787

Madden, C. J., Goodin, K., Allee, R. J., Cicchetti, G., Moses, C., Finkbeiner, M. & Bamford, D. (2009). *Coastal and Marine Ecological Classification Standard - Version III*. (pp. 107) National Oceanic and Atmospheric Administration and NatureServe.

Mantua, N. & Hare, S. R. (2002). The Pacific decadal oscillation. *Journal of Oceanography, 58*, 35-44.

Marine Species Modeling Team. (2012). Determination of Acoustic Effects on Marine Mammals and Sea Turtles for the Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement. (NUWC-NPT Technical Report 12,071) Naval Underseas Warfare Command Division, Newport.

Martin, J. H. & Gordon, M. R. (1988). Northeast Pacific iron distributions in relation to phytoplankton productivity. *Deep-Sea Research, 35*(2), 177-196. doi: 10.1016/0198-0149(88)90035-0

McDonald, M. A., Hildebrand, J. A., & Wiggins, S. M. (2006). Increases in deep ocean ambient noise in the Northeast Pacific west of San Nicolas Island, California.

McDonald, M. A., Hildebrand, J. A., Wiggins, S. M., & Ross, D. (2008). A 50 year comparison of ambient ocean noise near San Clemente Island: A bathymetrically complex coastal region off southern California. The Journal of the Acoustical Society of America, 124, 1985.

McLennan, M.W. (1997). A simple model for water impact peak pressure and width: a technical memorandum. Goleta, CA: Greeneridge Sciences Inc.

Millán-Núñez, R., Alvarez-Borrego, S. & Trees, C. C. (1997). Modeling the vertical distribution of chlorophyll in the California current system. *Journal of Geophysical Research, 102*(C4), 8587-8595.

Mintz, J. D. (2012). Vessel Traffic in the Hawaii-Southern California and Atlantic Fleet Testing and Training Study Areas

Mintz, J. D. & Filadelfo, R. J. (2011). Exposure of marine mammals to broadband radiated noise [Final Report]. (CRM D0024311.A2, pp. 36 pp.) CNA Corporation. Prepared by P. b. t. C. C. f. t. U. S. D. o. Defense.

Mintz, J. D. & Parker, C. L. (2006). *Vessel Traffic and Speed Along the U. S. Coasts and Around Hawaii* [Final report]. (CRM D0013236.A2, pp. 48). Alexandria, VA: CNA Corporation.

Moody, A. (2000). Analysis of plant species diversity with respect to island characteristics on the Channel Islands, California. *Journal of Biogeography, 27*(3), 711-723. Retrieved from http://www.jstor.org/stable/2656218

National Marine Fisheries Service. (2008). *Biological Opinion for the 2008 Rim-of-the-Pacific Joint Training Exercises*. (pp. 301). Silver Spring, MD: U. S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, Endangered Species Division.

National Marine Fisheries Service & U.S. Fish and Wildlife Service. (2009). Critical Habitat Data [Shapefile]. NOAA Fisheries Geographic Informaiton Systems. Silver Spring, MD. Available from http://www.nmfs.noaa.gov/gis/data/critical.htm, and http://www.fws.gov/plover/

National Oceanic and Atmospheric Administration. (2001). Office of Coast Survey. Retrieved from http://www.charts.noaa.gov/Catalogs/atlantic_chartside.shtml

National Oceanic and Atmospheric Administration. (2002). LME Polygon Boundaries, Offshore LME Boundaries [Shapefile]. LME Boundaries Download Page. Silver Spring, MD: Large Marine Ecosystem Program. Available from http://www.lme.noaa.gov/index.php?option=com_content&view=article&id=177&ltemid=75

National Oceanic and Atmospheric Administration. (2009). *National Oceanographic Data Center*. [Web Page]. Retrieved from http://www.nodc.noaa.gov, 06 May 2010.

National Oceanic Atmospheric Administration. (2010). *Large Marine Ecosystems of the World*. [Web Page]. Retrieved from http://www.lme.noaa.gov/index.php?option=com_content&view=article&id=47&Itemid=41, 06 May 2010.

National Research Council. (1990). *Monitoring Southern California's Coastal Waters* (pp. 15). Washington, D.C.: National Academy Press. Retrieved from Copyright protected.

National Research Council. (2003). Ocean Noise and Marine Mammals (pp. 219). Washington, DC: National Academies Press.

Navy Research Laboratory. (2011). Digital Bathymetry Data Base v 4.0. Retrieved from http://www7320.nrlssc.navy.mil/DBDB2_WWW/NRLCOM_dbdb2.html

Nemoto, K. & Kroenke, L. W. (1981). Marine Geology of the Hess Rise 1. Bathymetry, Surface Sediment Distribution, and Environment of Deposition. *Journal of Geophysical Research, 86*(B11), 10734-10752. doi: 10.1029/JB086iB11p10734

Norcross, B. L., McKinnell, S. M., Frandsen, M., Musgrave, D. L. & Sweet, S. R. (2003). Larval fishes in relation to water masses of the central North Pacific transitional areas, including the shelf break of west-central Alaska. *Journal of Oceanography, 59*(4), 445-460.

Normandeau, Exponent, Tricas, T. & Gill, A. (2011). Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species. Camarillo, CA: U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific OCS Region. Available from http://www.gomr.boemre.gov/PI/PDFImages/ESPIS/4/5115.pdf

North Pacific Marine Science Organization. (2004). *Marine ecosystems of the North Pacific* [Electronic Version]. (PICES Special Publication 1, pp. 280) North Pacific Marine Science Organization. Available from http://www.pices.int/publications/special_publications/NPESR/2005/npesr_2005.aspx

Northrop, J. (1974). Detection of low-frequency underwater sounds from a submarine volcano in the Western Pacific. *Journal of the Acoustical Society of America*, 56(3), 837-841.

Pater, L. L. (1981). Gun blast far field peak overpressure contours. Naval Surface Weapons Center.

Payne, K. & Payne, R. (1985). Large scale changes over 19 years in songs of humpback whales in Bermuda. *Zeitschrift fur Tierpsychologie 68*, 89-114.

Pickard, G.L. & Emery, W.J. (1990). Descriptive Physical Oceanography: An Introduction (5th ed.). Oxford: Pergamon Press.

Pierce, A.D. (1989). Acoustics: An introduction to its physical principles and applications. Woodbury, NY: *Acoustical Society of America*.

Polefka, S. (2004). *Anthropogenic Noise and the Channel Islands National Marine Sanctuary: How Noise Affects Sanctuary Resources, and What We Can Do About It*. (pp. 51). Santa Barbara, CA: Environmental Defense Center. Available from Channel Islands National Marine Sanctuary website: http://www.channelislands.noaa.gov/sac/report_doc.html

Polovina, J. J., Haight, W. R., Moffitt, R. B. & Parrish, F. A. (1995). The role of benthic habitat, oceanography, and fishing on the population dynamics of the spiny lobster, *Panulirus marginatus* (Decapoda, Palinuridae), in the Hawaiian Archipelago. *Crustaceana, 68*(2), 203-212. Retrieved from http://www.jstor.org/stable/20105039

Polovina, J. J., Howell, E., Kobayashi, D. R. & Seki, M. P. (2001). The transition zone chlorophyll front, a dynamic global feature defining migration and forage habitat for marine resources. *Progress in Oceanography, 49*, 469-483.

Polovina, J. J., Mitchum, G. T., Graham, N. E., Craig, M. P., DeMartini, E. E. & Flint, E. N. (1994). Physical and biological consequences of a climate event in the central North Pacific. *Fisheries Oceanography, 3*(1), 15-21.

Qiu, B., Koh, D. A., Lumpkin, C. & Flament, P. (1997). Existence and Formation Mechanism of the North Hawaiian Ridge Current. *Journal of Physical Oceanography, 27*(3), 431-444. doi: 10.1175/1520-0485(1997)027<0431:EAFMOT>2.0.CO;2

Ramcharitar, J., Gannon, D. & Popper, A. (2006). Bioacoustics of fishes of the family Sciaenidae (croakers and drums). *Transactions of the American Fisheries Society, 135*, 1409-1431.

Rasmussen, M. H., Miller, L. A. & Au, W. W. L. (2002). Source levels of clicks from free-ranging white-beaked dolphins (*Lagenorhynchus albirostris* Gray 1846) recorded in Icelandic waters. *Journal of the Acoustical Society of America, 111*(2), 1122-1125.

Reeder, D. M. & Kramer, K. M. (2005, April). Stress in Free-Ranging Mammals: Integrating Physiology, Ecology, and Natural History. *Journal of Mammalogy, 86*(2), 225-235. Retrieved from http://www.jstor.org/stable/4094340?origin=JSTOR-pdf

Reid, J. L., Jr., Roden, G. I. & Wyllie, J. G. (1958). Studies of the California current system. *CalCOFI Report, 6*, 27-56.

Reverdin, G., Niiler, P. P. & Valdimarsson, H. (2003). North Atlantic Ocean surface currents. *Journal of Geophysical Research, 108*(C1), 3002-3023. doi: 10.1029/2001jc001020

Richardson, W. J., Greene, C. R., Malme, C. I. & Thomson, D. H. (1995). Marine Mammals and Noise: Academic Press.

Rooney, J., Wessel, P., Hoeke, R., Weiss, J., Baker, J., Parrish, F., Vroom, P. (2008). Geology and geomorphology of coral reefs in the northwestern Hawaiian Islands. In B. M. Riegl and R. E. Dodge (Eds.), *Coral Reefs of the USA. Coral Reefs of the World* (Vol. 1, pp. 515-567). Springer.

Santamaria-del-Angel, E., Millan-Nuñez, R., Gonzalez-Silvera, A. & Muller-Karger, F. (2002). The color signature of the Ensenada Front and its seasonal and interannual variability. *CalCOFI Report, 43*, 155-161.

Sherman, K. & Hempel, G. (2009). *The UNEP Large Marine Ecosystem Report: A Perspective on Changing Conditions in LMEs of the World's Regional Seas* [Electronic Version]. (UNEP Regional Seas Report and Studies No. 182). Nairobi, Kenya: United Nations Environmental Programme. Available from http://www.iwlearn.net/publications/regional-seas-reports/unep-regional-seas-reports-and-studies-no-182/

Sies, H. (1997). Oxidative stress: oxidants and antioxidants. *Exp Physiol*. 82, 291-295.

Simmonds, M., Dolman, S. J., Weilgart, L., Owen, D., Parsons, E. C. M., Potter, J. & Swift, R. J. (2003). Oceans of Noise *A WDCS Science Report*. Whale and Dolphin Conservation Society (WDCS),.

Slabbekoorn, H. and E. Ripmeester. (2008). "Birdsong and anthropogenic noise: implications and applications for conservation." Molecular Ecology 17(1): 72-83.

Southall, B. L., Bowles, A. E., Ellison, W. T., Finneran, J. J., Gentry, R. L., Greene, C. R., Jr., Tyack, P. L. (2007). Marine mammal noise exposure criteria: initial scientific recommendations. [Journal Article]. *Aquatic Mammals, 33*(4), 411-521.

Spalding, M. D., Fox, H. E., Allen, G. R., Davidson, N., Ferdaña, Z. A., Finlayson, M., Roberston, J. (2007). Marine ecoregions of the world: A bioregionalisation of coastal and shelf areas. *Bioscience, 57*(7), 573-583.

Spargo, B. J. (2007, June 1). Chaff end cap and piston buoyancy. M. Collins, Parson.

St. Aubin, D. J. & Dierauf, L. A. (2001). Stress and Marine Mammals L. A. Dierauf and F. M. D. Gulland (Eds.), *Marine Mammal Medicine* (second ed., pp. 253-269). Boca Raton: CRC Press.

Swope, B. (2010). *Laser System Usage in the Marine Environment: Applications and Environmental Considerations*. (Technical Report 1996, pp. 47). San Diego: SPAWAR, Systems Center Pacific.

Talley, L. D. (1993). Distribution and formation of North Pacific intermediate water. *Journal of Physical Oceanography, 23*(3), 517-537. doi: 10.1175/1520-0485(1993)023<0517:DAFONP>2.0.CO;2

The White House Council on Environmental Quality. (2010). *Final Recommendations Of The Interagency Ocean Policy Task Force*. Available from http://www.whitehouse.gov/files/documents/OPTF_FinalRecs.pdf

Thompson, T. J., Winn, H. E. & Perkins, P. J. (1979). Mysticete sounds H. E. Winn and B. L. Olla (Eds.), *Behavior of Marine Animals* (Vol. 3: Cetaceans, pp. 403-431). New York: Plenum Press.

Tomczak, M. & Godfrey, J. S. (2003a). The Atlantic Ocean. In *Regional Oceanography: An Introduction* (2nd ed.). Daya Publishing House. Retrieved from http://www.es.flinders.edu.au/~mattom/regoc/pdfversion.html.

Tomczak, M. & Godfrey, J. S. (2003b). The Pacific Ocean. In *Regional Oceanography: An Introduction.* (2nd ed.). Daya Publishing House. Retrieved from http://www.es.flinders.edu.au/~mattom/regoc/pdfversion.html.

Tomczak, M. & Godfrey, J. S. (2003c). The Pacific Ocean. In *Regional Oceanography: An Introduction.* (2nd ed.). Daya Publishing House. Retrieved from http://www.es.flinders.edu.au/~mattom/regoc/pdfversion.html.

Touyz, R.M. (2004, September 1). Reactive Oxygen Species, Vascular Oxidative Stress, and Redox Signaling in Hypertension. *Hypertension*, 44(3), 248-252. 10.1161/01.HYP.0000138070.47616.9d Retrieved from http://hyper.ahajournals.org/content/44/3/248.

U.S. Air Force. (1997). Environmental Effects of Self-Protection Chaff and Flares. (pp. 241).

U.S. Army Corps of Engineers. (2012). U.S. Waterway Data. In *Waterborne Commerce of the United States*. Retrieved from http://www.ndc.iwr.usace.army.mil/data/datawcus.htm, March 29, 2012.

U.S Department of the Army. (1999). Finding of No Significant Impact (FONSI) for the Life Cycle Environmental Assessment (LCEA) for the HELLFIRE Modular Missile System.

U.S. Department of the Navy. (1996). *Environmental Assessment of the Use of Selected Navy Test Sites for Development Tests and Fleet Training Exercises of the MK-46 and MK 50 Torpedoes* [Draft report]. Program Executive Office Undersea Warfare, Program Manager for Undersea Weapons.

U.S. Department of the Navy. (2000). Noise Blast Test Results Aboard the USS Cole *Gun Blast Transmission into Water Test with a 5-Inch/54 Caliber Naval Gun (Standard Ordnance)*.

U.S. Department of the Navy. (2005). Final Environmental Assessment and Overseas Environmental Assessment for Organic Airborne and Surface Influence Sweep Mission Tests. Washington, DC: Airborne Mine Defense Program Office, Program Executive Office: Littoral and Mine Warfare.

U.S. Department of the Navy. (2009). VACAPES Range Complex Environmental Impact Statement/Overseas Environmental Impact Statement. Final March 2009.

U.S. Department of the Navy. (2011). Marine Species Monitoring for the U.S. Navy's Hawaii Range Complex and the Southern California Range Complex. 2011 Annual Report. Available at www.nmfs.noaa.gov/pr/permits/incidental.htm#applications

U.S. Department of the Navy. (2012a). Pacific Navy Marine Species Density Database. Naval Facilities Engineering Command, Pacific. May 2012.

U.S. Department of the Navy. (2012b). Ecosystem Technical Report version 3 for the Atlantic Fleet Training and Testing (AFTT) Draft Environmental Impact Statement. (pp. 69) Naval Facilities Engineering Command Atlantic Division. Prepared by Tetra Tech Inc. Available from http://www.ttcollab.com/teammarine/Task%20Orders/Forms/AllItems.aspx?RootFolder=%2fteammarine%2fTask%20Orders%2fTO46%20Atlantic%20EIS%2fDeliverables%2fTask_7%2fDEIS%20v%2e3&FolderCTID=&View=%7b8D69BFE4-ED90-4BA7-BE65-F742CA308804%7d

Uchupi, E. & Emery, K. O. (1963). The continental slope between San Francisco, California and Cedros Island, Mexico. *Deep-Sea Research, 10*, 397-447.

Ulrich, R. (2004). *Development of a sensitive and specific biosensor assay to detect Vibrio vulnificus in estuarine waters.* (Partial fulfillment of the requirements for the degree of Master of Science Department of Biology college of Arts and Sciences). University of South Florida.

United Nations Educational Scientific and Cultural Organization. (2009a). *Global Open Oceans and Deep Seabed (GOODS) - Biogeographic Classification*. (IOC Technical Series, 84, pp. 95). Paris, France: UNESCO-IOC.

United Nations Educational Scientific and Cultural Organization. (2009b). *Global Open Oceans and Deep Seabed (GOODS) - Biogeographic Classification* (pp. 82). Paris, France: [IOC] Intergovernmental Oceanographic Comission.

University of Miami Rosenstiel School of Marine and Atmospheric Science & National Oceanic and Atmospheric Administration, National Oceanic Data Center. (2007). Global Annual Daytime Sea Surface Temperature (°C) - 2007 [GIS data]. *4 km AVHRR Pathfinder Version 5 SST Project (Pathfinder V5)*. Available from http://podaac.jpl.nasa.gov/DATA_CATALOG/avhrrinfo.html

Urick, R. J. (1983). Principles of Underwater Sound. Los Altos, CA: Peninsula Publishing.

Valiela, I. (1995). *Marine Ecological Processes* (2nd ed.). New York, NY: Springer-Verlag.

Vanderbilt Engineering Center for Transportation Operations and Research. (2004). National Waterway Network: U.S. Army Corps of Engineers Navigation Data Center; New Orleans, LA.

Venrick, E. L. (2000). Summer in the Ensenada Front: The distribution of phytoplankton species, July 1985 and September 1988. *Journal of Plankton Research, 22*(5), 813-841.

Vetter, E. W., Smith, C. R. & De Leo, F. C. (2010). Hawaiian hotspots: enhanced megafaunal abundance and diversity in submarine canyons on the oceanic islands of Hawaii. *Marine Ecology 31*(1), 183-199. doi: 10.1111/j.1439-0485.2009.00351.x

Watkins, W. A. (1980). Acoustics and the behavior of Sperm Whales R. G. Busnel and J. F. Fish (Eds.), *Animal Sonar Systems* (pp. 283-290). New York: Plenum Press.

Wenz, G.M. (1962). Acoustic ambient noise in the ocean: Spectra and sources. *Journal of the Acoustical Society of America* 34:1936-1956.

Wolanski, E., Richmond, R. H., Davis, G., Deleersnijder, E. & Leben, R. R. (2003). Eddies around Guam, an island in the Mariana Islands group. *Continental Shelf Research, 23*(10), 991-1003. doi: 10.1016/s0278-4343(03)00087-6

Yagla, J. & Stiegler, R. (2003). Gun Blast Noise Transmission Across the Air-Sea Interface. Dahlgren, VA.

Young, G. A. (1991). Concise methods for predicting the effects of underwater explosions on marine life (pp. 1-12). Silver Spring: Naval Surface Warfare Center.

Young, R. W. (1973). Sound pressure in water from a source in air and vice versa. *Journal of the Acoustical Society of America, 53*(6), 1708-1716.

Zorn, H.M., Churnside, J.H. & Oliver, C.W. (2000). Laser safety thresholds for cetaceans and pinnipeds. *Marine Mammal Science*, 16(1): 186-200.

This Page Intentionally Left Blank

3.1 Sediments and Water Quality

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

3.1 SEDIMENTS AND WATER QUALITY

SEDIMENTS AND WATER QUALITY SYNOPSIS

The United States Department of the Navy considered all potential stressors, and the following constituents have been analyzed for sediments and water quality:

- Explosives and explosive byproducts,
- Metals,
- Chemicals other than explosives, and
- Other materials.

Preferred Alternative (Alternative 2)

- Impacts of explosive byproducts could be short-term and local, while impacts of unconsumed explosives and metals could be long-term and local. Chemical, physical, or biological changes in sediment or water quality would be measurable but below applicable standards, regulations, and guidelines, and within existing conditions or designated uses.
- Impacts of metals could be long-term and local. Corrosion and biological processes would reduce exposure of military expended materials to seawater, decreasing the rate of leaching, and most leached metals would bind to sediments and other organic matter. Sediments near military expended materials would contain some metals, but concentrations would be below applicable standards, regulations, and guidelines.
- Impacts of chemicals other than explosives and impacts of other materials could be both short- and long-term and local. Chemical, physical, or biological changes in sediment or water quality would not be detectable, and would be within existing conditions or designated uses.
- Impacts of other materials could be short-term and local. Most other materials from military expended materials would not be harmful to marine organisms, and would be consumed during use. Chemical, physical, or biological changes in sediment or water quality would not be detectable.

3.1.1 INTRODUCTION AND METHODS

3.1.1.1 Introduction

The following sections provide an overview of the characteristics of sediment and water quality in the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area), and describe in general terms the methods used to analyze potential impacts of the Proposed Action on these resources.

3.1.1.1.1 Sediments

The discussion of sediments begins with an overview of sediment sources and characteristics in the Study Area, and considers factors that affect sediment quality.

3.1.1.1.1.1 Characteristics of Sediments

Sediment consists of solid fragments of organic matter and inorganic matter from the weathering of rock that are transported by water, wind, and ice (glaciers), and deposited at the bottom of bodies of water. Sediments range in size from cobble (2.5 to 10 inches [in.] [64 to 254 millimeters {mm}]), to pebble (0.15 to 2.5 in. [4 to 64 mm]), to granule (0.08 to 0.15 in. [2.03 to 3.81 mm]), to sand (0.002 to 0.08 in. [0.05 to 2.03 mm]), to silt (0.00008 to 0.002 in. [0.002 to 0.05 mm]), and to clay (less than

0.00008 in. [less than 0.002 mm]). Sediment deposited on the continental shelf is mostly transported by rivers, but also by local and regional currents and wind. Most sediments in nearshore areas and on the continental shelf of the Pacific Ocean are aluminum silicates, derived from rocks on land that are deposited at rates of more than 10 centimeters (cm) (3.9 in.) per 1,000 years. Sediments may also be produced locally by non-living particulate organic matter ("detritus") that sinks to the bottom. Some areas of the deep ocean contain accumulations of the shells of marine microbes composed of silicones and calcium carbonates, termed biogenic ooze (Chester 2003). Through the downward movement of organic and inorganic particles in the water column, many substances that are otherwise scarce in the water column are concentrated in bottom sediments (Chapman et al. 2003; Kszos et al. 2003).

3.1.1.1.1.2 Factors Affecting Marine Sediment Quality

The quality of sediments is influenced by their physical, chemical, and biological components; by where they are deposited; by the properties of seawater; and by other inputs and sources of contamination. These factors interact to some degree, so sediments tend to be dynamic, and are not easily generalized. For this discussion, "contaminant" means biological, chemical, or physical materials normally absent in sediments, but which when present or present at high concentrations, can impact marine processes.

3.1.1.1.1.3 Sediment Physical Characteristics and Processes

At any given site, the texture and composition of sediments are important physical factors that influence the types of substances that are retained in the sediments, and subsequent biological and chemical processes. Clay-sized and smaller sediments and similarly sized organic particles tend to bind potential sediment contaminants such as metals, hydrocarbons, and persistent organic pollutants. Through this attraction, these particles efficiently scavenge contaminants from the water column and from the water between grains of sediment ("pore water"), and may bind them so strongly that their movement in the environment is limited (United States [U.S.] Environmental Protection Agency [EPA] 2008a). Conversely, fine-grained sediments are easily disturbed by currents and bottom-dwelling organisms (Hedges and Oades 1997), dredging (Eggleton and Thomas 2004), storms (Chang et al. 2001), and bottom trawling (Churchill 1989). Disturbance is also possible in deeper areas, where currents are minimal (Carmody et al. 1973), from mass wasting events such as underwater slides and debris flows (Coleman and Prior 1988). If re-suspended, fine-grained sediments (and any substances bound to them) can be transported long distances.

3.1.1.1.1.4 Sediment Chemical Characteristics and Processes

The concentration of oxygen in sediments strongly influences sediment quality through its effect on the binding of materials to sediment particles. At the sediment surface, the level of oxygen is usually the same as that of the overlying water. Deeper sediment layers, however, are often low in oxygen ("hypoxic") or have no oxygen ("anoxic"), and have a low oxidation-reduction ("redox") potential, which predicts the stability of various compounds that regulate nutrient and metal availability in sediments. Certain substances combine in oxygen-rich environments and become less available for other chemical or biological reactions. If these combined substances settle into the low or no-oxygen sediment zone, the change may release them into pore water, making them available for other chemical or biological reactions. Conversely, substances that remain in solution in oxygenated environments may combine with organic or inorganic substances under hypoxic or anoxic conditions, and are thus removed from further chemical or biological reactions (Spencer and MacLeod 2002; Wang et al. 2002).

3.1.1.1.1.5 Sediment Biological Characteristics and Processes

Organic matter in sediment provides food for resident microbes. Their metabolism can change the chemical environment in sediments and thereby increase or decrease the mobility of various substances and influence the ability of sediments to retain and transform those substances (Mitsch and Gosselink 2007; U.S. Environmental Protection Agency 2008a). Bottom-dwelling animals often rework sediments in the process of feeding or burrowing ("bioturbation"). In this way, marine organisms influence the structure, texture, and composition of sediments as well as the horizontal and vertical distribution of substances in the sediment (Boudreau 1998). Moving substances out of or into low or no-oxygen zones in the sediment may alter the form and availability of various substances. The metabolic processes of bacteria also influence sediment components directly. For example, sediment microbes may convert mercury to methyl mercury, increasing its toxicity (Mitchell and Gilmour 2008).

3.1.1.1.1.6 Location

The quality of coastal and marine sediments is influenced substantially by inputs from adjacent watersheds (Turner and Rabalais 2003). Proximity to watersheds with large cities or intensively farmed lands often increases the amount of both inorganic and organic contaminants that find their way into coastal and marine sediments. Metals enter estuaries through the weathering of natural rocks and mineralized deposits carried by rivers and through man-made inputs that often contribute amounts substantially above natural levels. The metals of greatest concern are cadmium, chromium, mercury, lead, selenium, arsenic, and antimony because they bioaccumulate, are toxic to biota at low concentrations, and have few natural functions in biological systems (Summers et al. 1996). In addition to metals, a wide variety of organic substances, such as polycyclic aromatic hydrocarbons, polychlorinated biphenyls (PCBs), and pesticides—often referred to collectively as "persistent organic pollutants"—are discharged into coastal waters by urban, agricultural, and industrial point and non-point sources in the watershed (U.S. Environmental Protection Agency 2008a).

The natural processes of estuaries retain a wide variety of substances (Li et al. 2008; Mitsch and Gosselink 2007). Examples of these processes include the binding of materials to small particles in the water column and the settling of those particles into sediments in calm areas. Thus, the concentrations of various substances generally decrease with increasing distance from the shore. Once in the ocean, the fates of various substances may also be influenced by longshore currents that travel parallel to the shore (Duursma and Gross 1971). Location on the ocean floor also influences the distribution and concentration of various elements through local geology and volcanic activity (Demina et al. 2009), as well as through mass wasting events (Coleman and Prior 1988).

3.1.1.1.1.7 Other Contributions to Sediments

While the greatest mass of sediments is carried into marine systems by rivers (U.S. Environmental Protection Agency 2008a), wind and rain also deposit materials in coastal waters, and contribute to the mass and quality of sediments. For example, approximately 80 percent of the mercury released by human activities comes from coal combustion, mining and smelting, and solid waste incineration (Agency for Toxic Substances and Disease Registry 1999). These activities are generally considered to be the major sources of mercury in marine systems (Fitzgerald et al. 2007). Atmospheric deposition of lead is similar in that human activity is a major source of lead in sediments (Wu and Boyle 1997).

Hydrocarbons are common in marine sediments. In addition to washing in from land and shipping sources, they are generated by the combustion of fuels (both wood and petroleum), are produced directly by marine and terrestrial biological sources, and arise from processes in sediments, including microbial activity and natural hydrocarbon seeps (Boehm and Gequejo 1986; Geiselbrecht et al. 1998). Means (1995) noted that, because of the large binding capacities of rich, organic, fine-grained sediments found at many coastal and estuarine sites, "hydrocarbons may concentrate to levels far exceeding those observed in the water column of the receiving water body."

3.1.1.1.2 Water Quality

The discussion of water quality begins with an overview of the characteristics of marine waters, including pH, temperature, oxygen, nutrients, salinity, and dissolved elements. The discussion then considers how those characteristics of marine waters are influenced by physical, chemical, and biological processes.

3.1.1.1.2.1 Characteristics of Marine Waters

The composition of water in the marine environment is determined by complex interactions among physical, chemical, and biological processes. Physical processes include region-wide currents and tidal flows, seasonal weather patterns and temperature, sediment characteristics, and unique local conditions, such as the volume of fresh water delivered by large rivers. Chemical processes involve salinity, pH, dissolved minerals and gases, particulates, nutrients, and pollutants. Biological processes involve the influence of living things on the physical and chemical environment. The two dominant biological processes in the ocean are photosynthesis and respiration, particularly by microorganisms. These processes involve the uptake, conversion, and excretion of waste products during growth, reproduction, and decomposition (Mann and Lazier 1996).

3.1.1.1.2.2 pH

pH is a measure of the degree to which a solution is either acidic (pH less than 7.0) or basic (pH greater than 7.0). Seawater has a relatively stable pH between 7.5 and 8.5 because of the presence of dissolved elements, particularly carbon and hydrogen. Most of the carbon in the sea is present as dissolved inorganic carbon generated through the complex interactions of dissolved carbon dioxide in seawater. This carbon dioxide-carbonate equilibrium is the major pH buffering system in seawater. Changes in pH outside of the normal range of seawater can make maintaining their shells difficult for specialized marine animals (e.g., mollusks; Fabry et al. 2008).

3.1.1.1.2.3 Temperature

Temperature influences the speed at which chemical reactions take place in solution: higher temperatures increase reaction rates and vice versa. Seasonal changes in weather influence water temperatures that, in turn, influence the degree to which marine waters mix. The increases in surface water temperatures during summer create three distinct layers in deeper water, a process known as stratification. The warmer surface layer is separated from colder water toward the bottom by an intervening layer ("thermocline") within which the temperature changes rapidly with depth. Stratification can limit the exchange of gases and nutrients, as well as the onset and decline of phytoplankton blooms (Howarth et al. 2002). In fall and winter, lower air temperatures and cool surface waters break down the vertical stratification and promote mixing within the water column.

Sea surface temperatures in Southern California range from 54 degrees Fahrenheit (°F) (12 degrees Celsius [°C]) to 70°F (21°C) during the year. In the Hawaiian Islands, temperatures are higher, ranging from 71°F (22°C) to 81°F (27°C) during the year (National Oceanographic Data Center 2011a, b).

3.1.1.1.2.4 Oxygen

Surface waters in the ocean are usually saturated or supersaturated with dissolved oxygen by photosynthetic activity and wave mixing (4.49 to 5.82 milliliters per liter [ml/L]). As water depth below the surface increases, the oxygen concentration decreases from 4.4 ml/L to a minimum of 1.7 ml/L at intermediate depths between 1,000 and 3,000 feet (ft.) (300 and 900 m). Thereafter, the oxygen level increases with depth to about 6,500 ft. (2,000 m) (5.4 to 6.7 ml/L) and remains relatively constant at greater depths (Seiwell 1934).

A dissolved oxygen concentration of less than two milligrams per liter (mg/L) is considered to be poor, a condition referred to as hypoxia (Rabalais et al. 2002; U.S. Environmental Protection Agency 2008a). Such low oxygen levels are natural in marine systems under certain conditions, such as oxygen minimum zones at intermediate depths, upwelling areas, deep ocean basins, and fjords (Helly and Levin 2004). Upwelling refers to the movement of colder, nutrient-rich waters from deeper areas of the ocean to the surface. However, the occurrence of hypoxia and anoxia in shallow coastal and estuarine areas can adversely affect fish, bottom-dwelling ("benthic") creatures, and submerged aquatic vegetation. Hypoxia appears to be increasing (Diaz and Rosenberg 1995), and affects more than half of estuaries in the United States (Bricker et al. 1999).

3.1.1.1.2.5 Nutrients

Nutrients are elements and compounds necessary for the growth and metabolism of organisms. In marine systems, basic nutrients include dissolved nitrogen, phosphates, silicates, and metals such as iron and copper. Dissolved inorganic nitrogen occurs in ocean water as nitrates, and ammonia (Zehr and Ward 2002). Depending on local conditions, the productivity of marine ecosystems may be limited by the amount of phosphorus available or, more often, by the amount of nitrogen available (Cloern 2001; Anderson et al. 2002). Too much of either nutrient can lead to deleterious conditions referred to as eutrophication. Too many nutrients can stimulate algal blooms, the rapid expansion of microscopic algae (phytoplankton). Once the excess nutrients are consumed, the algae population dies off and the remains are consumed by bacteria. Bacterial consumption causes dissolved oxygen in the water to decline to the point where organisms can no longer survive (Boesch et al. 1997). Sources of excess nutrients include fertilizers, wastewater, and atmospheric deposition of the combustion products from burning fossil fuels (Turner and Rabalais 2003). Biogeochemical processes in estuaries and on the continental shelf influence the extent to which nitrogen and phosphorus reach the open ocean. Many of these nutrients eventually reside in coastal sediments (Nixon et al. 1996).

3.1.1.1.2.6 Salinity, Ions, and Other Dissolved Substances

The concentrations of major ions in seawater determine its salinity. These ions include sodium, chloride, potassium, calcium, magnesium, and sulfate. Salinity varies seasonally and geographically, especially in areas influenced by large rivers (Milliman et al. 1972). Table 3.1-1 provides estimated concentrations of elements in open ocean waters (Nozaki 1997). The presence of extremely small organic particles (less than 0.63 micrometer [µm]), carbonates, sulfides, phosphates, and other metals, will influence the dominant form of some substances, and determine whether they remain dissolved or form solids.

Salts in ocean waters may come from land, rivers, undersea volcanoes, hydrothermal vents, or other sources. When water evaporates from the surface of the ocean, the salts are left behind and salinity will depend on the ratio of evaporation to precipitation. For example, regions closer to the equator are generally higher in salinity because of their higher evaporation rates. The salinity around the Hawaiian Islands is similar to other subtropical waters, where salinity ranges from 32 to 36 practical salinity units (psu), with a mean of 34.68 practical salinity units. Southern California salinity ranges from 30 to 36 psu, with a mean of 33.79 psu (Srokosz n.d.).

3.1.1.1.2.7 Influences of Marine Properties and Processes on Seawater Characteristics

Ocean currents and tides mix and redistribute seawater. In doing so, they alter surface water temperatures, transport and deposit sediment, and concentrate and dilute substances that are dissolved and suspended in the water. These processes operate to varying degrees from nearshore areas to the abyssal plain. Salinity also affects the density of seawater and, therefore, its movement relative to the sea surface (Libes 2009). Upwelling brings cold, nutrient-rich waters from deeper areas, increasing the productivity of local surface waters (Mann and Lazier 1996). Storms and hurricanes also cause strong mixing of marine waters (Li et al. 2006).

Table 3.1-1: Concentrations of Selected Elements in Seawater

Element	Estimated Mean Oceanic Concentration (ng/kg [ppt])
Magnesium	1,280,000,000
Silicon	2,800,000
Lithium	180,000
Phosphorus	62,000
Molybdenum	10,000
Uranium	3,200
Nickel	480
Zinc	350
Chromium (VI)	210
Copper	150
Cadmium	70
Aluminum	30
Iron	30
Manganese	20
Tungsten	10
Titanium	6.5
Lead	2.7
Chromium (III)	2
Silver	2
Cobalt	1.2
Tin	0.5
Mercury	0.14
Platinum	0.05
Gold	0.02

Notes: ng = nanogram, kg = kilogram, ppt = parts per trillion

Temperature and pH influence the behavior of trace metals in seawater, such as the extent to which they dissolve in water ("solubility") or their tendency to adsorb to organic and inorganic particles. However, the degree of influence differs widely among metals (Byrne et al. 1988). The concentration of a given element may change with position in the water column. For example, some metals (e.g., cadmium) are present at low concentrations in surface waters and at higher concentrations at depth (Bruland 1992), while others decline quickly with increasing depth below the surface (e.g., zinc and iron; Morel and Price 2003; Nozaki 1997). On the other hand, dissolved aluminum concentrations are highest at the surface, lowest at mid-depths, and increase again at depths below about 3,300 ft. (1,006 m) (Li et al. 2008).

Substances like nitrogen, carbon, silicon, and trace metals are extracted from the water by biological processes. Others, like oxygen and carbon dioxide (CO_2), are produced. Metabolic waste products add organic compounds to the water, and may also absorb trace metals, removing those metals from the water column. Those organic compounds may then be consumed by biological organisms, or they may aggregate with other particles and sink (Wallace et al. 1977; Mann and Lazier 1996).

Runoff from coastal watersheds influences local and regional coastal water conditions, especially large rivers. Influences include increased sediments and pollutants, and decreased salinity (Wiseman and Garvine 1995; Turner and Rabalais 2003). Coastal bays and large estuaries serve to filter river outflows and reduce total discharge of runoff to the ocean (Edwards et al. 2006). Depending on their structure and components, estuaries can directly or indirectly affect coastal water quality by recycling various compounds (e.g., excess nutrients), sequestering elements in more inert forms (e.g., trace metals), or altering them, such as the conversion of mercury to methyl mercury (Mitsch and Gosselink 2007; Mitchell and Gilmour 2008).

3.1.1.1.2.8 Coastal Water Quality

A recent coastal condition report by the U.S. Environmental Protection Agency (2008a) evaluated the condition of U. S. coastal water quality. According to the report, most water quality problems in coastal waters of the United States are from degraded water clarity or increased concentrations of phosphates or chlorophyll *a*. Water quality indicators measured included dissolved inorganic nitrogen, dissolved inorganic phosphorus, water clarity or turbidity, dissolved oxygen, and chlorophyll *a*. Chlorophyll *a* is an indicator of microscopic algae (phytoplankton) abundance used to judge nutrient availability (i.e., phosphates and nitrates). Excess phytoplankton blooms can decrease water clarity and, when phytoplankton die off following blooms, lower concentrations of dissolved oxygen. Most sources of these negative impacts arise from on-shore point and non-point sources of pollution. Point sources are direct water discharges from a single source, such as industrial or sewage treatment plants, while non-point sources are the result of many diffuse sources, such as runoff caused by rainfall.

3.1.1.1.2.9 Hydrocarbons, Trace Metals, and Persistent Organic Pollutants

In addition to the characteristics discussed above, other substances influence seawater quality, including hydrocarbons, metals, and persistent organic pollutants (e.g., pesticides, PCBs, organotins, polycyclic aromatic hydrocarbons, and similar synthetic organic compounds). The sources of these contaminants include commercial and recreational vessels; oil and gas exploration, processing, and spills; industrial and municipal discharges (point source pollution); runoff from urban and agricultural areas (non-point source pollution); legal and illegal ocean dumping; poorly or untreated sewage; and atmospheric deposition of combustion residues (U.S. Environmental Protection Agency 2008a). Various physical, chemical, and biological processes work to remove many of these substances from seawater; thereafter, they become part of nearshore and continental shelf sediments.

Hydrocarbons

Hydrocarbons are common in marine ecosystems. They arise from man-made sources, from natural hydrocarbon seeps, and from microbial activity (Boehm and Requejo 1986; Geiselbrecht et al. 1998). According to Kvenvolden and Cooper (2003), during the 1980s, about 10 percent of crude oil entering the marine environment came from natural sources; 27 percent came from oil production, transportation, and refining; and the remaining 63 percent came from atmospheric emissions, municipal and industrial sources, and urban and river runoff. These sources produce many thousands of chemically different hydrocarbon compounds. When hydrocarbons enter the ocean, the lighter-weight components evaporate, degrade by sunlight ("photolysis"), or undergo chemical and biological degradation. A wider range of constituents are consumed by microbes ("biodegradation"). Higher-weight molecular compounds such as asphaltenes are more resistant to degradation, and tend to persist after these processes have occurred (Blumer et al. 1973, Mackay and McAuliffe 1988).

Trace Metals

Trace metals commonly present in seawater are listed in Table 3.1-1. Levels of dissolved metals in seawater are normally quite low because some are extracted by organisms (e.g., iron), many tend to precipitate with various ions already present in the water, and others bind to various metal oxides and small organic and inorganic particles in the water (Turekian 1977). These processes transform the metals from a dissolved state to a solid (particulate) state, and substantially decrease concentrations of dissolved metals in seawater (Wallace et al. 1977). Concentrations of heavy metals normally decrease with increasing distance from shore (Wurl and Obbard 2004) and vary with depth (Li et al. 2008). Certain amounts of trace metals are naturally present in marine waters because of the dissolution of geological formations on land by rain and runoff. However, the additional amounts of metals produced by human activity often have adverse consequences for marine ecosystems (Summers et al. 1996), such as the atmospheric deposition of lead into marine systems (Wu and Boyle 1997).

Persistent Organic Pollutants

Persistent organic pollutants, such as herbicides, pesticides, PCBs, organotins, polycyclic aromatic hydrocarbons, and similar synthetic organic compounds, are chemical substances that persist in the environment and bioaccumulate through the food web. Persistent organic pollutants have long half-lives in the environment. They are resistant to degradation, do not readily dissolve in water, and tend to adhere to organic solids and lipids (fats) (Jones and deVoogt 1999) and plastics. Although they are present in the open ocean and deep ocean waters (Tanabe and Tatsukawa 1983), they are more common and in higher concentrations in nearshore areas and estuaries (Means 1995; Wurl and Obbard 2004). The surface of the ocean is an important micro-habitat for a variety of microbes, larvae, and fish eggs. Because of the tendency of hydrocarbons and persistent organic pollutants to float in this surface micro-layer, they can be much more toxic to those organisms than the adjacent sub-surface water (Wurl and Obbard 2004). Also, persistent organic pollutants that adhere to particulates may sink to the seafloor. Levels of persistent organic pollutants in bottom-feeding fish were higher than fish that live higher up in the water column on the Palos Verde Shelf off the coast of the Palos Verdes peninsula near Los Angeles (U.S. Environmental Protection Agency 2011). Sauer et al. (1989) noted that concentrations of PCBs and dichlorodiphenyltrichloroethane (DDT) have been declining in the open ocean for several decades.

PCBs are mixtures of up to 209 individual chlorinated compounds that are related chemicals of similar molecular structure, also known as congeners. They were used widely as coolants and lubricants in transformers, capacitors, and other electrical equipment. Manufacturing of PCBs stopped in the United States in 1977 (Agency for Toxic Substances and Disease Registry 2000). Marine sources include runoff from agricultural and urban areas and atmospheric deposition from industrial areas (Kalmaz and Kalmaz 1979). PCBs do not readily degrade in the environment, and tend to persist for many years. They can easily move between air, water, and soil, although in aquatic systems, they tend to adhere to fine-grained sediments, organic matter, and marine debris. PCBs have a variety of effects on aquatic organisms, including disrupting endocrine systems. PCBs persist in the tissues of animals at the bottom of the food chain. Consumers of those species accumulate PCBs to levels that may be many times higher than their concentrations in water. Microbial breakdown of PCBs (dechlorination) has been documented in estuarine and marine sediments (Agency for Toxic Substances and Disease Registry 2000).

3.1.1.2 Methods

The following four stressors may impact sediment or water quality: (1) explosives and explosive byproducts, (2) metals, (3) chemicals other than explosives, and (4) a miscellaneous category of other materials. The term “stressor” is used because the military expended materials in these four categories may negatively affect sediment or water quality by altering their physical or chemical characteristics. The potential impacts of these stressors are evaluated based on the extent to which the release of these materials would directly or indirectly impact sediments or water quality such that existing laws or standards would be violated or recommended guidelines would be exceeded. The differences between standards and guidelines are described below.

- **Standards** are established by law or through government regulations that have the force of law. Standards may be numerical or narrative. Numerical standards set allowable concentrations of specific pollutants (e.g., micrograms per liter [µg/L]) or levels of other parameters (e.g., pH) to protect the water's designated uses. Narrative standards describe water conditions that are not acceptable.
- **Guidelines** are nonregulatory, and generally do not have the force of law. They reflect an agency's preference or suggest conditions that should prevail. Guidelines are often used to assess the condition of a resource to guide subsequent steps, such as the disposal of dredged materials. Terms such as screening criteria, effect levels, and recommendations are also used.

3.1.1.2.1 State Standards and Guidelines

State jurisdiction over sediment and water quality extends from the low tide line out 3 nautical miles (nm; Submerged Lands Act of 1953 [43 United States Code {U.S.C.} § 1301, et seq.]). Creating state-level sediment and water quality standards and guidelines begins with each state establishing a use for the water, which is referred to as its "beneficial" or "designated" use. Examples of such uses of marine waters include fishing, shellfish harvest, and swimming. For this section, a water body is considered "impaired" if any one of its designated uses is not met. Once this use is designated, standards or guidelines are established to protect the water at the desired level of quality. Applicable state standards and guidelines specific to each stressor are detailed in Section 3.1.3 (Environmental Consequences).

3.1.1.2.2 Federal Standards and Guidelines

Chief of Naval Operations Instruction 5090.1 is the Navy's controlling authority for all at-sea compliance with federal regulations. Federal jurisdiction over ocean waters extends from 3 to 12 nm (Outer Continental Shelf Lands Act of 1953 [43 U.S.C. § 1331 et seq.]). Sediments and water quality standards and guidelines are mainly the responsibility of the EPA, specifically ocean discharge provisions of the Clean Water Act (33 U.S.C. § 1251, et seq.). Ocean discharge may not result in "unreasonable degradation of the marine environment." Specifically, the disposal may not result in (1) unacceptable negative effects on human health, (2) unacceptable negative effects on the marine ecosystem, (3) unacceptable negative persistent or permanent effects because of the particular volumes or concentrations of the dumped materials, or (4) unacceptable negative effects on the ocean for other uses as a result of direct environmental impact (40 Code of Federal Regulations [C.F.R.] § 125.122). Federal standards and guidelines applicable to each stressor are described in Section 3.1.3 (Environmental Consequences). Where U.S. legal and regulatory authority do not apply (e.g., beyond 200 nm from shore), federal standards and guidelines may be used as reference points for evaluating effects of proposed training and testing activities on sediment and water quality.

The International Convention for the Prevention of Pollution from Ships (Convention) addresses pollution generated by normal vessel operations. The Convention is incorporated into U.S. law as 33 U.S.C. §§ 1901-1915. The Convention includes six annexes: Annex I, oil discharge; Annex II, hazardous liquid control; Annex III, hazardous material transport; Annex IV, sewage discharge; Annex V, plastic and garbage disposal; and Annex VI, air pollution. The U.S. Department of the Navy (Navy) is required to comply with the Convention; however, the United States is not a party to Annex IV. The Convention contains handling requirements and specifies where materials can be discharged at sea, but it does not contain standards related to sediment and water quality.

3.1.1.2.3 Intensity and Duration of Impact

The intensity or severity of impact is defined as follows (increasing order of negative impacts):

- Chemical, physical, or biological changes in sediment or water quality would not be detectable and total concentrations would be below or within existing conditions or designated uses.
- Chemical, physical, or biological changes in sediment or water quality would be measurable but total concentrations would be below applicable standards, regulations, and guidelines, and would be within existing conditions or designated uses.
- Chemical, physical, or biological changes in sediment or water quality would be measurable and readily apparent but total concentrations would be within applicable standards, regulations, and guidelines. Sediment or water quality would be altered compared to historical baseline, desired conditions, or designated uses. Mitigation would be necessary and would likely be successful.
- Chemical, physical, or biological changes in sediment or water quality would be readily measurable, and some standards, regulations, and guidelines would be periodically approached, equaled, or exceeded by total concentrations. Sediment or water quality would be frequently altered from the historical baseline, desired conditions, or designated uses. Mitigation would be necessary, but success would not be assured.

Duration is characterized as either short-term or long-term. Short-term is defined as days or months. Long-term is defined as months or years, depending on the type of activity or the materials involved.

3.1.1.2.4 Measurement and Prediction

Many of the conditions discussed above often influence each other, so measuring and characterizing various substances in the marine environment is often difficult (Byrne 1996; Ho et al. 2007). For instance, sediment contaminants may also change over time. Valette-Silver (1993) reviewed several studies that demonstrated the gradual increase in a variety of contaminants in coastal sediments that began as early as the 1800s, continued into the 1900s, peaked between the 1940s and 1970s, and declined thereafter (e.g., lead, dioxin, PCBs). After their initial deposition, normal physical, chemical, and biological processes can re-suspend, transport, and redeposit sediments and associated substances in areas far removed from the source (Hameedi et al. 2002; U.S. Environmental Protection Agency 2008a). The conditions noted above further complicate predictions of the impact of various substances on the marine environment.

3.1.1.2.5 Sources of Information

Relevant literature was systematically reviewed to complete this analysis of sediment and water quality. The review included journals, technical reports published by government agencies, work conducted by private businesses and consulting firms, U.S. Department of Defense reports, operational manuals, natural resource management plans, and current and prior environmental documents for facilities and activities in the Study Area.

Because of its importance and proximity to humans, information is readily available on the condition of inshore and nearshore sediment and water quality. However, much less is known about deep ocean sediments and open ocean water quality. Because inshore and nearshore sediment and water quality are negatively affected mostly by various human social and economic activities, two general assumptions are used in this discussion: (1) the greater the distance from shore, the higher the quality of sediments and waters; and (2) deeper waters are generally of higher quality than surface waters.

3.1.1.2.6 Areas of Analysis

The locations where specific military expended materials would be used are discussed under each stressor in Section 3.1.3 (Environmental Consequences).

3.1.2 Affected Environment

The affected environment includes sediment and water quality within the Study Area, from nearshore areas to the open ocean and deep sea bottom. Existing sediment conditions are discussed first and water quality thereafter.

3.1.2.1 Sediments

The following subsections discuss sediments for each region in the Study Area. Table 3.1-2 provides the sediment quality criteria and index for the U.S. west coast and Hawaiian Islands.

Table 3.1-2: Sediment Quality Criteria and Index, United States West Coast and Hawaiian Islands

Parameter	Site Criteria			Regional Criteria		
	Good	Fair	Poor	Good	Fair	Poor
Sediment Toxicity	Amphipod survival rate ≥ 80%	n/a	Amphipod survival rate < 80%	< 5% of coastal area in poor condition	n/a	≥ 5% of coastal area in poor condition
Sediment Contaminants	No ERM concentration exceeded, and < 5 ERL concentrations exceeded	No ERM concentration exceeded and ≥ 5 ERL concentration s exceeded	An ERM concentration exceeded for one or more contaminants	< 5% of coastal area in poor condition	5–15% of coastal area in poor condition	> 15% of coastal area in poor condition
Excess Sediment TOC	TOC concentration < 2%	TOC concentration 2% to 5%	TOC concentration > 5%	< 20% of coastal area in poor condition	20–30% of coastal area in poor condition	> 30% of coastal area in poor condition

Table 3.1-2: Sediment Quality Criteria and Index, United States West Coast and Hawaiian Islands (continued)

Parameter	Site Criteria			Regional Criteria		
	Good	Fair	Poor	Good	Fair	Poor
Sediment Quality Index	No individual criteria rated poor, and sediment contaminants criteria is rated good	No individual criteria rated poor, and sediment contaminants criteria is rated fair	One or more individual criteria rated poor	< 5% of coastal area in poor condition, and > 50% in good condition	5–15% of coastal area in poor condition, and > 50% in combined fair and poor condition	> 15% of coastal area in poor condition

Notes: ERM = effects range–median; is the level measured in the sediment below which adverse biological effects were measured 50 percent of the time; ERL = effects range–low; is the level measured in the sediment below which adverse biological effects were measured 10 percent of the time (Long et al. 1995); n/a = Not Applicable; TOC = total organic carbon, refers to the amount of carbon contained in organic compounds; < = less than; > = greater than

Source: U.S. Environmental Protection Agency 2008a

3.1.2.1.1 Sediments in the Insular Pacific-Hawaiian Large Marine Ecosystem

The composition and distribution of bottom substrate in the Insular Pacific-Hawaiian Large Marine Ecosystem are discussed in Section 3.3 (Marine Habitats). The sediment quality index for Hawaii's coastal waters is rated good to fair, with 7 percent of the coastal sediment rated fair and 5 percent rated poor (Figure 3.1-1; U.S. Environmental Protection Agency 2008a). Sediment quality was based on three components: sediment toxicity, sediment contaminants, and sediment total organic carbon. Poor sediment quality ratings were primarily influenced by metal and organic contaminants near the heavily urbanized southern shore of Oahu. In terms of sediment toxicity, 97 percent of the coastal area was rated good, with 3 percent rated poor because of elevated levels of arsenic and DDT (U.S. Environmental Protection Agency 2008a). Most sediments in Hawaii's coastal waters are rated good for sediment contaminants, with approximately 9 percent of the coastal area rated fair or poor. Those sites generally exhibited elevated levels of metals, such as chromium, lead, copper, mercury, silver, and zinc, and polycyclic aromatic hydrocarbons (U.S. Environmental Protection Agency 2008a).

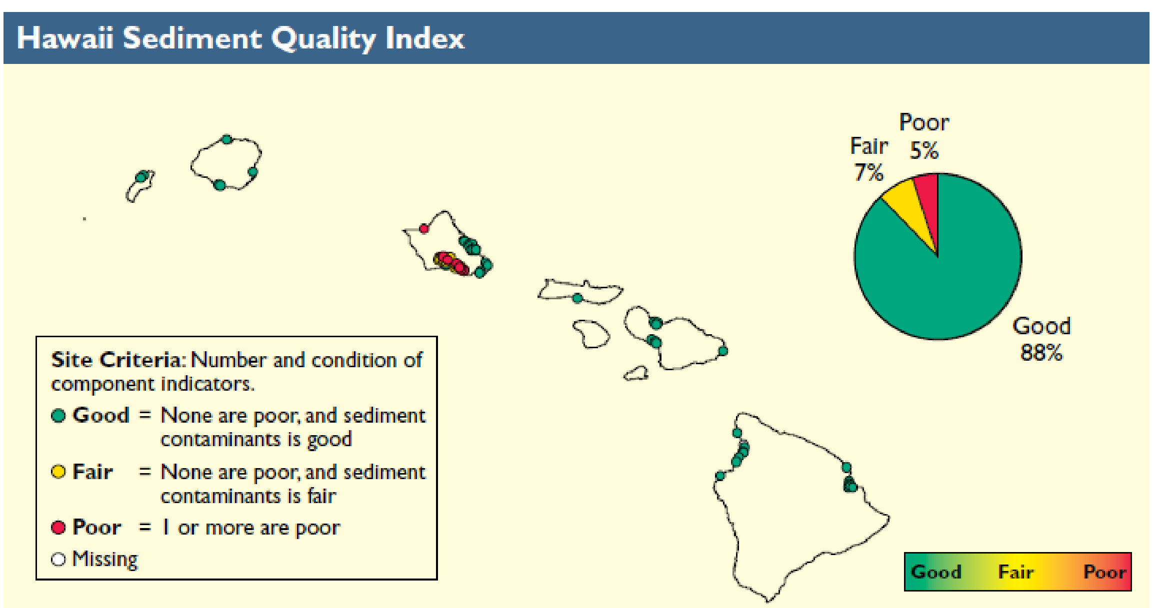


Figure 3.1-1: Sediment Quality Index for the Hawaiian Islands

Some metals naturally occur at elevated concentrations in the volcanic soils of Hawaii. Natural concentrations of copper, zinc, nickel, and chromium are high compared to soils in the mainland United States. Pearl Harbor receives a substantial amount of metal contamination because it serves as a natural trap for sediment particles (Agency for Toxic Substance and Disease Registry 2005).

Anthropogenic activities within and around Pearl Harbor, including Navy activities and private industrial, commercial, and agricultural activities, contribute pollutants through point and non-point sources. These activities release numerous pollutants into Pearl Harbor, where sediments can act as a sink or repository for chemicals (U.S. Department of the Navy 1999). The Department of the Navy conducted a Remedial Investigation/Feasibility Study of the sediments in Pearl Harbor from March to June 2009. The results of the Remedial Investigation indicate that eight metals (antimony, cadmium, copper, lead, mercury, selenium, silver, and zinc), total high molecular weight polycyclic aromatic hydrocarbons, total PCBs, and two chlorinated pesticides (dieldrin and total endosulfan) exceed the project screening criteria (Table 3.1-3).

Table 3.1-3: Sediment Screening Criteria for Pearl Harbor Sediment Remedial Investigation

Parameter		Sediment Screening Criterion (mg/kg [ppm], dry weight)
Metals	Antimony	8.4
	Arsenic	27.5
	Cadmium	3.2
	Chromium	277
	Copper	214
	Lead	119
	Mercury	0.71
	Nickel	660
	Selenium	3.8
	Silver	1.8
	Zinc	330
	HMW-PAHs	35,253
	Total PCBs	92 (> 2 m water depth) 29 (< 2 m water depth
Pesticides	Total DDT	106.6
	Dieldrin	14.4
	Total BHC	1,215
	Total Chlordane	174
	Heptachlor Epoxide	174
	Total Endosulfan	1.09
Dioxins	2,3,7,8-TCDD	0.36

Notes: mg = milligram, kg = kilogram, ppm = parts per million, HMW-PAH = high molecular weight-polyaromatic hydrocarbons, PCBs = polychlorinated biphenyls, DDT = dichlorodiphenyltrichloroethane, BHC = benzene hexachloride, TCDD = tetrachlorodibenzo-p-dioxin, < = less than, > = greater than

Source: U.S. Department of the Navy 2010a

Surface weighted-average concentrations in sediment were below project screening criteria in Middle Loch and West Loch and above project screening criteria in Southeast Loch, Bishop Point, northwest shoreline of Ford Island, Aiea Bay, shoreline of Oscar 1 and 2, and off the Waiau Power Plant (U.S. Department of the Navy 2010a). In 1998, the Hawaii Department of Health and EPA issued an advisory stating that marine life from Pearl Harbor should not be eaten (Agency for Toxic Substance and Disease Registry 2005).

3.1.2.1.2 Sediments in the California Current Large Marine Ecosystem

The composition and distribution of bottom substrates in the California Current Large Marine Ecosystem are discussed in Section 3.3 (Marine Habitats). In the *National Coastal Condition Report IV* (U.S. Environmental Protection Agency 2012), the sediment quality index for the West Coast region was rated as fair, with 10 percent of the coast rated poor and 1 percent rated fair. The sediment quality index for the West Coast region is based on the same criteria as identified for the Hawaiian Islands in Section 3.1.2.1.1 (Sediments in the Insular Pacific-Hawaiian Large Marine Ecosystem). The West Coast region (Figure 3.1-2) includes more than 410 estuaries and bays covering over 3,940 square miles along the coasts of Washington, Oregon, and California.

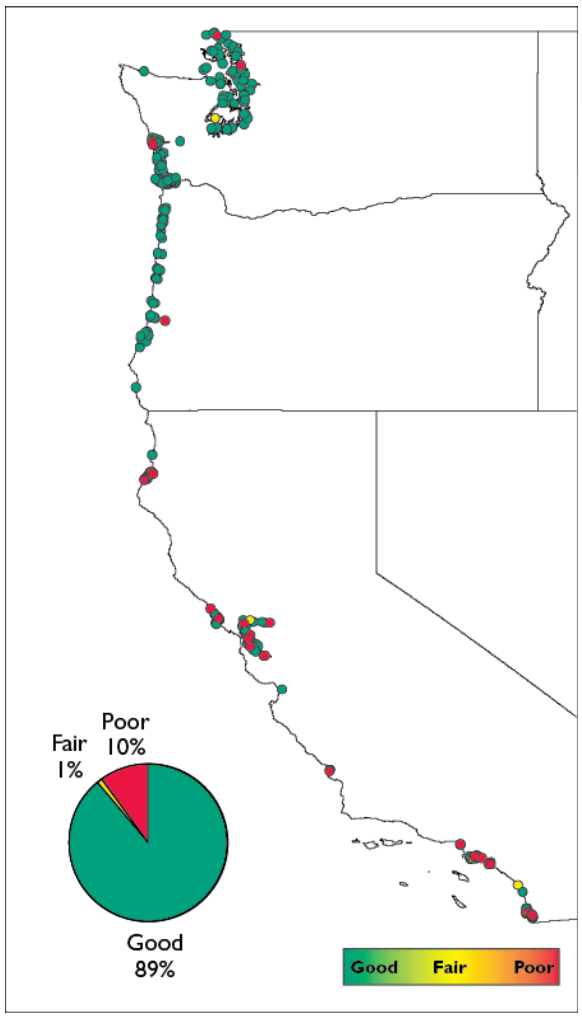


Figure 3.1-2: Sediment Quality Index for the West Coast Region

In a report on the *Southern California Bight 1998 Regional Monitoring Program*, the Southern California Coastal Water Research Project stated that sediment toxicity was most severe in ports and marinas in bays, harbors, and river mouths (Southern California Coastal Water Research Project 2003). A study conducted between 1984 and 1990 along the California coast showed that the highest concentrations of sediment contaminants, including chlordanes, dieldrin, DDT, polycyclic aromatic hydrocarbons, and PCBs, were present in the most highly urbanized areas. The highest concentrations were found in highly populated areas of Los Angeles, San Diego Bay, and San Francisco Bay (Center for Ocean Solutions 2009).

Sediment quality in the waters surrounding San Clemente Island was tested in 2006 (U.S. Department of the Navy 2006); the results for contaminants found in sediments surrounding San Clemente Island are shown in Table 3.1-4. The 10-day solid-phase amphipod bioassay tests of the sediments also indicated high survival and no substantial toxicity. The results indicate that ocean bottom sediment quality is good in that portion of the Southern California (SOCAL) Range Complex Operating Areas (OPAREAs) off San Clemente Island where training and testing activities are most concentrated.

Table 3.1-4: Contaminant Concentrations in Bottom Sediments Offshore San Clemente Island

Constituent	Sediment Concentration at SCI Reference Sampling Site, ppm	EPA Sediment Quality Guidelines (ERM Values), ppm
Arsenic	2.87	70
Cadmium	0.11	9.6
Chromium	8.56	370
Copper	7.48	270
Lead	2.19	218
Mercury	0.275	0.71
Nickel	4.6	51.6
Selenium	0.56	n/a
Silver	0.09	3.7
Zinc	19.2	410
Polychlorinated biphenyls	ND (< 0.005)	180
Phenols	ND (< 0.1)	n/a
Dioxins (TEQ)	0.0–0.028	n/a

Notes: ppm = parts per million, ERM = Effects Range Median, ND = nondetectable concentration, n/a = not available, TEQ = toxicity equivalency factor, SCI = San Clemente Island, EPA = United States U.S. Environmental Protection Agency, < = less than

Sources: U.S. Department of the Navy 2006, National Oceanic and Atmospheric Administration 1999

Pacific Ocean sediments offshore of Silver Strand have above-average levels of organic loading and concentrations of some metals (aluminum, arsenic, chromium, copper, iron, manganese, and zinc), but these substances are not present at concentrations that pose a risk to public health or the environment. Traces of synthetic organic contaminants (e.g., polycyclic aromatic hydrocarbons) are occasionally detected in sediments, but have been well below a threshold of concern (U.S. Army Corps of Engineers 2002).

Past sources of sediment contamination in San Diego Bay include sewage, industrial wastes, ship discharges, urban runoff, and accidental spills, while current sources include underground dewatering, industries in the Bay, Navy installations, underwater hull cleaning, vessel antifouling paints, and urban runoff. Known contaminants in San Diego Bay include arsenic, copper, chromium, lead, cadmium, selenium, mercury, tin, manganese, silver, zinc, polycyclic aromatic hydrocarbons, petroleum hydrocarbons, PCBs, chlordane, dieldrin, and DDT (U.S. Department of the Navy 2000).

Sediments from sampling events from 1984 to 1990 at two sites in San Diego Bay, the 28th Street Pier site and a northern San Diego Bay site, showed concentrations of polycyclic aromatic hydrocarbons and PCBs that tended to be higher than most of the other sites sampled along the west coast (McCain et al. 2000). Recent sediment sampling in San Diego Bay near Silver Strand Training Complex (SSTC)-North indicates that—while concentrations of some contaminants are elevated above background levels—no contaminants were present at concentrations which would adversely affect marine organisms (Port of San Diego 2002). The *Ecological Assessment of San Diego Bay* (City of San Diego 2003) stated that "in comparison to other bays and harbors in the Southern California Bight…San Diego Bay has relatively low levels of widespread contamination and has considerably less contamination than in decades past."

Sediment samples were collected at 46 randomly selected stations in San Diego Bay in July and August 1998 as part of a Memorandum of Understanding between the San Diego Regional Water Quality Control Board and the City of San Diego (Table 3.1-5).

Table 3.1-5: Summary of Sediment Sampling in San Diego Bay

Sample Parameter	Contaminant Concentration											
	Metals (parts per million)										PAH (ppb)	DDT (ppt)
	As	Sb	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn		
# Detected[1]	46	19	38	45	46	46	45	44	36	46	34	7
TEL % Exceed[2]	35	-	0	24	96	43	91	32	22	59	21	14
TEL Threshold	7.24	N/A	0.676	52.3	18.7	30.24	0.13	15.9	0.733	124	1,684	3,890
ERL % Exceed[2]	22	100	0	0	91	17	91	2	11	39	9	57
ERL Threshold	8.2	2	1.2	81	34	46.7	0.15	20.9	1	150	4,022	1,580
PEL % Exceed[2]	0	-	0	0	35	2	9	0	0	4	0	0
PEL Threshold	41.6	N/A	4.21	160.4	108.2	112.18	0.7	42.8	1.77	271	16,771	51,700
ERM % Exceed[2]	0	100	0	0	0	0	9	0	0	2	0	0
ERM Threshold	70	2.5	9.6	370	270	218	0.7	51.6	3.7	410	44,792	46,100

[1] Number of samples where contaminant was detected. Total number of samples = 46

[2] % Exceed = percent of samples with detected values that exceed threshold values.

Notes: As = arsenic, Sb = antimony, Cd = cadmium, Cr = chromium, Cu = copper, Pb = lead, Hg = mercury, Ni = nickel, Ag = silver, Zn = zinc, PAH = polyaromatic hydrocarbon, DDT = dichlorodiphenyltrichloroethane, TEL = Threshold Effects Level, ERL = Effects Range-Low, PEL = Probably Effects Level, ERM = Effects Range-Medium, N/A = Not Analyzed

Source: State of California 2003

All samples were analyzed to determine particle size composition and concentrations of various contaminants. Sampling showed that sediment contaminants were present throughout San Diego Bay. Chromium, copper, lead, mercury, zinc, and polyaromatic hydrocarbons were detected in over 70 percent of the sediment samples, while PCBs and tributyltin were found less frequently (less than 26 percent of samples) and chlordane was not detected at all (State of California 2003). Concentrations of various contaminants were evaluated using established sediment quality thresholds (i.e., Effects Range-Low, Effects Range-Medium, Threshold Effects Level, and Probably Effects Level). Concentrations of nine metals and polyaromatic hydrocarbons exceeded at least one of these thresholds. Sites where multiple contaminants exceeded the thresholds typically had high percentages of fine sediments (i.e., > 60% fines) and were located near or within marinas or shipyards (State of California 2003).

Sediments in San Diego Bay near the B Street/Broadway Piers, Downtown Anchorage, and near the mouth of Switzer Creek are contaminated with anthropogenic chemicals, including polynuclear aromatic hydrocarbons, PCBs, chlorinated pesticides, and metals (e.g., copper, antimony, and mercury) (Anderson et al. 2004). Past samples from these sites have been shown to be toxic to marine invertebrate species in laboratory toxicity tests. As a result, these sites are considered to be areas of impaired water quality. The San Diego Regional Water Quality Control Board is developing total maximum daily loads for these sites to reduce discharges of contaminants (Anderson et al. 2005).

3.1.2.1.3 Marine Debris, Military Materials, and Marine Sediments

Keller et al. (2010) surveyed marine debris collected from the seafloor at 1,347 randomly selected stations off the coasts of Washington, Oregon, and California during annual groundfish surveys in 2007 and 2008. Depth of trawling ranged from 180 to 4,200 ft. (55 to 1,280 m) and marine debris was recovered in 469 tows. Categories of marine debris collected included plastic, metal, glass, fabric and fiber, rubber, fishing, and other. Plastic and metallic debris occurred in the greatest number of hauls, followed by fabric and glass. The survey area included portions of the SOCAL Range Complex. Data about military materials as a component of the recovered materials are provided in Table 3.1-6.

Table 3.1-6: Military Materials as Components of All Materials Recovered on the West Coast, United States, 2007–2008

Category	Number of Items	Percent of Total Items Recovered	Weight	Percent of Total Weight
Plastic	29	7.4	62.3 lb. (28.3 kg)	5.8
Metal	37	6.2	926.6 lb. (420.3 kg)	42.7
Fabric, Fiber	34	13.2	51.4 lb. (23.3 kg)	6.7
Rubber	3	4.7	32.8 lb. (14.9 kg)	6.8

Notes: lb. = pound, kg = kilogram
Source: Keller et al. 2010

Military materials containing metals recovered during surveys included ammunition boxes, helmets, rocket boosters and launchers, and cannon shells (Keller et al. 2010). The authors noted that “virtually all” materials identified as military were collected off the coast of Southern California in an area where naval maneuvers are conducted.

Because of their buoyancy, many types of plastic float, and may travel thousands of miles in the ocean (U.S. Commission on Ocean Policy 2004). Many plastics remain in the water column, so additional discussion of marine debris is provided in Section 3.1.2.2.3 (Marine Debris and Marine Water Quality). Although plastics are resistant to degradation, they do gradually break down into smaller particles because of exposure to sunlight (“photolysis”) and mechanical wear (Law et al. 2010). A study in 1998 collected debris from 43 coastal sites Orange County, California. Approximately 106 million items (weighing 12 metric tons) were collected, with 99 percent of items consisting of pre-production pellets, foamed plastics, and hard plastic fragments (Stevenson 2011). Thompson et al. (2004) found that microscopic particles were common in marine sediments at 18 beaches around the United Kingdom.

They noted that such particles were ingested by small filter and deposit feeders, with unknown effects. The fate of plastics that sink beyond the continental shelf is largely unknown. However, analysis of debris in the center of an area near Bermuda with a high concentration of plastic debris on the surface showed no evidence of plastic as a substantial contributor to debris sinking at depths of 1,650 to 10,500 ft. (500 to 3,200 m) (Law et al. 2010). Marine microbes and fungi are known to degrade biologically produced polyesters such as polyhydroxyalkanoates, a bacterial carbon and energy source (Doi et al. 1992). Marine microbes also degrade other synthetic polymers, although at slower rates (Shah et al. 2008).

3.1.2.1.4 Climate Change and Sediments

Aspects of climate change that influence sediments include increasing ocean acidity (pH), increasing sea surface water temperatures, and increasing storm activity. Breitbarth et al. (2010) referred to seawater temperature and pH as "master variables for chemical and biological processes," and noted that effects of changes on trace metal biogeochemistry "may be multifaceted and complex." Under more acidic conditions, metals tend to dissociate from particles to which they are bound in sediments, become more soluble, and potentially more available.

As noted in the beginning of this section, tropical storms can substantially affect re-suspension and distribution of bottom sediments (Wren and Leonard 2005). If storm frequency and intensity increase from climate change, the additional disturbance of marine sediment may adversely impact water quality in nearshore and coastal areas. However, no consensus seems to exist as to whether there will be more tropical storms or whether those storms will be more intense. This issue is addressed in more detail in Section 3.1.2.2.3 (Marine Debris and Marine Water Quality).

3.1.2.2 Water Quality

The current state of water quality in the Study Area is discussed below, from nearshore areas to the open ocean and deep sea bottom. Table 3.1-7 and Table 3.1-8 provide the water quality criteria and index for the U.S. west coast and Hawaiian Islands, respectively.

Table 3.1-7: Water Quality Criteria and Index, United States West Coast

Criterion	Site Criteria			Regional Criteria		
	Good	Fair	Poor	Good	Fair	Poor
Dissolved Inorganic Nitrogen	< 0.5 mg/L	0.5–1.0 mg/L	> 1.0 mg/L	Less than 10% of the coastal area is in poor condition, and more than 50% of the coastal area is in good condition.	10–25% of the coastal area is in poor condition, or more than 50% of the coastal area is in combined poor and fair condition.	More than 25% of the coastal area is in poor condition.
Dissolved Inorganic Phosphorus	< 0.01 mg/L	0.01–0.1 mg/L	> 0.1 mg/L			
Water Clarity	Sites with naturally high turbidity: > 10% light at 1 meter Sites with normal turbidity: > 20% light at 1 meter Sites that support submerged aquatic vegetation: > 40% light at 1 meter	Sites with naturally high turbidity: 5–10% light at 1 meter Sites with normal turbidity: 10–20% light at 1 meter Sites that support submerged aquatic vegetation: 20–40% light at 1 meter	Sites with naturally high turbidity: < 5% light at 1 meter Sites with normal turbidity: < 10% light at 1 meter Sites that support submerged aquatic vegetation: < 20% light at 1 meter			
Dissolved Oxygen	> 5.0 mg/L	2.0-5.0 mg/L	< 2.0 mg/L	Less than 5% of the coastal area is in poor condition and more than 50% of the coastal area is in good condition.	5–15% of the coastal area is in poor condition, or more than 50% of the coastal area is in combined poor and fair condition.	More than 15% of the coastal area is in poor condition.
Chlorophyll *a*	< 5 µg/L	5–20 µg/L	> 20 µg/L	Less than 10% of the coastal area is in poor condition, and more than 50% of the coastal area is in good condition.	10–20% of the coastal area is in poor condition, or more than 50% of the coastal area is in combined poor and fair condition.	More than 20% of the coastal area is in poor condition.
Water Quality Index	A maximum of one indicator is rated fair, and no indicators are rated poor.	One of the indicators is rated poor, or two or more indicators are rated fair.	Two or more of the five indicators are rated poor.			

Notes: < = less than, > = greater than, mg/L = milligram per liter, µg/L = microgram per liter
Source: U.S. Environmental Protection Agency 2008a

Table 3.1-8: Water Quality Criteria and Index, Hawaiian Islands

Criterion	Site Criteria			Regional Criteria		
	Good	Fair	Poor	Good	Fair	Poor
Dissolved Inorganic Nitrogen	< 0.05 mg/L	0.05–0.1 mg/L	> 0.1 mg/L	Less than 10% of the coastal area is in poor condition, and more than 50% of the coastal area is in good condition.	10–25% of the coastal area is in poor condition, or more than 50% of the coastal area is in combined poor and fair condition.	More than 25% of the coastal area is in poor condition.
Dissolved Inorganic Phosphorus	< 0.005 mg/L	0.005–0.01 mg/L	> 0.01 mg/L			
Water Clarity	Sites with naturally high turbidity: > 10% light at 1 meter Sites with normal turbidity: > 20% light at 1 meter Sites that support submerged aquatic vegetation: > 40% light at 1 meter	Sites with naturally high turbidity: 5–10% light at 1 meter Sites with normal turbidity: 10–20% light at 1 meter Sites that support submerged aquatic vegetation: 20–40% light at 1 meter	Sites with naturally high turbidity: < 5% light at 1 meter Sites with normal turbidity: < 10% light at 1 meter Sites that support submerged aquatic vegetation: < 20% light at 1 meter			
Dissolved Oxygen	> 5.0 mg/L	2.0–5.0 mg/L	< 2.0 mg/L	Less than 5% of the coastal area is in poor condition and more than 50% of the coastal area is in good condition.	5%-15% of the coastal area is in poor condition, or more than 50% of the coastal area is in combined poor and fair condition.	More than 15% of the coastal area is in poor condition.
Chlorophyll *a*	< 0.5 µg/L	0.5–1.0 µg/L	> 1.0 µg/L	Less than 10% of the coastal area is in poor condition, and more than 50% of the coastal area is in good condition.	10%-20% of the coastal area is in poor condition, or more than 50% of the coastal area is in combined poor and fair condition.	More than 20% of the coastal area is in poor condition.
Water Quality Index	A maximum of one indicator is rated fair, and no indicators are rated poor.	One of the indicators is rated poor, or two or more indicators are rated fair.	Two or more of the five indicators are rated poor.			

Notes: < = less than, > = greater than, mg/L= milligram per liter, µg/L = microgram per liter
Source: U.S. Environmental Protection Agency 2008a

3.1.2.2.1 Water Quality in the Insular Pacific-Hawaiian Large Marine Ecosystem

Population growth is the primary cause of impacts on the coastal water quality of the Hawaiian Islands. The coastal waters of the Hawaiian Islands are affected by different kinds of marine debris, garbage, and solid wastes that deposit toxic chemicals and nutrients in the ocean. In addition to large quantities of marine debris, PCBs have been deposited in the marine environment because of urbanization (Center for Ocean Solutions 2009). Urban land use typically results in water quality contaminants such as nitrogen, phosphorous, suspended solids, sediments, pesticides, and herbicides, as well as fecal contamination. Agricultural runoff contains the same water quality contaminants as urban runoff, but has higher concentrations of pesticides, herbicides, and sediments.

A survey for the *National Coastal Condition Report III* of 50 stations across the main islands and 29 stations along the southern shore of Oahu, mostly near heavily urbanized areas, resulted in a water quality index of "good" (Figure 3.1-3); U.S. Environmental Protection Agency 2008a). This rating was based on five indicators: concentrations of dissolved inorganic nitrogen, dissolved inorganic phosphorus, chlorophyll *a* and dissolved oxygen, and water clarity. Most of the coastal area surveyed (78 percent) was rated "good," while 18 percent of the surveyed area was "fair" and four percent was considered "poor." The finding of 22 percent considered either fair or poor is preliminary because some stations did not measure all five component indicators (U.S. Environmental Protection Agency 2008a).

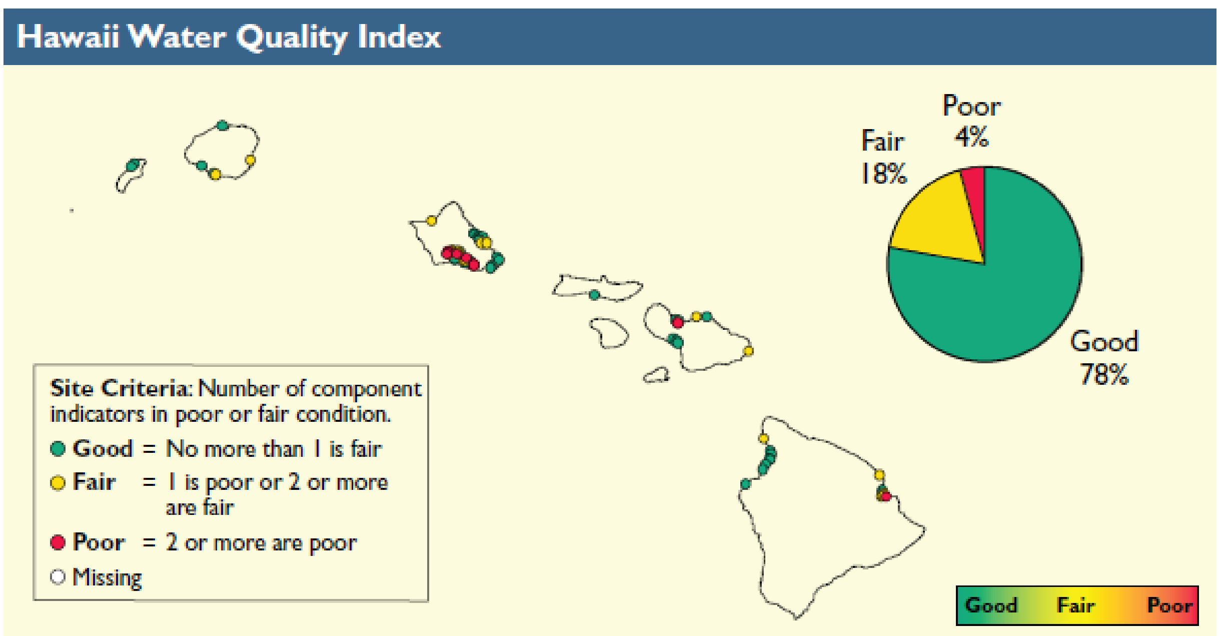


Figure 3.1-3: Water Quality Index for the Hawaiian Islands

In 2006, the Hawaii Department of Health listed 209 marine segments in the Hawaiian Islands as impaired[1] under the Clean Water Act, Section 303(d) (Hawaii Department of Health 2008). The most common pollutants of 303(d)-listed marine waters were bacteria and turbidity. Potential bacterial sources included animal wastes, soils, and human sewage. Other contaminant indicators for 303(d) listings included total nitrogen, nitrites or nitrates, phosphorous, total suspended solids, chlorophyll *a*, and ammonium (Hawaii Department of Health 2008).

[1] Impaired water bodies are those waters that do not meet water quality standards for one or more pollutants; thus, they are impaired for their designated use.

Pearl Harbor is on Hawaii's Clean Water Act Section 303(d) List of Water Quality Limited Segments. The Pearl Harbor Water Quality Limited Segment includes the entire harbor and the mouths of perennial streams discharging into the harbor. Beneficial uses of Pearl Harbor include bait fish and shellfish propagation in West and East Lochs, shipping navigation and industrial water in East Loch, and water fowl habitat in Middle and West Lochs (Hawaii Department of Health 2000).

Contaminants are introduced into Pearl Harbor via point source and non-point source discharges. Surface runoff from urban, industrial, and agricultural activities carries variable levels of herbicides, pesticides, and other contaminants, in addition to natural loads of sediment, dissolved metals, and other soluble constituents (Agency for Toxic Substance and Disease Registry 2005). Water quality criteria that are frequently violated in Pearl Harbor include maximum nitrogen, phosphorous, fecal coliform, and chlorophyll *a* concentrations, and turbidity and temperature limits (Hawaii Department of Health 2000).

3.1.2.2.2 Water Quality in the California Current Large Marine Ecosystem

The offshore waters of the SOCAL Range Complex are vast. Their expanse, distance from the shore, and the mixing and transport effects of ocean currents and upwelling, combine to maintain a generally high quality of water that meets or exceeds criteria set forth by the *California Ocean Plan* (State of California 2009) and by the *National Ambient Water Quality Criteria* (U.S. Environmental Protection Agency 2009). The water quality index for the coastal waters of the West Coast region is rated good, with 19 percent of the coast rated fair and 2 percent rated poor (U.S. Environmental Protection Agency 2012). The water quality index for the West Coast region (Figure 3.1-4) is based on the same criteria as identified for the Hawaiian Islands in Section 3.1.2.2.1 (Water Quality in the Insular Pacific-Hawaiian Large Marine Ecosystem).

Water quality in the SOCAL Range Complex is strongly affected by human activities in heavily developed Southern California. In a report on the *Southern California Bight 1998 Regional Monitoring Program*, the Southern California Coastal Water Research Project identified urban runoff as one of the largest sources of contamination along the Southern California coast, containing bacteria, inorganic nutrients, various organic compounds, and metals (Southern California Coastal Water Research Project 2003).

Nonpoint source runoff is substantial in Southern California because most rivers are highly modified stormwater conveyance systems that are not connected to sewage treatment systems. When storm events occur, runoff plumes can become large oceanographic features that extend for many kilometers (Center for Ocean Solutions 2009). Along the Southern California coast, land-based chemical pollution, in particular PCBs and DDT, affect water quality.

Most of the marine water pollution in the SOCAL Range Complex results from municipal discharges. The oil and gas industry, however, is a source of water pollution in the northern part of the Southern California Bight. Several active oil platforms are located near the northern boundary of the SOCAL Range Complex. As offshore oil and gas activities continue in Southern California, potential pollutants may be introduced into the marine environment through oil leaks, accidental spills, discharges of formation water, drill mud, sediment, debris, and sludge, all of which degrade water quality.

Commercial, recreational, and institutional vessels also discharge water pollutants in the SOCAL Range Complex. Shipboard waste-handling procedures governing the discharge of nonhazardous waste streams have been established for commercial and Navy vessels. These categories of wastes include (a) liquids: "black water" (sewage); "grey water" (water from deck drains, showers, dishwashers, laundries, etc.); and oily wastes (oil-water mixtures) and (b) solids (garbage).

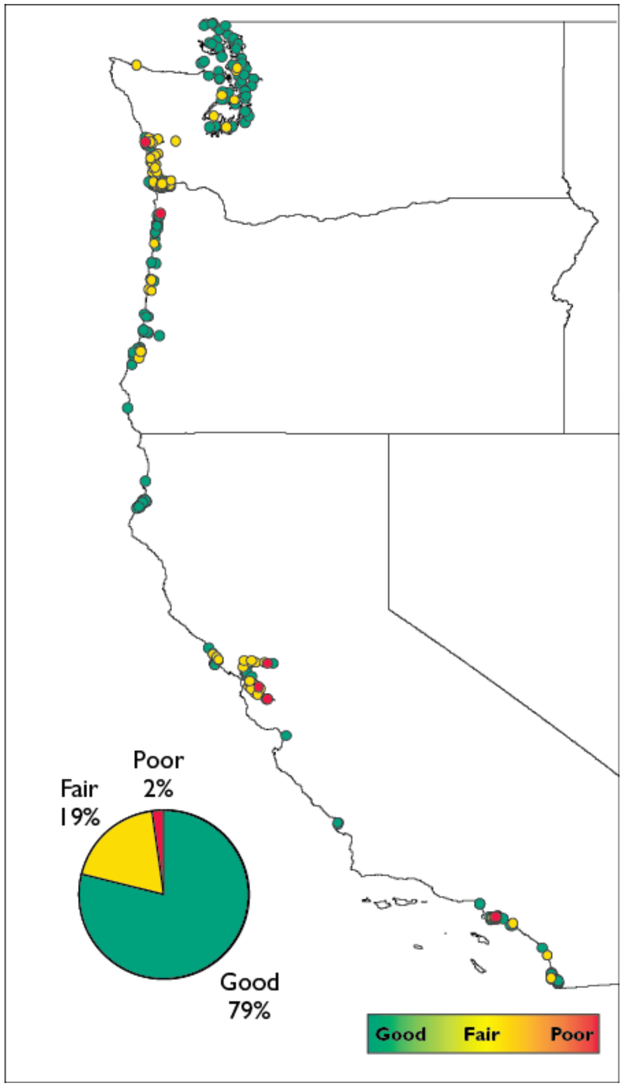


Figure 3.1-4: Water Quality Index for the West Coast Region

Water quality in the nearshore waters of San Clemente Island, which are affected by baseline at-sea and ashore training and testing activities, has been tested (U.S. Department of the Navy 2006). Based on *California Ocean Plan* objectives for protection of aquatic life (Table 3.1-9), concentrations of potential water pollutants are low, and have no substantial effects on marine water quality in that portion of the SOCAL Range Complex OPAREAs where training and testing activities are most concentrated.

Major contaminants found in San Diego Bay include chlorinated hydrocarbons, PCBs, toxic components of petroleum hydrocarbons, polycyclic aromatic hydrocarbons, heavy metals, and organotins such as tributyltin (U.S. Department of the Navy 1998). The sources of these compounds include effluents from non-point-source storm drain runoff (municipal and industrial); contaminants from vessel maintenance; antifouling paints (military, commercial, and private vessels); marina discharges; and residues of prior industrial discharges. These contaminants have generally been incorporated into bottom sediments in the Bay, and are periodically re-suspended in the water column when bottom sediments are disturbed by natural or human activities.

Water quality in north-central San Diego Bay is affected primarily by tidal flushing and currents. Water quality also is influenced locally by freshwater inflows. The Shelter Island Yacht Basin portion of San Diego Bay is listed as an impaired water body by the Regional Water Quality Control Board for dissolved copper pursuant to Clean Water Act Section 303(d); a Total Maximum Daily Load has been adopted to address excessive dissolved copper (Regional Water Quality Control Board 2007). Gross water quality characteristics (e.g., salinity, temperature, and dissolved oxygen) form a gradient within San Diego Bay. Waters in northern San Diego Bay are similar to ocean conditions; waters in southern San Diego Bay are strongly affected by shallow depths, fresh water inflows, and solar insolation; waters in central San Diego Bay are intermediate in character.

Table 3.1-9: Water Pollutant Concentrations in Surface Waters at San Clemente Island

Constituent	Concentration (micrograms/liter [ppb])	
	SCI Reference Sampling Site	California Ocean Plan Objective
Antimony	0.18	1,200
Arsenic	1.19	8[a]
Beryllium	ND (< 0.005)	0.033[b]
Cadmium	ND (< 0.005)	1[a]
Copper	0.142	3[a]
Lead	0.228	2[a]
Mercury	ND (< 0.01)	0.04[a]
Nickel	0.25	5[a]
Selenium	ND (< 0.01)	15[a]
Silver	ND (< 0.005)	0.7
Thallium	ND (< 0.005)	2[b]
Zinc	2.65	20[a]
Polychlorinated biphenyls	ND (< 0.005)	0.000019[b]
Phenols	ND (< 0.1)	30[a]
Chromium, hexavalent	ND (< 5.0)	2[a]
Cyanide	ND (< 1.0)	1[a]

[a] 6-month median value
[b] 30-day arithmetic average
Notes: ppb = parts per billion, ND = nondetectable concentration, SCI = San Clemente Island, < = less than
Sources: U.S. Department of the Navy 2006, State of California 2009

3.1.2.2.3 Marine Debris and Marine Water Quality

The National Marine Debris Monitoring Program developed three categories of marine debris for its study of the extent of man-made materials in the oceans. The three categories were land-based, ocean-based, and general (i.e., origin unspecified; Sheavly 2007). Land-based debris may be blown in on the wind, washed in with stormwater, arise from recreational use of coastal areas, or generated by extreme weather such as hurricanes. Ocean sources of marine debris include commercial shipping and fishing, private boating, offshore mining and extraction, and legal and illegal dumping at sea. Ocean current patterns, weather and tides, and proximity to urban centers, industrial and recreational areas, shipping lanes, and fishing grounds influence the types and amounts of debris that are found (Sheavly 2010).

Teuten et al. (2007) found that water-borne phenanthrene (a type of polycyclic aromatic hydrocarbon) adhered preferentially to small pieces of plastic that were ingested by a bottom-dwelling marine lugworm and incorporated into its tissue. Plastics also may transport various pollutants, whether through adsorption from seawater or from the constituents of the plastics themselves. Mato et al. (2001) noted that polypropylene resin pellets-precursors to certain manufactured plastics, collected from sites in Japan contained PCBs, dichlorodiphenyldichloroethylene (a breakdown product of DDT), and nonylphenol, a persistent organic pollutant that is a precursor to certain detergents. PCBs and DDT were adsorbed from seawater. The original source of nonylphenol is less clear; it may have come from the pellets themselves or may have been adsorbed from the seawater.

3.1.2.2.4 Climate Change and Marine Water Quality

Aspects of climate change that influence water quality include decreasing ocean pH (i.e., more acidic), increasing water temperatures, and increasing storm activity. Changes in pH outside of the normal range can make it difficult for marine organisms to maintain their shells (Fabry et al. 2008). Many of those creatures are at the base of the marine food chain, such as phytoplankton, so changes may reverberate through the ecosystem. Rising water temperatures can be detrimental to coastal ecosystems. For example, in waters that are warmer than normal, coral colonies appear to turn white (“bleaching”) because they expel symbiotic microbes (“zooxanthellae”) that give them some of their colors. These microbes are important for coral survival because they provide the coral with food and oxygen, while the coral provides shelter, nutrients, and CO_2. Rising seawater temperatures combined with decreasing ocean pH can be especially detrimental to corals (Anthony et al. 2008). Water pollution and natural disturbances (e.g., hurricanes) can inflict additional stress on coral (Hughes and Connell 1999).

3.1.3 ENVIRONMENTAL CONSEQUENCES

This section evaluates how and to what degree the training and testing activities described in Chapter 2 (Description of Proposed Action and Alternatives) may impact sediment and water quality in the Study Area. Tables 2.8-1 through 2.8-5 present the baseline and proposed training and testing activity locations for each alternative (including number of events and ordnance expended). Each water quality stressor is introduced, analyzed by alternative, and analyzed for training activities and testing activities. Potential impacts could be from:

- releasing materials into the water that subsequently disperse, react with seawater, or may dissolve over time;
- depositing materials on the ocean bottom and any subsequent interactions with sediments or the accumulation of such materials over time;
- depositing materials or substances on the ocean bottom and any subsequent interaction with the water column; and
- depositing materials on the ocean bottom and any subsequent disturbance of those sediments or their resuspension in the water column.

These potential impacts may result from four stressors: (1) explosives and explosive byproducts, (2) metals, (3) chemicals other than explosives, and (4) a miscellaneous category of other materials. The term “stressor” is used because materials in these four categories may directly impact sediment and water quality by altering their physical and chemical characteristics.

The area of analysis for sediment and water quality includes estuaries, nearshore areas, and the open ocean (including the sea bottom) in the Study Area. Sediments and marine waters within territorial and nonterritorial waters along the coasts of California and the Hawaiian Islands would react similarly to military expended materials. For instance, sediment size is a major determinant of how metals behave in sediments, and sediment size would be similar at a given distance from shore. Thus, for this analysis, potential impacts on sediment and water quality from military expended materials that are deposited in sediments at any given distance from shore are assumed to be similar.

3.1.3.1 Explosives and Explosion Byproducts

3.1.3.1.1 Introduction

Explosives are complex chemical mixtures that may affect sediment and water quality through the byproducts of their detonation in water and the distribution of unconsumed explosives in water and sediments. Detonating explosives may also disturb sediments and increase turbidity. Underwater explosions re-suspend sediments in the water column. However, these impacts are minimal because, depending on site-specific conditions of wind and tidal currents, the sediment plume eventually dissipates as particles settle to the bottom or disperse. Therefore, this issue is not considered further.

The Proposed Action involves three categories of high-explosives:

- Nitroaromatics, such as trinitrotoluene (TNT), ammonium picrate, and tetryl (methyl-2,4,6-trinitrophenyl-nitramine),
- Nitramines, such as royal demolition explosive (hexahydro-1,3,5-trinitro-1,3,5-triazine) and high melting explosive (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine), and
- Nitrate esters, such as pentaerythritol-tetranitrate.

The explosives TNT, royal demolition explosive, and high melting explosive are components of bombs, missile and rocket fuels and warheads, torpedoes, sonobuoys, medium- and large-caliber munitions, and charges used in a variety of training and testing activities, such as mine countermeasure and mine neutralization (Clausen et al. 2007). Pentaerythritol-tetranitrate is most commonly used in blasting caps, detonation cord, and other initiators of explosions. Chemical stressors other than explosives are discussed in Section 3.1.3.3 (Chemicals Other than Explosives).

When they are used, explosives may undergo a high-order detonation, a low-order detonation, or may fail to detonate. High-order ("complete") detonations consume 98 to 99 percent of the explosive material; the remainder is released into the environment as discrete particles. Low-order ("incomplete") detonations consume a lower percentage of the explosive and release larger amounts of explosives into the environment. If ordnance fails to detonate, the energetic materials it contains may be released into the environment over time as its casing corrodes. In this discussion, the term "explosives" means unconsumed explosives remaining after low-order detonations and detonation failures. The term "explosion byproducts" is used to refer to the liquids and gases that remain after detonation of explosives.

Explosions that occur above or at the surface are assumed to distribute nearly all of the explosion byproducts into the air, rather than into the water, and are discussed in Section 3.2 (Air Quality). This analysis concerns only those explosions that occur underwater. However, military expended materials that explode in the air or at the water surface may deposit particles of unconsumed explosives in the marine environment. These materials are addressed in the next section on unconsumed explosives.

3.1.3.1.2 Background

Under the Proposed Action, explosions would occur (1) above, at, or just beneath the water surface during training and testing activities that use bombs, medium- and large-caliber projectiles, missiles, and rockets; and (2) underwater during mine countermeasure and mine neutralization training and testing activities and from training and testing activities that use explosive sonobuoys. Mine countermeasure and neutralization activities occur beneath the surface and on or near the bottom typically in fairly shallow areas. Explosives charges for training and testing activities range in size up to 600 pounds (lb.) (270 kilograms [kg]).

Mine countermeasure and mine neutralization activities most often involve the explosive Composition 4 (C-4), which is composed of about 95 percent royal demolition explosive mixed with polyisobutylene, a plastic binding material. When it functions properly (i.e., complete detonation), 99.997 percent of the explosive is converted to inorganic compounds (U.S. Army Corps of Engineers 2003). Table 3.1-10 below lists the byproducts of underwater detonation of royal demolition explosive. Of the byproducts identified in Table 3.1-10, nitrogen, carbon dioxide, water, carbon monoxide, ammonia, and hydrogen are natural components of seawater, and represent 98 percent of all byproducts produced by the detonation of royal demolition explosive.

Table 3.1-10: Byproducts of Underwater Detonation of Royal Demolition Explosive

Byproduct	Percent of Total, by Weight	Byproduct	Percent of Total, by Weight
Nitrogen	37.0	Propane	0.2
Carbon dioxide	24.9	Methane	0.2
Water	16.4	Hydrogen cyanide	< 0.01
Carbon monoxide	18.4	Methyl alcohol	< 0.01
Ethane	1.6	Formaldehyde	< 0.01
Ammonia	0.9	Other compounds	< 0.01
Hydrogen	0.3		

Note: < = less than

3.1.3.1.3 Ordnance Failure and Low-Order Detonations

Table 3.1-11 provides information about the rates of failure and low-order detonations for high-explosives and other munitions (Rand Corporation 2005; U.S. Army Corps of Engineers 2007).

Table 3.1-11: Failure and Low-Order Determination Rates of Military Ordnance

Ordnance	Failure Rate (Percent)	Low-Order Detonation Rate (Percent)
Guns/artillery	4.68	0.16
Hand grenades	1.78	n/a
High-explosive ordnance	3.37	0.09
Rockets	3.84	n/a
Submunitions	8.23	n/a

Note: n/a = not available

3.1.3.1.4 Approach to Analysis

Most activities involving explosives and explosion byproducts would be conducted more than 3 nautical miles offshore. Out to 12 nm, these activities would be subject to federal sediment and water quality standards and guidelines. Explosives are also used in nearshore areas during shallow water and very shallow water mine countermeasure and mine neutralization activities. These activities would occur within three nautical miles of shore, and would be subject to state sediment and water quality standards and guidelines.

For explosion byproducts, “local” means the water column that is disturbed by an underwater detonation. For unconsumed explosives, “local” means the area of potential impact from explosives in a zone of sediment about 66 in. (170 cm) in diameter around the ordnance or unconsumed explosive where it settles on the sea floor.

3.1.3.1.4.1 State Standards and Guidelines

Table 3.1-12 below summarizes existing state standards and guidelines for sediment and water quality related to explosives and explosion byproducts

Table 3.1-12: State Water Quality Criteria for Explosives and Explosion Byproducts

<table>
<tr><th>State</th><th>Explosive, Explosion Byproduct</th><th>Criteria (µg/L)</th><th>Source</th></tr>
<tr><td rowspan="2">California</td><td>Cyanide</td><td>6-month median = 1, Daily Max = 4, Instant Max = 10</td><td rowspan="2">State of California 2009</td></tr>
<tr><td>2,4-dinitrotoluene</td><td>30-day average = 2.6</td></tr>
<tr><td rowspan="2">Hawaii</td><td>Cyanide</td><td>1.0 (chronic/acute)</td><td rowspan="2">Hawaii Department of Health 2009</td></tr>
<tr><td>2,4-dinitrotoluene</td><td>200 (acute)</td></tr>
</table>

Note: “Acute” criteria apply to a 1-hour average concentration not to be exceeded more than once every 3 years on average. “Chronic” criteria apply to a 4-day average concentration not to be exceeded more than once every 3 years on average.

3.1.3.1.4.2 Federal Standards and Guidelines

Table 3.1-13 summarizes the EPA criteria for explosives and explosion byproducts in saltwater (U.S. Environmental Protection Agency 2009).

Table 3.1-13: Criteria for Explosives and Explosion Byproducts in Saltwater

Explosives, Explosion Byproducts	Criteria Maximum Concentration	Criterion Continuous Concentration
Cyanide	1 µg/L	1 µg/L

Note: µg/L = microgram per liter

“Criteria maximum concentration” is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect. “Criterion continuous concentration” is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect.

3.1.3.1.5 Fate of Military Munitions in the Marine Environment

3.1.3.1.5.1 Explosives and Explosion Byproducts

Little data are available on the fate and degradation of unconsumed explosives in marine sediments (Zhao et al. 2004). Cruz-Uribe et al. (2007) noted that “contamination of the marine environment by munitions constituents is not well documented," and Montgomery et al. (2008) noted that there is "little published information on TNT degradation in seawater or marine sediments aside from the work of Carr and Nipper (2003)." Still, Zhao et al. (2004) noted that leaching of unconsumed explosives is considered a major source of sediment contamination in seas and waterways, and that contaminants can subsequently move from sediments and accumulate in aquatic organisms. According to Nipper et al. (2002), their studies of Puget Sound sediments demonstrate that the studied ordnance compounds were not a cause for environmental concern in the levels previously measured in marine sediments. The studied compounds included 2, 6-dinitrotoluene, tetryl, and picric acid. They remarked that the "levels of ordnance compounds that would be of concern in marine sediments have not yet been identified."

The behavior of explosives and explosion byproducts in marine environments and the extent to which those constituents have adverse impacts are influenced by a number of processes, including the ease with which the explosive dissolves in a liquid such as water (solubility), the degree to which explosives are attracted to other materials in the water (e.g., clay-sized particles and organic matter, "sorption"), and the tendency of the explosives to evaporate (volatilization). These characteristics, in turn, influence the extent to which the material is subject to biotic (biological) and abiotic (physical and chemical) transformation and degradation (Pennington and Brannon 2002). The solubility of various explosives is provided in Table 3.1-14. In the table, higher values indicate greater solubility. For example, high melting explosive is virtually insoluble in water. Table salt, which dissolves easily in water, is included in the table for comparison.

Solubility rates are not affected by pH, but increase as temperature increases (Lynch et al. 2002). As Table 3.1-14 indicates, explosives associated with the Proposed Action dissolve slowly over time, and thus are not very mobile in marine environments (Juhasz and Naidu 2007). Nitroaromatics such as TNT do not bind to metal hydroxides, but may bind to clays, depending on the type (more so with potassium or ammonium ions but negligible for clays with sodium, calcium, magnesium, or aluminum ions). Sorption by nitroamines such as royal demolition explosive is very low (Haderlein et al. 1996).

Table 3.1-14: Water Solubility of Common Explosives and Explosive Degradation Products

Compound	Water Solubility[1]
Table salt (sodium chloride)	357,000
Ammonium perchlorate (D)	249,000
Picric acid (E)	12,820
Nitrobenzene (D)	1,900
Dinitrobenzene (E)	500
Trinitrobenzene (E)	335
dinitrotoluene (D)	160-161
TNT (E)	130
Tetryl (E)	51
Pentaerythritoltetranitrate (E)	43
Royal Demolition Explosive (E)	38
High Melting Explosive (E)	7

[1] Units are milligrams per liter at 20 degrees Celsius
Notes: D = explosive degradation product, E = explosive, TNT = Trinitrotoluene
Source: U.S. Department of the Navy 2008a

According to Walker et al. (2006), TNT, royal demolition explosive, and high melting explosive experience rapid biological and photochemical degradation in marine systems. The authors noted that productivity in marine and estuarine systems is largely controlled by the limited availability of nitrogen. Because nitrogen is a key component of explosives, they are attractive as substrates for marine bacteria that metabolize other naturally-occurring organic matter, such as polycyclic aromatic hydrocarbons. Juhasz and Naidu (2007) also noted that microbes use explosives as sources of carbon and energy.

Carr and Nipper (2003) indicated that conversion of TNT to CO_2, methane, and nitrates in coastal sediments (a process referred to as "mineralization") occurred at rates that were typical for naturally occurring compounds such as phenanthrene, fluoranthene, toluene, and naphthalene. They noted that transformation of 2, 6-dinitrotoluene and picric acid by organisms in sediments is dependent on temperature and type of sediment (i.e., finer-grained). Pavlostathis and Jackson (2002) reported the uptake and metabolism of TNT by the marine microalgae *Anabaena* spp. Nipper et al. (2002) noted that enhanced degradation of 2, 6-dinitrotoluene, tetryl, and picric acid occurred in fine-grained sediments high in organic carbon. Cruz-Uribe et al (2007) noted that three species of marine macroalgae metabolize TNT to 2-amino-4,6-dinitrotoluene and 4-amino-2, 6-dinitrotoluene, and speculate that "the ability of marine macroalgae to metabolize TNT is widespread, if not generic."

Singh et al. (2009) indicated that biodegradation of royal demolition explosive and high melting explosive occurs with oxygen (aerobic) and without oxygen (anoxic or anaerobic), but that they were more easily degraded under anaerobic conditions. Crocker et al. (2006) indicated that the mechanisms of high melting explosive and royal demolition explosive biodegradation are similar, but that high melting explosive degrades more slowly. Singh et al. (2009) noted that royal demolition explosive and high melting explosive are biodegraded under a variety of anaerobic conditions by specific microbial species and by mixtures ("consortia") of such species. Zhao et al. (2004) found that biodegradation of royal demolition explosive and high melting explosive occurs in cold marine sediments.

According to Singh et al. (2009), typical end products of royal demolition explosive degradation include nitrite, nitrous oxide, nitrogen, ammonia, formaldehyde, formic acid, and carbon dioxide. Crocker et al. (2006) stated that many of the primary and secondary intermediate compounds from biodegradation of royal demolition explosive and high melting explosive are unstable in water and spontaneously decompose. Thus, these explosives are degraded by a combination of biotic and abiotic reactions. Formaldehyde is subsequently metabolized to formic acid, methanol, CO_2, or methane by various microorganisms (Crocker et al. 2006).

According to Juhasz and Naidu (2007), TNT, royal demolition explosive, and high melting explosive also degrade from photolysis (exposure to light) and hydrolysis (exposure to water). The byproducts of TNT photolysis include nitrobenzenes, benzaldehydes, azoxydicarboxylic acids, and nitrophenols. The byproducts of royal demolition explosive and high melting explosive photolysis include azoxy compounds, ammonia, formaldehyde, nitrate, nitrite, nitrous oxide, and *N*-nitroso-methylenediamine (Juhasz and Naidu 2007). Walker et al. (2006) speculated that degradation of TNT "below the photic [light] zone in coastal waters and sediments may be largely controlled by metabolism by heterotrophic bacteria." According to Monteil-Rivera et al. (2008), at the pH common in marine environments (i.e., pH of 8), there should be a "slow but significant removal" of royal demolition explosive and high melting explosive through alkaline hydrolysis. Under such conditions, and absent biodegradation, royal demolition explosive would take over 100 years to hydrolyze, while high melting explosive would require more than 2,100 years (Monteil-Rivera et al. 2008).

3.1.3.1.5.2 Unexploded Ordnance

Most studies of unexploded ordnance in marine environments have not detected explosives or have detected them in the range of parts per billion. Studies examining the impact of ordnance on marine organisms have produced mixed results. The amounts and concentrations of ordnance deposited in the areas studied, however, were far in excess of those that would occur under the Proposed Action.

Several authors have studied the impacts of unexploded ordnance in Halifax Harbor, Nova Scotia, Canada. Rodacy et al. (2000) noted that munitions explosions in 1917 and 1946 scattered ordnance across an area known as the Bedford Basin. Ordnance was both fully exposed on and partially buried in the sea floor. They reported that 34 of 59 water samples (58 percent) “produced detectable signatures” of ordnance, as did 26 of 27 sediment samples (96 percent). They also noted that marine growth was observed on most of the exposed ordnance, and that TNT metabolites were present and suspected as the result of biological decomposition. In a prior study (Durrach et al. 1998), sediments collected near unexploded, but broken, ordnance did not indicate the presence of TNT, but samples near ordnance targets that appeared intact showed trace explosives in the range of low parts per billion or high parts per trillion. The sampling distance was 6 to 12 in. (15 to 30 cm) from the munitions. The authors expressed the opinion that, after 50 years, the contents of broken munitions had dissolved, reacted, biodegraded, or photodegraded, and that intact munitions appear to be slowly releasing their contents through corrosion pinholes or screw threads. Studies by Zhao et al. (2004) in Halifax Harbor documented the biodegradation of royal demolition explosive and high melting explosive in cold marine sediments.

Chemical and conventional munitions disposed on the ocean floor approximately 5 miles (mi.) (8.05 km) south of Pearl Harbor, Hawaii were recently studied (Hawaii Undersea Military Munitions Assessment 2010). Documents indicate that sixteen thousand 100 lb. (45 kg) mustard-filled bombs may have been disposed in this area in October–November 1944. The condition of the munitions ranged from “nearly intact to almost completely disintegrated.” The authors collected 94 sediment samples and 30 water samples from 27 stations at five locations. These samples were analyzed for chemical agents, explosives, metals (arsenic, copper, lead, and zinc), polycyclic aromatic hydrocarbons, pesticides, PCBs, phenols, and organic tin. No chemical agents or explosives were detected, and comparisons between the disposal site and reference sites showed no statistically significant differences in levels of munitions constituents, chemical agents, or metals. However, the sampling distance for this project was 3 to 6 ft. (1 to 2 m). The authors compared their sampling distance to that used by Durrach et al. (1998), that is, 6 to 12 in. (15 to 30 cm). They indicated that the project sampling distance may have been too far to detect chemical agents or explosives, and that sampling distance may be a significant factor determining whether or not munitions constituents can be detected near discarded munitions. Samples with elevated concentrations of metals relative to typical deep-sea sediments were “most likely” the result of dumping of sediments dredged from Oahu harbors.

Hoffsommer et al. (1972) analyzed seawater and ocean floor sediments and fauna for military ordnance constituents at known ocean dumping sites. The sites were located 85 mi. (136 km) west of Cape Flattery, Washington, and 172 mi. (280 km) south-southeast of Charleston, South Carolina. Samples were tested for TNT, royal demolition explosive, tetryl, and ammonium perchlorate, none of which were detected in the samples. Detection limits were in the parts-per-trillion. Walker et al. (2006) sampled seawater and sediment at two offshore underwater demolition sites where 10 lb. (4.5 kg) charges of TNT and royal demolition explosive were used. Seawater concentrations of both explosives were below their detection limits, including samples collected in the detonation plume within five minutes of the detonation.

According to Fisheries Research Services Report (1996), over one million tons of chemical and conventional munitions were disposed of at Beaufort's Dyke, a trench in the North Channel between Scotland and Ireland. The trench is more than 30 mi. (48 km) long and 2 mi. (3 km) wide. The average density of munitions is about 2,225 tons per square mile ($mi.^2$) (5,760 tons per square kilometer [km^2]). Seabed sediment samples were obtained from 105 sites. Sampling distance from the munitions was not noted. Sediment sampling results did not find detectable concentrations of the explosives nitroglycerine, TNT, royal demolition explosive, or tetryl, and analysis of metals indicated that levels within the survey area were within the ranges reported for other Scottish coastal areas.

Nipper et al. (2002) studied the impacts of the explosives 2, 6-dinitrotoluene, tetryl, and picric acid on marine sediments in Puget Sound. They noted that the levels measured did not account for the sediment's toxicity. Test subjects and processes included small marine crustaceans (amphipods), marine segmented worms (polychaetes), macro-algae germination and growth, and sea urchin embryo development. The authors suggested that the degradation products of the explosives rather than the explosives themselves may be responsible. They acknowledged that the "persistence of such degradation compounds in marine environments is not known."

An underwater explosion deposits a fraction of the chemical products of the reaction in the water in a roughly circular surface pool that moves with the current (Young and Willey 1977). In a land-based study, Pennington et al. (2006) noted that data demonstrate that explosives in the main charge of howitzer rounds, mortar rounds, and hand grenades are efficiently consumed (on average 99.997 percent or more) during live-fire operations that result in high-order detonations. The explosives not consumed during these detonations are spread over an area that would, on average, contribute 10 µg/kg (parts per billion) per detonation or less to the ground surface. However, the applicability of the study by Pennington et al. (2006) to underwater marine systems remains uncertain.

Table 3.1-15 provides (1) the amount of explosive remaining after underwater detonation of 5 and 20 lb. (9.0 kg) charges of C-4, and (2) the volume of water required to meet the marine screening value for the remaining amount of C-4. A 5-lb. (2.3 kg) block of C-4 contains 2.27 lb. (1.03 kg) of royal demolition explosive; a 20 lb. (9.1 kg) block contains 18.2 lb. (8.25 kg) of royal demolition explosive (U.S. Department of the Navy 2010b). Pennington et al. (2006) assumed that 0.02 percent of royal demolition explosive residue remained after detonation (Pennington et al. 2006). The failure rate is zero for C-4 because, during mine countermeasure and mine neutralization activities, personnel do not leave any undetonated C-4 on range at the end of training.

Table 3.1-15: Volume of Water Needed to Meet Marine Screening Value for Royal Demolition Explosive

Screening Value for Ecological Marine Surface Water	Explosive Charge, lb. (kg)			
	5 lb. (2.27 kg)		20 lb. (9.1 kg)	
	Amount of RDX Remaining after Detonation	Attenuation Needed to Meet Screening Value	Amount of RDX Remaining after Detonation	Attenuation Needed to Meet Screening Value
5,000 µg/L	0.01 ounce (oz.) (0.41 gram [g])	22 gallons (gal.) (82.6 Liters [L])	0.06 oz. (1.65 g)	87 gal. (330 L)

Notes: lb. = pound, kg = kilogram, RDX = Royal Demolition Explosive, µg/L = microgram/liter, oz. = ounce, g = gram, gal. = gallon, L = liter

The amount of pentaerythritol-tetranitrate in detonation cord associated with any underwater detonation event is low (approximately 13.4 ounces [oz.] [380 grams {g}]). Assuming 5 percent is not consumed in the detonation, 0.7 oz. (20 g) of pentaerythritol-tetranitrate would be present. This amount would attenuate to a level below the benchmark risk screening value for marine surface water in 8 cubic feet (ft.^{3}) (0.22 cubic meters [m^3]) of water (U.S. Department of the Navy 2010b).

3.1.3.1.6 Evaluation of Alternatives

Table 3.1-16 summarizes the types and amounts of high-explosive military expended materials proposed to be used annually under the alternatives. The types and amounts of expended materials in the table are based on the tables in Chapter 2. In most instances, explosive bombs, projectiles, missiles, and rockets detonate above the surface of the water, at the water surface, or just beneath the surface. Underwater detonations always occur during sinking exercises, mine countermeasure and mine neutralization training and testing, explosives testing, and during the use of explosive torpedoes, percussion grenades, and explosive sonobuoys.

Table 3.1-16: High-Explosive Military Expended Materials from Training and Testing Activities – All Alternatives

Type of Military Expended Material	Hawaii Range Complex			Southern California Range Complex		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
High-Explosive Bombs						
Training	110	74	74	652	166	166
Testing	0	0	0	0	0	0
Total	110	74	74	652	166	166
Medium Caliber High-Explosive Projectiles						
Training	3,100	6,640	6,640	15,000	13,920	13,920
Testing	0	1,400	1,750	2,500	16,400	18,250
Total	3,100	8,040	8,390	17,500	30,320	31,540
Large Caliber High-Explosive Projectiles						
Training	11,200	1,894	1,894	16,400	4,244	4,244
Testing	0	2,690	3,680	0	3,470	4,460
Total	11,200	4,584	5,574	16,400	7,714	8,704
High-Explosive Missiles						
Training	160	146	146	142	330	330
Testing	4	54	56	29	64	70
Total	164	200	202	171	394	400
High-Explosive Rockets						
Training	0	760	760	0	3,800	3,800
Testing	0	0	0	0	284	297
Total	0	760	760	15	4,084	4,097
Underwater Detonations						
Training	68	82	82	575	758	758
Testing	0	12	16	20	81	88
Total	68	94	98	595	839	846

Table 3.1-16: High-Explosive Military Expended Materials from Training and Testing Activities – All Alternatives (continued)

Type of Military Expended Material	Hawaii Range Complex			Southern California Range Complex		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
High-Explosive Torpedoes						
Training	6	6	6	2	2	2
Testing	8	26	29	8	8	8
Total	14	32	35	10	10	10
Explosive Sonobuoys						
Training	0	480	480	0	120	120
Testing	314	408	500	2,652	2,760	2,892
Total	314	888	980	2,652	2,880	3,012

3.1.3.1.6.1 No Action Alternative

Under the No Action Alternative, up to 52,327 high-explosive ordnance items would be expended during training (46,772 items) and testing (5,555 items) activities in the Study Area. Within the Study Area, approximately 71 percent of high-explosive ordnance (37,425 items) would be expended in the SOCAL Range Complex, while approximately 29 percent (14,902 items) would be expended in the Hawaii Range Complex (HRC). Numerically, medium- and large-caliber high-explosive projectiles would represent over 87 percent of high-explosive ordnance used during training and testing activities within the Study Area. Charge sizes for medium- and large-caliber projectiles range from 0.5 to 10 lb. (0.2 to 4.5 kg), in comparison to charges in missiles (2.5 to 20 lb. [1.1 to 9.1 kg]) and charges in bombs range from 250 to 1,000 lb. (113.4 to 453.6 kg).

Training Activities

Under the No Action Alternative, 46,772 high-explosive ordnance items would be expended during training activities in the Study Area. Approximately 69 percent of high-explosive ordnance (32,196 items) would be expended in the SOCAL Range Complex, with the remaining 31 percent (14,576 items) expended in HRC. No ordnance would be expended in the HSTT Transit Corridor under the No Action Alternative.

Comparison of Training Materials by Weight of Explosives

A review of training materials based on the weight of explosives provides a different perspective on the relative contribution of various items under the No Action Alternative. Table 3.1-17 depicts those categories of training materials that contribute nearly all (99 percent) of the total weight under the No Action Alternative. The total weight of explosives used during training under the No Action Alternative would be an estimated 473,200 lb. (212,900 kg).

Under the No Action Alternative, the distribution of training materials based on the weight of explosives would be approximately 65 percent in SOCAL and 35 percent in HRC. Note: Because the contribution of testing materials to the total amount of high-explosive material is relatively small, by number and by weight, only training materials were used for the comparisons in Table 3.1-17.

Table 3.1-17: Comparison of Number of High-Explosive Items versus Weight of Explosives

Type of Military Expended Material	Percent of Total HE by Number	Percent of Total HE by Weight
Medium-and Large-Caliber Projectiles	97.7	58.2
Bombs	1.6	30.9
Missiles	< 1.0	6.4
Underwater Detonations	< 1.0	2.7
Torpedoes	< 1.0	1.3

Notes: HE = high-explosive, < = less than

Subsurface High-Order Explosions and Explosion Byproducts

Under the No Action Alternative, most training-related underwater explosions would be during mine countermeasure and neutralization training, with charges up to 60 lb. (27 kg). The impacts of explosion byproducts on sediment and water quality would be short-term, local, and negative. Chemical, physical, or biological changes in sediment or water quality would not be detectable.

Unconsumed Explosives

Under the No Action Alternative, approximately 18,200 lb. (8,190 kg) per year of residual explosives would remain from high-explosive ordnance used during training activities because of ordnance failure and low-order detonations. Approximately 69 percent (12,600 lb. [5,670 kg]) of the residual explosives would be expended in SOCAL Range Complex, with the remaining 31 percent (5,600 lb. [2,520 kg]) expended in HRC. Over 98 percent of residual explosive materials would result from ordnance failures. Ordnance failure rates are listed in Table 3.1-11. The amount of residual explosive materials is based on the rate of failure multiplied by the number of explosive ordnance and weight of explosives of each ordnance item expended during training activities.

In the event of an ordnance failure, the energetic materials it contains would remain intact. These materials would leach from the item slowly because they would have little or no direct exposure to marine waters. Small amounts of explosives may be released into sediment and into the surrounding water column as the ordnance item degrades and decomposes. Ocean currents would quickly disperse leached explosive constituents, and these constituents would not result in water toxicity.

Sinking exercises require the highest concentrations of high-explosive ordnance. During each sinking exercise, an estimated 720 high-explosive ordnance items would be expended, 97 percent of which would consist of large-caliber projectiles. Approximately 530 lb. (240 kg) of explosive materials would be released per sinking exercise from low-order detonations and ordnance failures. The sinking exercise training area is approximately 2 square nautical miles (nm^2) in size. Thus, during each exercise, approximately 360 items per nm^2 and 265 lb. (120 kg) of explosive material per nm^2 would sink to the ocean floor.

<u>Testing Activities</u>

An estimated 5,555 high-explosive ordnance items would be expended during testing activities in the Study Area. Over 99 percent (5,229 items) of high-explosive ordnance would be expended in the SOCAL Range Complex, with the remainder expended in HRC.

Subsurface High-Order Explosions and Explosion Byproducts

Under the No Action Alternative, most testing-related underwater explosions would be during mine countermeasure and neutralization testing, with charges ranging from greater than 60 lb. (27 kg) up to 100 lb. (45 kg) net explosive weight. The impacts of explosion byproducts on sediment and water quality would be short-term, local, and negative. Chemical, physical, or biological changes in sediment or water quality would not be detectable.

Unconsumed Explosives

Under the No Action Alternative, approximately 690 lb. (310 kg) per year residual explosives would remain from high-explosive ordnance used during testing activities because of ordnance failure and low-order detonations. Approximately 59 percent (400 lb. [180 kg]) of the residual explosives would be expended in SOCAL Range Complex, with the remaining 41 percent (280 lb. [130 kg]) expended in HRC. Over 98 percent of explosive residues would result from ordnance failures. In the event of an ordnance failure, the energetic materials it contains would remain mostly intact. These materials would leach from the item slowly because they would have little or no direct exposure to marine waters. Small amounts of explosives may be released into sediments and into the surrounding water column as the ordnance item degrades and decomposes. Ocean currents would quickly disperse leached explosive constituents, and these constituents would not result in water toxicity.

3.1.3.1.6.2 Alternative 1

Under Alternative 1, the number of high-explosive ordnance items expended during training and testing activities would increase from 52,327 to 60,526 items, a 16 percent increase compared to the No Action Alternative. This increase would include additional high-explosive ordnance expended in the Transit Corridor (320 medium-caliber and 20 large-caliber projectiles) as part of training activities. In the Study Area, the majority of high-explosive ordnance (approximately 75 percent [45,608 items]) would be expended in the SOCAL Range Complex, while approximately 24 percent (14,578 items) would be expended in HRC and one percent (340 items) would be expended in the Transit Corridor. Training activities account for about 54 percent of the high-explosive ordnance under Alternative 1.

The amount of training materials expended under Alternative 1 would be similar to the No Action Alternative and impacts would be similar to those under the No Action Alternative. Short-term impacts would arise from explosion byproducts, while long-term impacts would arise from unconsumed explosives. The majority of high-order explosions would occur at or above the surface of the ocean, and would have no impacts on sediments and minimal impacts on water quality.

Training Activities

Under Alternative 1, the amount of high-explosive ordnance used for training activities would decrease from 46,772 to 32,582 items. Approximately 69 percent (22,582 items) of high-explosive ordnance would be expended in the SOCAL Range Complex, with about 30 percent (10,000 items) expended in HRC and one percent (340 items) in the HSTT Transit Corridor. Numerically, medium- and large-caliber high-explosive projectiles would represent over 81 percent of high-explosive ordnance used during training and testing activities within the Study Area.

Comparison of Training Materials by Weight of Explosives

A review of training materials based on the weight of explosives provides a different perspective on the relative contribution of various items under the No Action Alternative. Table 3.1-18 depicts those categories of training materials that contribute nearly all (99 percent) of the total weight under the No

Action Alternative. Under Alternative 1, the total weight of explosives used during training would decrease from an estimated 473,200 lb. (212,900 kg) to an estimated 229,200 lb. (103,100 kg).

Table 3.1-18: Comparison of Number of High-Explosive Items versus Weight of Explosives

Type of Military Expended Material	Percent of Total HE by Number	Percent of Total HE by Weight
Medium-and Large-Caliber Projectiles	81.9	38.4
Missiles	1.5	20.8
Bombs	< 1.0	20.1
Rockets	14.0	9.5
Underwater Detonations	< 1.0	7.3
Torpedoes	< 1.0	3.5

Notes: HE = high-explosive, < = less than

Under Alternative 1, the distribution of training materials based on weight of explosives would be approximately 62 percent in SOCAL, 38 percent in HRC, and less than one percent in the HSTT Transit Corridor. Note: Because the contribution of testing materials to the total amount of high-explosive material is relatively small, by number and by weight, only training materials were used for the comparisons in Table 3.1-18.

Subsurface High-Order Explosions and Explosion Byproducts

Under Alternative 1, nearly all training-related underwater explosions would be from mine countermeasures and neutralization training and explosive sonobuoys. Explosive sonobuoys use small charges approximately 4.2 lb. (1.9 kg). The impacts of explosion byproducts on sediment and water quality would be short-term, local, and negative. Chemical, physical, or biological changes in sediment or water quality would not be detectable.

Unconsumed Explosives

Although Alternative 1 would increase the number of training activities, the amount of explosives released during training would decrease compared to the No Action Alternative. The estimated amounts of residual explosives from ordnance failures and low-order detonations during training activities would decrease to 8,360 lb. (3,760 kg) per year because of a decrease in the use of high-explosive bombs and large-caliber projectiles for training. The majority of residual explosives (65 percent) (5,390 lb. [2,430 kg]) would be expended in SOCAL Range Complex and 35 percent (2,930 lb. [1,320 kg]) would be expended in HRC. In addition, a minimal amount of residual explosive material about 40 lb. (18 kg) would be expended in the HSTT Transit Corridor during training activities. The deposition of explosive materials from sinking exercises would be the same as under the No Action Alternative. Therefore, because the amount of explosives released during training would decrease under Alternative 1, impacts would be less than under the No Action Alternative.

Testing Activities

Under Alternative 1, the number of high-explosive ordnance used for testing activities would increase from 5,555 to 27,604 items, a substantial increase compared to the No Action Alternative. Within the Study Area, approximately 83 percent (23,026 items) of high-explosive ordnance would be expended in the SOCAL Range Complex, with the remaining 17 percent (4,578 items) expended in HRC.

Subsurface High-Order Explosions and Explosion Byproducts

Under Alternative 1, underwater explosions associated with testing activities would be from underwater detonations, explosive sonobuoys, and torpedo testing. Despite the increase in underwater explosions, the impacts of explosion byproducts on sediment and water quality would be short-term, local, and negative. Chemical, physical, or biological changes in sediment or water quality would not be detectable.

Unconsumed Explosives

Under Alternative 1, approximately 4,800 lb. (2,180 kg) per year of residual explosives would remain from high-explosive ordnance used during testing activities because of ordnance failure and low-order detonations. Approximately 47 percent (2,270 lb. [1,030 kg]) and 53 percent (2,530 lb. [1,150 kg]) of residual explosives would be expended in HRC and SOCAL Range Complex, respectively. Over 98 percent of explosive residues would result from ordnance failures. In the event of an ordnance failure, the energetic materials it contains would remain mostly intact.

3.1.3.1.6.3 Alternative 2

Under Alternative 2, the number of high-explosive ordnance items expended during training and testing activities would increase from 52,327 to 64,958 items, a 23 percent increase compared to the No Action Alternative. Within the Study Area, the majority of high-explosive ordnance (approximately 75 percent [48,603 items]) would be expended in the SOCAL Range Complex, while approximately 25 percent (16,015 items) would be expended in HRC and less than one percent (340 items) would be expended in the HSTT Transit Corridor. Numerically, medium- and large-caliber high-explosive projectiles would represent over 85 percent of high-explosive ordnance used during training and testing activities within the Study Area.

Training Activities

Under Alternative 2, the number of training activities and amounts of high-explosive ordnance would be the same as under Alternative 1. Therefore, the impacts of underwater explosions and explosives residues would be the same as under Alternative 1.

Testing Activities

Under Alternative 2, high-explosive ordnance used for testing activities would increase from 5,555 to 32,036 items, a substantial increase compared to the No Action Alternative. Within the Study Area, approximately 81 percent (26,021 items) of high-explosive ordnance would be expended in the SOCAL Range Complex, with the remaining 19 percent (6,015 items) expended in HRC.

Subsurface High-Order Explosions and Explosion Byproducts

Under Alternative 2, the number of underwater explosions during testing activities would increase slightly over the number under the No Action Alternative. Underwater explosions would be from underwater detonations, explosive sonobuoys, and torpedo testing. Despite the increase in underwater explosions during testing activities, the impacts of explosion byproducts on sediment and water quality would be short-term, local, and negative.

Unconsumed Explosives

Under Alternative 2, approximately 5,830 lb. (2,650 kg) per year of residual explosives would remain from high-explosive ordnance used during testing activities because of ordnance failure and low-order detonations. Approximately 52 percent (3,010 lb. [1,370 kg]) of residual explosives would be expended in HRC, while 48 percent (2,820 lb. [1,280 kg]) would be expended in SOCAL Range Complex. Over

98 percent of explosives residues would result from ordnance failures. In the event of an ordnance failure, the energetic materials it contains would remain mostly intact.

3.1.3.1.6.4 Summary and Conclusions for Explosives and Explosion Byproducts

Over 98 percent of residual explosive materials would result from ordnance failures. In the event of an ordnance failure, the energetic materials it contained would remain mostly intact. The explosive materials in failed ordnance items would leach slowly because they would have little or no direct exposure to marine waters. Residual explosive materials deposited in sediments would be limited to small areas surrounding the ordnance item. Ocean currents would quickly disperse leached explosive materials in the water column, and residual explosive materials would not result in water toxicity.

Short-term impacts arise from explosion byproducts; long-term impacts arise from unconsumed explosives. The majority of high-order explosions occurs at or above the surface of the ocean, and would have no impacts on sediments and minimal impacts on water quality. Chemical, physical, or biological changes in sediment or water quality would not be detectable. Neither state nor federal standards or guidelines would be violated.

The impacts of unconsumed explosives on water and sediment quality would be long-term, local, and negative. Chemical, physical, or biological changes in sediment or water quality would be measurable, but neither state nor federal standards or guidelines would be violated. This conclusion about the level of impact is based on (1) most of the explosives would be consumed during detonation; (2) the frequency of low-order detonations would be low, and therefore the frequency of releases of explosives would be low; (3) the amounts of explosives used would be small relative to the area within which they would be distributed; and (4) the constituents of explosives would be subject to physical, chemical, and biological processes that would render the materials harmless or otherwise disperse them to undetectable levels.

3.1.3.2 Metals

3.1.3.2.1 Introduction

Many metals occur naturally in seawater, and several are necessary for marine organisms and ecosystems to function properly, such as iron, zinc, copper, and manganese. Other metals have adverse impacts on sediment and water quality (e.g., cadmium, chromium, lead, and mercury), but zinc, copper, and manganese may also be harmful to plants and animals at high concentrations.

Metals are introduced into seawater and sediments by the Proposed Action. These materials represent parts or the whole of vessels, manned and unmanned aircraft, ordnance (bombs, projectiles, missiles, and torpedoes), sonobuoys, batteries, electronic components, and anti-corrosion compounds coating the exterior surfaces of some munitions. Because of the physical and chemical reactions that occur with metals in marine systems (e.g., precipitation), metals often concentrate in sediments. Thus, metal contaminants in sediments are a greater issue than metals in the water column.

Military expended materials such as steel bomb bodies or fins, missile casings, small arms projectiles, and naval gun projectiles may contain small percentages (less than one percent by weight) of lead, manganese, phosphorus, sulfur, copper, nickel, tungsten, chromium, molybdenum, vanadium, boron, selenium, columbium, or titanium. Small-caliber projectiles are composed of steel with small amounts of aluminum and copper and brass casings that are 70 percent copper and 30 percent zinc. Medium- and large-caliber projectiles are composed of steel, brass, copper, tungsten, and other metals. The 20 mm cannon shells used in close-in weapons systems are composed mostly of tungsten alloy. Some projectiles have lead cores (U.S. Department of the Navy 2008b). Torpedo guidance wire is composed of copper and cadmium coated with plastic (U.S. Department of the Navy 2008a). Sonobuoy components include metal housing, batteries and battery electrodes, lead solder, copper wire, and lead used for ballast. Thermal batteries in sonobuoys are contained in a hermetically-sealed and welded stainless steel case that is 0.03 to 0.1 in. (0.07 to 0.25 cm) thick and resistant to the battery electrolytes (Naval Facilities Engineering Command 1993). Rockets are usually composed of steel and steel alloys, although composite cases made of glass, carbon, or Kevlar fiber are also used (Missile Technology Control Regime 1996).

Non-explosive practice munitions consist of ammunition and components that contain no explosive material, and may include (1) ammunition and components that have had all explosive material removed and replaced with non-explosive material, (2) empty ammunition or components, and (3) ammunition or components that were manufactured with non-explosive material in place of all explosive material. These practice munitions vary in size from 25 to 500 lb. (11 kg to 230 kg), and can be built to simulate different explosive capabilities. Some non-explosive practice munitions may also contain unburned propellant (e.g., rockets), and some may contain spotting charges or signal cartridges for locating the point of impact (e.g., smoke charges for daylight spotting or flash charges for night spotting) (U.S. Department of the Navy 2010b). Non-explosive bombs-also called “practice” or “bomb dummy units”-are composed mainly of iron and steel casings filled with sand, concrete, or vermiculite. These materials are similar to those used to construct artificial reefs. Non-explosive bombs are configured to have the same weight, size, center of gravity, and ballistics as live bombs (U.S. Department of the Navy 2006). Practice bombs do not contain the energetic materials found in live bombs.

Decommissioned vessels used as targets for sinking exercises are selected from a list of U.S. Navy-approved vessels that have been cleaned or remediated in accordance with EPA guidelines. By rule, vessel-sinking exercises must be conducted at least 50 nm offshore and in water at least 6,000 ft. (1,828.8 m) deep (40 C.F.R. 229.2). The EPA considers the contaminant levels released during the sinking of a target to be within the standards of the Marine Protection, Research, and Sanctuaries Act (16 U.S.C. 1341, et seq.).

3.1.3.2.2 Approach to Analysis

Most activities involving military expended materials with metal components would be conducted more than 3 nm offshore in each range complex or test range. Activities in these areas would be subject to federal sediment and water quality standards and guidelines. For metals, “local” means the zone of sediment about 0.4 in. (1.02 cm) surrounding the metal where it comes to rest.

3.1.3.2.2.1 State Standards and Guidelines

Table 3.1-19 summarizes the state water quality standards and guidelines for metals in California and Hawaii waters.

Table 3.1-19: Water Quality Criteria for Metals

State	Metal	**Acute** (µg/L [ppb])	**Chronic** (µg/L [ppb])
California	Cadmium	Daily Max = 32, Instant Max = 80	6-month median = 8
	Chromium	Daily Max = 8, Instant Max = 20	6-month median = 2
	Copper	Daily Max = 12, Instant Max = 30	6-month median = 3
	Lead	Daily Max = 8, Instant Max = 20	6-month median = 2
	Mercury	Daily Max = 0.16, Instant Max = 0.4	6-month median = 0.04
	Nickel	Daily Max = 2.8, Instant Max = 7	6-month median = 0.7
	Silver	Daily Max = 0.16, Instant Max = 0.4	6-month median = 0.04
	Zinc	Daily Max = 80, Instant Max = 200	6-month median = 20
Hawaii	Cadmium	43	9.3
	Chromium	1,100	50
	Copper	2.9	2.9
	Lead	140	5.6
	Mercury	2.1	0.025
	Nickel	75	8.3
	Silver	2.3	n/a
	Zinc	95	86

Notes: n/a = no value is available, µg/L = microgram per liter, ppb = parts per billion
Sources: State of California 2009, Hawaii Department of Health 2009

3.1.3.2.2.2 Federal Standards and Guidelines

Table 3.1-20 summarizes the EPA "threshold values" for metals in marine waters (U.S. Environmental Protection Agency 2009). "Acute toxicity" means an adverse response to a substance observed in 96 hours or less (e.g., mortality, disorientation, or immobilization). "Chronic toxicity" means the lowest concentration of a substance that causes an observable effect (e.g., reduced growth, lower reproduction, or mortality). This effect occurs over a relatively long period, such as one-tenth of the life span of the species. A 28-day test period is used for small fish test species (U.S. Environmental Protection Agency 1991).

Table 3.1-20: Federal Threshold Values for Exposure to Selected Metals in Saltwater

Metal	Exposure Criteria (µg/L [ppb])	
	Acute (1-hour)	Chronic (4-day mean)
Cadmium	40	8.8
Chromium	1,000	50
Copper	4.8	3.1
Lead	210	8.1
Lithium[1]	6,000	N/A
Mercury	1.8	0.94
Nickel	74	8.2
Silver	1.9	N/A
Zinc	90	81

[1] No threshold value established by U.S. Environmental Protection Agency. Value shown is from Kszos et al. (2003).
Notes: n/a = no value available, µg/L = microgram per liter, ppb = parts per billion
Source: U.S. Environmental Protection Agency 1991

3.1.3.2.3 Impacts from Metals

The discussion below summarizes studies that investigated the impacts of metals in military expended materials on the marine environment.

In general, three things happen to materials that come to rest on the ocean floor: (1) they lodge in sediments where there is little or no oxygen below 4 in. (10.2 cm), (2) they remain on the ocean floor and begin to react with seawater, or (3) they remain on the ocean floor and become encrusted by marine organisms. As a result, rates of deterioration depend on the metal or metal alloy and the conditions in the immediate marine and benthic environment. If buried deep in ocean sediments, materials tend to decompose at much lower rates than when exposed to seawater (Ankley 1996). With the exception of torpedo guidance wires and sonobuoy parts, sediment burial appears to be the fate of most ordnance used in marine warfare (Canadian Forces Maritime Experimental and Test Ranges 2005).

When metals are exposed to seawater, they begin to slowly corrode, a process that creates a layer of corroded material between the seawater and uncorroded metal. This layer of corrosion removes the metal from direct exposure to the corrosiveness of seawater, a process that further slows movement of the metals into the adjacent sediments and water column. This is particularly true of aluminum. Elevated levels of metals in sediments would be restricted to a small zone around the metal, and any release to the overlying water column would be diluted. In a similar fashion, as materials become covered by marine life, the direct exposure of the material to seawater decreases and the rate of corrosion decreases. Dispersal of these materials in the water column is controlled by physical mixing and diffusion, both of which tend to vary with time and location. The analysis of metals in marine systems begins with a review of studies involving metals used in military training and testing activities that may be introduced into the marine environment.

In one study, the water was sampled for lead, manganese, nickel, vanadium, and zinc at a shallow bombing range in Pamlico Sound (state waters of North Carolina) immediately following a training event with non-explosive practice bombs. All water quality parameters tested, except nickel, were within the state limits. The nickel concentration was significantly higher than the state criterion, although the concentration did not differ significantly from the control site located outside the bombing range. The results suggest that bombing activities were not responsible for the elevated nickel concentrations (U.S. Department of the Navy 2010b). A recent study conducted by the U.S. Marine Corps sampled sediment and water quality for 26 different constituents related to munitions at several U.S. Marine Corps water-based training ranges. Metals included lead and magnesium. These areas also were used for bombing practice. No munitions constituents were detected above screening values used at the U.S. Marine Corps water ranges (U.S. Department of the Navy 2010b).

A study by Pait et al. (2010) of previous Navy training areas at Vieques, Puerto Rico, found generally low concentrations of metals in marine sediments. Areas in which live ammunition and loaded weapons were used (“live-fire areas”) were included in the analysis. Table 3.1-21 compares the sediment concentrations of several metals from those naval training areas with sediment screening levels established by the National Oceanic and Atmospheric Administration (Buchman 2008).

As shown in Table 3.1-21, average sediment concentrations of the metals evaluated, except for copper, were below both the threshold and probable effects levels. The average copper concentration was above the threshold effect level, but below the probable effect level. For other elements: (1) the mean sediment concentration of arsenic at Vieques was 4.37 micrograms per gram (µg/g), and the highest concentration was 15.4 µg/g. Both values were below the sediment quality guidelines examined, and

(2) the mean sediment concentration of manganese in sediment was 301 µg/g, and the highest concentration was 967 µg/g (Pait et al. 2010). The National Oceanic and Atmospheric Administration did not report threshold or probable effects levels for manganese.

Table 3.1-21: Concentrations of and Screening Levels for Selected Metals in Marine Sediments, Vieques, Puerto Rico

Metal	Sediment Concentration (µg/g)			Sediment Guidelines – National Oceanic and Atmospheric Administration (µg/g)	
	Minimum	Maximum	Average	Threshold Effect Level	Probable Effect Level
Cadmium	0	1.92	0.15	0.68	4.21
Chromium	0	178	22.5	52.3	160
Copper	0	103	25.9	18.7	390
Lead	0	17.6	5.42	30.24	112
Mercury	N/R	0.112	0.019	130	700
Nickel	N/R	38.3	7.80	15.9	42.8
Zinc	N/R	130	34.4	124	271

Notes: N/R = not reported, µg/g = micrograms per gram

The impacts of lead and lithium were studied at the Canadian Forces Maritime Experimental and Test Ranges near Nanoose Bay, British Columbia, Canada (Canadian Forces Maritime Experimental and Test Ranges 2005). These materials are common to Expendable Mobile Anti-Submarine Warfare Training Targets, acoustic device countermeasures, sonobuoys, and torpedoes. The study noted that lead is a naturally-occurring metal in the environment, and that typical concentrations of lead in seawater in the test range were between 0.01 and 0.06 parts per million (ppm), and from 4 to 16 ppm in sediments. Cores of marine sediments in the test range show a steady increase in lead concentration from the bottom of the core to a depth of approximately 8 in. (20.3 cm). This depth corresponds to the late 1970s and early 1980s, and the lead contamination was attributed to atmospheric deposition of lead from gasoline additives. The sediment cores showed a general reduction in lead concentration to the present time, coincident with the phasing out of lead in gasoline by the mid-1980s. The study also noted that other training ranges have shown minimal impacts of lead ballasts because they are usually buried deep in marine sediments where they are not biologically available. The study concluded that the lead ballasts would not adversely impact marine organisms because of the low probability of mobilization of lead.

A study by the Navy examined the impacts of materials from activated seawater batteries in sonobuoys that freely dissolve in the water column (e.g., lead, silver, and copper ions), as well as nickel-plated steel housing, lead solder, copper wire, and lead shot used for sonobuoy ballast (Naval Facilities Engineering Command 1993). The study concluded that constituents released by saltwater batteries as well as the decomposition of other sonobuoy components did not exceed state or federal standards, and that the reaction products are short-lived in seawater.

3.1.3.2.3.1 Lead

Lead is used as ballast in torpedoes, in batteries in torpedoes and sonobuoys, and in various munitions. Lead is nearly insoluble in water, particularly at the near-neutral pH levels of seawater. While some dissolution of lead could occur, such releases into the water column would be small and would be diluted (U.S. Department of the Navy 2006).

Several studies have evaluated the potential impacts of batteries expended in seawater (Naval Facilities Engineering Command 1993; Borener and Maugham 1998; Canadian Forces Maritime Experimental and Test Ranges 2005; U.S. Coast Guard 1994). Sediment was sampled adjacent to and near fixed navigation sites where batteries are used, and analyzed for all metal constituents in the batteries. Results indicated that metals were either below or consistent with background levels or were below National Oceanic and Atmospheric Administration sediment screening levels (Buchman 2008), "reportable quantities" under the Comprehensive Environmental Response, Compensation, and Liability Act §103(a), or EPA toxicity criteria (U.S. Environmental Protection Agency 2008b).

A sonobuoy battery experiment employed lead (II) chloride batteries in a 17 gallons (64 L) seawater bath for 8 hours (Naval Facilities Engineering Command 1993). Under these conditions, the dilution assumptions are conservative relative to normal ocean bottom conditions. The concentration released from the battery was diluted to 200 µg/L (200 parts per billion [ppb]) in 2 seconds, which is less than the acute criteria of 210 µg/L (210 ppb), a criteria applied as a 24-hour mean. Considering each milliliter as a discrete parcel, dilution by a current traveling at 2 in. per second (5.1 cm per second) would dilute the lead released from the battery to 200 µg/L (200 ppb) in 2 seconds, which is less than the acute criteria of 210 µg/L (210 ppb), a criteria applied as a 1-hour mean. Assuming the exponential factor of two dilutions, the concentration is less than the chronic limit (8.1 µg/L [8.1 ppb]) in 7 seconds. The calculated rate of leaching will decrease as the concentration of lead in the battery decreases.

Lead (II) chloride tends to dissolve more readily than either silver chloride or copper thiocyanate, this assures that the potential impacts of batteries employing silver chloride or copper thiocyanate are substantially lower than those of the lead (II) chloride battery. The copper thiocyanate battery also could release cyanide, a material often toxic to the marine environment. However, thiocyanate is tightly bound and can form a salt or bind to bottom sediments. Therefore, the risk from thiocyanate is low (U.S. Department of the Navy 2008a). The peak concentration of copper released by a copper thiocyanate seawater battery was calculated to be 0.015 µg/L (0.015 ppb) (Naval Facilities Engineering Command 1993), which is substantially lower than EPA acute and chronic toxicity criteria.

3.1.3.2.3.2 Tungsten and Tungsten Alloys

Because of environmental concerns about lead, tungsten has been used to replace lead in munitions (Defense Science Board 2003). Tungsten was chosen because it was considered to be non-reactive in the environment under normal circumstances. However, concerns have arisen lately about that assessment. Adverse health consequences arise with inhalation, and movement of tungsten into groundwater is an issue. However, no drinking water standard exists for tungsten and it is not listed as a carcinogen (U.S. Environmental Protection Agency 2008b). Neither inhalation nor groundwater are issues relative to sediment and water quality.

The natural concentration of tungsten reported in seawater is about 0.1 µg/L (Agency for Toxic Substances and Disease Registry 2005). It arises naturally from weathering of tungsten-rich deposits and from underwater hydrothermal vents; elevated levels in marine sediments from natural sources have been reported. Industrial processes also release tungsten into the environment (Koutsospyros et al. 2006). In water, tungsten can exist in several different forms depending on pH, and it has a strong tendency to form complexes with various oxides and with organic matter. The rate at which tungsten dissolves or dissociates increases as the pH decreases below 7.0 (pH of seawater is normally between

7.5 and 8.4). The speed of the process also depends on the metal with which tungsten is alloyed. For instance, iron tends to enhance the dissolution of tungsten, while cobalt slows the process (Agency for Toxic Substances and Disease Registry 2005). Tungsten is a component of metabolic enzymes in various microbes (Kletzin and Adams 1996). Much is known about the physical and chemical properties of tungsten. Less is known about the behavior of the various complexes that tungsten forms, making predictions about its behavior in the environment difficult. For instance, it is not known whether the organic complexes that tungsten forms affect its bioavailability (Koutsospyros et al. 2006).

3.1.3.2.3.3 Lithium

Silver chloride, lithium, or lithium iron disulfide thermal batteries are used to power subsurface units of sonobuoys. Lithium iron disulfide thermal batteries are used in the some types of sonobuoys. Lithium-sulfur batteries typically contain lithium sulfur dioxide and lithium bromide, but may also contain lithium carbon monofluoroxide, lithium manganese dioxide, sulfur dioxide, and acenitrile (a cyanide compound). During battery operation, the lithium reacts with the sulfur dioxide to form lithium dithionite. Thermal batteries are contained in a hermetically-sealed and welded stainless steel case that is 0.03 to 0.1 in. (0.07 to 0.3 cm) thick and resistant to the battery electrolytes.

Lithium always occurs as a stable mineral or salt, such as lithium chloride or lithium bromide (Kszos et al. 2003). Lithium is naturally present in seawater at 180 µg/L, and its incorporation into clay minerals is a major process in its removal from solution (Stoffyn-Egli and Machenzie 1984). Kszos et al. (2003) demonstrated that sodium ions in saltwater mitigate the toxicity of lithium to sensitive aquatic species. Fathead minnows (*Pimephales promelas*) and the water flea (*Ceriodaphnia dubia*) were unaffected by lithium concentrations as high as 6 mg/L (6 ppm) in the presence of tolerated concentrations of sodium. Therefore, in the marine environment, where sodium concentrations are at least an order of magnitude higher than tolerance limits for the tested freshwater species, lithium would be essentially nontoxic.

Canadian Forces Maritime Experimental and Test Ranges (2005) reported that 99 percent of the lithium in a sonobuoy battery would be released into the environment over 55 years. The release will result in a dissolved lithium concentration of 83 mg/L (83 ppm) near the breach in the sonobuoy housing. At a distance of 0.2 in. (0.5 cm) from the breach, the concentration of lithium will be about 15 mg/L (15 ppm), or 10 percent of typical seawater lithium values (150 ppm); thus it would be difficult to measure the change in the seawater concentration of lithium resulting from lithium leaking out of the battery (Canadian Forces Maritime Experimental and Test Ranges 2005). Cores of marine sediments collected in the Canadian Forces Maritime Experimental and Test Ranges near Nanoose Bay, British Columbia, Canada, showed fairly consistent lithium concentrations with depth, indicating little change in lithium deposition with time. Compared with lithium concentrations measured outside of the range, the report concluded that “it is difficult to demonstrate an environmental impact of lithium caused by (test range activities)” (Canadian Forces Maritime Experimental and Test Ranges 2005).

3.1.3.2.3.4 Metals in Non-Explosive Practice Munitions

On the ocean bottom, non-explosive practice munitions and fragments are exposed to seawater or lodge in sediments. Once settled, metal components slowly corrode in seawater. Over time, natural encrustation of exposed surfaces occurs and reduces the rate of corrosion. Elemental aluminum in seawater tends to be converted by hydrolysis to aluminum hydroxide, which is relatively insoluble, and scavenged by particulates and transported to the bottom sediments (Monterey Bay Research Institute 2010). Practice bombs are made of materials similar to those used to construct artificial reefs. The steel and iron, though durable, corrode over time, with no noticeable environmental impacts (U.S. Department of the Navy 2006).

3.1.3.2.3.5 Metals in Vessels Used as Targets

Target vessels are only used during sinking exercises. The metal structure of a target vessel can be a suitable substrate for the development of hardbottom marine habitat. Hard reef materials such as rock, concrete, and steel become encrusted with a variety of marine life. Certain bait fish school around sunken ships, and open water ("pelagic") species use these structures as sources of prey (Carberry 2008). Properly prepared and strategically sited artificial reefs can enhance fish habitat and provide more access to quality fishing grounds (U.S. Environmental Protection Agency 2006).

3.1.3.2.4 Evaluation of Alternatives

Tables 3.0-63, 3.0-64, and 3.0-64 (Section 3.0, Introduction) summarize the types and amounts of military expended materials with metal components for all alternatives.

3.1.3.2.4.1 No Action Alternative

Under the No Action Alternative, 1,496,802 military items with metal components would be expended throughout the Study Area during training and testing activities. Approximately 85 percent (1,279,682 items) of military expended materials would be expended in the SOCAL Range Complex, with the remaining 15 percent (217,120 items) expended in HRC. Small-caliber and medium-caliber projectiles would account for the highest percentages of military expended material by number (66 percent and 27 percent, respectively). Metal components on the sea floor could be exposed to seawater or, more likely, be buried in sea floor sediments. These metals would slowly corrode over years or decades and release small amounts of metals and metal compounds to adjacent sediments and waters.

Training Activities

Approximately 1,477,053 military items with metals components would be expended during training activities under the No Action Alternative. The majority of these materials (approximately 85 percent [1,262,298 items]) would be expended in SOCAL Range Complex, with the remaining 15 percent (214,755 items) expended in HRC.

Comparison of Training Materials by Weight. A review of training materials based on weight provides a different perspective on the relative contribution of various items under the No Action Alternative. For instance, although small-caliber projectiles comprise 65.6 percent of the total number of items, small-caliber projectiles represent less than one percent of the total weight. Table 3.1-22 depicts those categories of materials that contribute nearly all of the total weight of training items with metal components under the No Action Alternative. Under the No Action Alternative, training activities would expend approximately 221,000 lb. (99,450 kg) of potentially toxic metals. Approximately 54 percent (118,760 lb. [53,440 kg]) and 46 percent (102,230 lb. [46,000 kg]) of potentially toxic metals (i.e., cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc) would be expended in HRC and SOCAL Range Complex, respectively.

Because the contribution of testing materials to the total amount of materials with metal components is relatively small, by number and by weight, only training materials were used for comparisons in Table 3.1-22. Surface vessels used as targets would also contribute a large amount of metal weight. Under the No Action Alternative, eight target vessels would be proposed for sinking exercises during training activities. However, the number and types of vessels used as targets would depend on their availability and, therefore, cannot be specified. A Navy vessel used as a target would weigh between 5,000 and 10,000 tons (4,536,000 and 9,072,000 kg).

Table 3.1-22: Comparison of Training Materials with Metal Components – No Action Alternative

Type of Military Expended Material	Percent of Total by Number	Percent of Total by Weight
Sonobuoys	2.8	56.4
Torpedo Accessories	< 1.0	22.4
Large- and Medium-Caliber Projectiles	30.0	15.9
Bombs	< 1.0	3.7
Missiles	< 1.0	1.1
Small-Caliber Projectiles	65.6	< 1.0

Note: < = less than

Testing Activities

Approximately 19,749 military expended materials containing potentially toxic metals would be expended in the Study Area during testing activities. Numerically, the majority of expended materials would be deposited in the SOCAL Range Complex (88 percent [17,384 items]), with the remaining 12 percent (2,365 items) deposited in HRC. Under the No Action Alternative, testing activities would expend approximately 55,200 lb. (24,900 kg) of potentially toxic metals. Within the Study Area, approximately 70 percent (38,600 lb. [17,400 kg]) would be expended in SOCAL Range Complex and 30 percent (16,600 lb. [7,500 kg]) would be expended in HRC.

Summary of Impacts from Metals

Metals with potential toxicity would be incorporated with benign metals (i.e., steel) in military expended materials. Metal components settling on the sea floor would be exposed to seawater or, more likely, would be gradually buried in sea floor sediments. These metals would slowly corrode over years or decades, and would release small amounts of metal compounds to adjacent sediments and waters.

The potential impacts of metal components from training and testing activities on sediment and water quality would be long-term, local, and negative. However, because of slow corrosion rates and prevailing ocean currents, chemical, physical, and biological changes in sediment or water quality would not be detectable beyond the vicinity of the corroding metals. This conclusion is based on: (1) most of the metals are benign, and those of potential concern are a small percentage of those munitions; (2) metals released through corrosion would be diluted by currents or bound up and sequestered in adjacent sediments; (3) impacts would be limited to a small area around the expended material; (4) the areas within which metal components would be distributed would be large; and (5) most of the metals would be small-caliber projectiles. Neither state nor federal standards or guidelines would be violated.

3.1.3.2.4.2 Alternative 1

Under Alternative 1, the number of military items with metal components expended during training and testing activities would increase from 1,496,802 to 3,955,769, a 160 percent increase compared to the No Action Alternative. Approximately 80 percent (3,163,137 items) of military expended materials would be expended in the SOCAL Range Complex, with 18 percent (701,532 items) expended in HRC and two percent (91,100 items) expended in the Transit Corridor. Numerically, projectiles would represent 98 percent of these materials, with small-caliber projectiles making up 77 percent of all military expended materials with metal components.

Training Activities

Approximately 3,798,672 military items with metals components would be expended during training activities under Alternative 1. The majority of these materials (approximately 80 percent [3,052,365 items]) would be expended in SOCAL Range Complex, with 17 percent (655,207 items) expended in HRC and 3 percent (91,100 items) expended in the Transit Corridor.

Comparison of Training Materials by Weight. A review of training materials based on weight provides a different perspective on the relative contribution of various items under Alternative 1. For instance, although small-caliber projectiles comprise 80.7 percent of the total number of items, small-caliber projectiles represent less than 1 percent of the total weight. Table 3.1-23 depicts those categories of materials that contribute nearly all of the total weight of training items with metal components under Alternative 1. Under Alternative 1, the amount of potentially toxic metals expended during training activities would be approximately 242,200 lb. (109,000 kg). Approximately 52 percent (126,400 lb. [56,900 kg]) of potentially toxic metals would be expended in the SOCAL Range Complex and 47 percent (114,400 lb. [51,500 kg]) would be expended in HRC. In addition, about 1 percent of metals (about 1,400 lb. [630 kg]) would be expended in the Transit Corridor during training activities.

Table 3.1-23: Comparison of Training Materials with Metal Components – Alternative 1

Type of Military Expended Material	Percent of Total by Number	Percent of Total by Weight
Sonobuoys	1.4	63.5
Torpedo Accessories	< 1.0	25.0
Large- and Medium-Caliber Projectiles	17.7	4.9
Bombs	< 1.0	3.7
Missiles	< 1.0	1.7
Rockets	< 1.0	< 1.0
Small-Caliber Projectiles	80.7	< 1.0

Note: < = less than

Surface vessels used as targets would also contribute a large amount of metal weight. Under Alternative 1, eight surface vessels would be proposed for sinking exercises during training activities. However, the number and types of vessels used as targets would depend on their availability and, therefore, cannot be specified. A Navy vessel used as a target would weigh between 5,000 and 10,000 tons (4,536,000 and 9,072,000 kg).

Testing Activities

During testing activities, approximately 157,097 military items with potentially toxic metals would be expended in the Study Area under Alternative 1. Numerically, the majority of expended materials would be deposited in the SOCAL Range Complex (71 percent [110,772 items]), with the remaining 29 percent (46,325 items) deposited in HRC. Under Alternative 1, the amount of potentially toxic metals expended during testing activities would be more than under the No Action Alternative. Approximately 108,000 lb. (49,100 kg) of potentially toxic metals would be expended, compared to 55,200 lb. (24,900 kg) under the No Action Alternative. Within the Study Area, approximately 61 percent (65,400 lb. [29,700 kg]) would be expended in SOCAL Range Complex and 39 percent (42,600 lb. [19,400 kg]) would be expended in HRC.

Summary of Impacts from Metals

Although the amount of expended materials associated with training and testing under Alternative 1 would represent a notable increase over the No Action Alternative, impacts are judged to be similar to the No Action Alternative for the reasons enumerated under the No Action Alternative. Metal components would come to rest on the sea floor exposed to seawater when resting on the bottom or, more likely, buried in sea floor sediments. These metals would slowly corrode over years or decades and release small amounts of metals and metal compounds to adjacent sediments and waters. Potential impacts on sediments and water quality would be long-term, local, and negative. Chemical, physical, or biological changes to sediments or water quality would be measurable, but neither state nor federal standards or guidelines would be violated.

3.1.3.2.4.3 Alternative 2

Under Alternative 1, the number of military items with metal components expended during training and testing activities would increase from 1,496,802 to 3,960,963, a 165 percent increase compared to the No Action Alternative. Approximately 80 percent (3,168,660 items) of military expended materials would be expended in the SOCAL Range Complex, with 18 percent (701,293 items) expended in HRC and two percent (91,010 items) expended in the Transit Corridor.

Training Activities

Under Alternative 2, the number of training activities and amounts of ordnance used would be the same as under Alternative 1. Therefore, metals in the military expended materials would have the same environmental impacts as under Alternative 1.

Testing Activities

During testing activities, approximately 162,381 military items with potentially toxic metals would be expended in the Study Area under Alternative 2. Numerically, the majority of expended materials would be deposited in the SOCAL Range Complex (72 percent [116,295 items]), with the remaining 28 percent (46,086 items) deposited in HRC. Under Alternative 2, the amount of potentially toxic metals, by weight, would be approximately 128,500 lb. (58,400 kg). Within the Study Area, approximately 59 percent (75,500 lb. [34,300 kg]) would be expended in SOCAL Range Complex and 41 percent (53,000 lb. [24,100 kg]) would be expended in HRC.

Summary of Impacts from Metals

Although the amount of materials with metal components associated with training and testing activities under Alternative 2 would represent a notable increase, the increase is similar to Alternative 1 and the impacts are judged to be similar to the No Action Alternative. Metal components would come to rest on the sea floor exposed to seawater when resting on the bottom or, more likely, buried in sea floor sediments. These metals would slowly corrode over years or decades and release small amounts of metals and metal compounds to adjacent sediments and waters. Potential impacts on sediments and water quality would be long-term, local, and negative. Chemical, physical, or biological changes in sediment or water quality would be measurable but neither state nor federal standards or guidelines would be violated.

3.1.3.2.4.4 Summary and Conclusions for Metals

Corrosion and biological processes (e.g., colonization by marine organisms) would reduce exposure of military expended materials to seawater, decreasing the rate of leaching. Most leached metals would bind to sediments and other organic matter. Sediments near military expended materials would contain some metals, but their concentrations would not be at harmful levels because of the bottom substrate composition. Metals in batteries are readily soluble, which would result in faster releases of metals if batteries are exposed to seawater once they are expended. Batteries are sealed, however, and the exterior metal casing can become encrusted by marine organisms or coated by corrosion. Batteries continue to operate until most of their metals are consumed. Any leached metals would be present in seawater and sediments at low concentrations, and would behave similarly to leached metals from other military expended materials.

3.1.3.3 Chemicals Other than Explosives

3.1.3.3.1 Introduction

Under the Proposed Action, chemicals other than explosives are associated with the following military expended materials: (1) solid-fuel propellants in missiles and rockets; (2) Otto Fuel II torpedo propellant and combustion byproducts; (3) PCBs in target vessels used during sinking exercises; (4) other chemicals associated with ordnance; and (5) chemicals that simulate chemical warfare agents, referred to as "chemical simulants."

Hazardous air pollutants from explosives and explosion byproducts are discussed in Section 3.2 (Air Quality). Explosives and explosion byproducts are discussed in Section 3.1.3.1 (Explosives and Explosion Byproducts). Fuels onboard manned aircraft and vessels are not reviewed, nor are fuel-loading activities, onboard operations, or maintenance activities reviewed.

3.1.3.3.2 Missile and Rocket Propellant – Solid Fuel

The largest chemical constituent of missiles is solid propellant. Solid propellant contains both the fuel and the oxidizer, a source of oxygen needed for combustion. An extended-range Standard Missile-2 typically contains 1,822 lb. (826 kg) of solid propellant. Ammonium perchlorate is an oxidizing agent used in most modern solid-propellant formulas. It normally accounts for 50 to 85 percent of the propellant by weight. Ammonium dinitramide may also be used as an oxidizing agent. Aluminum powder as a fuel additive makes up five to 21 percent by weight of solid propellant; it is added to increase missile range and payload capacity. The high-explosives high melting explosive (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine) and royal demolition explosive (hexahydro-1,3,5-trinitro-1,3,5-triazine) may be added, although they usually comprise less than 30 percent of the propellant weight (Missile Technology Control Regime 1996).

The most common substance used as binding material for solid propellants is hydroxyl-terminated polybutadiene. Other binding materials include carboxyl-terminated polybutadiene and polybutadiene-acrylic acid-acrylonitrile. These materials also burn as fuels and contribute to missile thrust. Other materials found in solid-fuel propellants include curing agents and catalysts such as triphenyl bismuth, nitrate esters and nitrated plasticizers—liquid explosives added to increase the engine burn rate, and n-hexyl carborane and carboranylmethyl propionate to increase propellant performance.

Double-base propellant is a solid fuel that is a mixture of fuels and small particulate oxidizers. Like other solid propellants, the most commonly used fuel component of these propellants is ammonium perchlorate. High melting explosive and royal demolition explosive may be added to improve performance, and the most common binder is hydroxyl-terminated polybutadiene. In addition to the binders listed in the preceding paragraph, polybutadiene-acrylic acid polymer, elastomeric polyesters, polyethers, and nitrocellulose plasticized with nitroglycerine or other nitrate esters may be used. To reduce decomposition of propellant, 2-nitrodiphenylamine and N-methyl-4-nitroaniline may be added (Missile Technology Control Regime 1996).

3.1.3.3.3 Torpedo Propellant – Otto Fuel II and Combustion Byproducts

The MK 48 torpedo weighs roughly 3,700 lb. (1,680 kg) and uses Otto Fuel II as a liquid propellant. Otto Fuel II is composed of propylene glycol dinitrate and nitro-diphenylamine (76 percent), dibutyl sebacate (23 percent) and 2-nitrodiphenylamine as a stabilizer (2 percent). Combustion byproducts of Otto Fuel II include nitrous oxides, carbon monoxide, CO_2, hydrogen, nitrogen, methane, ammonia, and hydrogen cyanide. During normal venting of excess pressure or upon failure of the torpedo's buoyancy bag, the following constituents are discharged: carbon dioxide, water, hydrogen, nitrogen, carbon monoxide, methane, ammonia, hydrochloric acid, hydrogen cyanide, formaldehyde, potassium chloride, ferrous oxide, potassium hydroxide, and potassium carbonate (U.S. Department of the Navy 1996a,b).

3.1.3.3.4 Polychlorinated Biphenyls in Target Vessels

Target vessels are only used during sinking exercises. PCBs are a concern because they are present in certain solid materials (e.g., insulation, wires, felts, and rubber gaskets) on vessels used as targets for sinking exercises. These vessels are selected from a list of Navy-approved vessels that have been cleaned in accordance with EPA guidelines (U.S. Environmental Protection Agency 1999). By rule, a sinking exercise must be conducted at least 50 nm offshore and in water at least 6,000 ft. (1,828.8 m) deep (40 C.F.R. 229.2).

The EPA estimates that as much as 100 lb. (45.4 kg) of PCBs remain onboard sunken target vessels. The EPA considers the contaminant levels released during the sinking of a target to be within the standards of the Marine Protection, Research, and Sanctuaries Act (16 U.S.C. 1341, et seq.) (U.S. Environmental Protection Agency 1999). Based on these considerations, PCBs will not be considered further.

3.1.3.3.5 Other Chemicals Associated with Ordnance

Table 3.1-24 lists ordnance constituents remaining after low-order detonations and in unconsumed explosives. These constituents are in addition to the explosives contained in the ordnance.

Table 3.1-24: Ordnance Constituents in Residues of Low-Order Detonations and in Unconsumed Explosives

Ordnance Component	Constituent
Pyrotechnics Tracers Spotting Charges	Barium chromate Potassium perchlorate Chlorides Phosphorus Titanium compounds
Oxidizers	Lead (II) oxide
Delay Elements	Barium chromate Potassium perchlorate Lead chromate
Fuses	Potassium perchlorate
Detonators	Fulminate of mercury Potassium perchlorate
Primers	Lead azide

Lead azide, titanium compounds, perchlorates, barium chromate, and fulminate of mercury are not natural constituents of seawater. Lead oxide is a rare, naturally occurring mineral. It is one of several lead compounds that form films on lead objects in the marine environment (Agency for Toxic Substances and Disease Registry 2007). Metals are discussed in more detail in Section 3.1.3.2 (Metals).

3.1.3.3.6 Chemical and Biological Simulants

Chemical and biological agent detectors monitor for the presence of chemical and biological warfare agents and protect military personnel and civilians from the threat of exposure to these agents. Chemical, gaseous, and biological simulants are generally dispersed by hand at the detector or by aircraft as a fine mist or aerosol. The exposure of military personnel or the public to even small amounts of real warfare agents, such as nerve or blistering agents, or harmful biological organisms, such as anthrax, is potentially harmful and is illegal in most countries, including the United States. Furthermore, their use, including for the testing of detection equipment, is banned by international agreement. The 1993 Chemical Weapons Convention banned the development, production, stockpiling, transfer, or use of chemical weapons and required existing stocks of chemical weapons to be destroyed within 10 years. The United States signed the Chemical Weapons Convention on 13 January 1993 and ratified it on 25 April 1997. Nevertheless, because chemical and biological warfare agents remain a security threat, the DoD utilizes relatively harmless compounds (simulants) as substitutes for chemical and biological warfare agents to test equipment intended to detect their presence. The simulants trigger a response by sensors in the detection equipment without irritating or injuring personnel involved in testing detectors.

Simulants must have one or more characteristic—size, density, or aerosol behavior—that is similar to those of real chemical or biological agents so they can effectively mimic them. They must also pose a minimal risk to human health and the environment so they can be used safely in outdoor tests. Simulants are selected using the following criteria: (1) safety to humans and the environment, and (2) the ability to trigger a response by sensors used in the detection equipment.

Safety to humans and the environment. Simulants must be relatively benign (e.g., low toxicity or effects potential) from a human health, safety, and environmental perspective. Exposure levels during testing activities should be well below concentrations associated with any adverse human health or environmental effects. The degradation products of simulants must also be harmless.

Infrared absorbance. The spectral absorbance peaks for simulant vapors should be within a certain range of the spectral absorbance peaks of the warfare agents they are intended to mimic to assess the capacity of infrared sensor detectors to see the vapors of stimulants or agents.

Both chemical and biological simulants may be used for testing purposes. Chemical and biological simulant testing could occur anywhere within the range complexes. Vapor releases would take place in these areas, allowing vapor clouds to disperse within the boundaries of the range complexes, as determined by modeling and by monitoring weather conditions just prior to the test. Because of the need for early detection of chemical and biological agents, testing is designed to detect simulants at very low levels—levels well below quantities that could present risks to human health or the environment.

The types of chemical simulants proposed for use in testing activities include Navy Chemical Agent Simulant 82 (NCAS-82), glacial acetic acid, triethyl phosphate, sulfur hexafluoride, 1,1,1,2 tetrafluoroethane (refrigerant-134 or “R-134”), and 1,1-difluoroethane (refrigerant-152a or “R-152a”). Sulfur hexafluoride and the proposed refrigerant simulants (refrigerant-134 and refrigerant-152a) are also referred to as gaseous simulants, and can be released in smaller quantities in conjunction with glacial acetic acid or triethyl phosphate releases. The types of biological simulants that may be used include spore-forming bacteria, non-spore-forming bacteria, ovalbumin, bacteriophage MS2, and *Aspergillus niger*.

3.1.3.3.6.1 Chemical Simulants

Navy Chemical Agent Simulant 82. NCAS-82 is a mixture of 90 percent polyethylene glycol and 10 percent methyl salicylate. This simulant is used to test the detection of liquid agents deposited on ship surfaces or aerosolized agents carried into ship spaces. In addition, ships' decontamination, filtration, and collective protection systems and procedures can be evaluated for their ability to remove this simulant. NCAS-82 is dispersed by aircraft or watercraft to deliver relatively coarse droplets from above to targeted ships and can also be dispersed by hand sprayer. Up to 20 gallons of simulant are released per aircraft pass, with most of the liquid intended to reach the surface of the target area on the ship. Tests are typically planned for the possibility of up to three releases—in the event a release does not sufficiently coat the target area due to wind conditions or other targeting complications. This agent is also used in handheld sprayers in quantities less than 5 gallons per sprayer, and up to 20 gallons would be applied per day by hand sprayer. This agent is delivered essentially undiluted to ship surfaces (Neil 2013).

Polyethylene glycol. Polyethylene glycol is either a clear liquid or a white semi-solid to solid with a slightly sweet (mild) odor, depending on its molecular weight and the ambient temperature. It can be used as a component of a chemical simulant for a G-agent (nerve agent) or H-agent (blister agent) due to its physicochemical properties (U.S. Patent Office 2003). The polyethylene glycol used in Navy testing is a liquid.

Methyl salicylate. Methyl salicylate is a colorless or pale yellow liquid with a strong characteristic wintergreen odor. It is used as a simulant for blister agents such as sulfur mustard agents (Seitzinger et al. 1990). It occurs naturally in plants, where it probably developed as an anti-herbivore defense. Methyl salicylate has a half-life of about 1.4 days due to its reaction with photochemically produced hydroxyl radicals (Meylan and Howard 1993). It is slightly soluble in water, with lowest solubility of 0.11 percent at an acid concentration of 62 percent acid and increasing in solubility at concentrations both above and below this value (Rubel 1989).

Glacial Acetic Acid. Glacial acetic acid is used to simulate airborne chemical agents because its appearance to infrared standoff detectors is similar to that of blister agent vapor. It is used as a simulant for persistent nerve agents, the V-agents. Glacial acetic acid is dispersed by spraying a fine mist into a high speed airflow so the simulant forms a vapor cloud approximately 100 ft. above the sea surface. Up to 10 gallons are released per aircraft or vessel pass to produce a cloud of vapor. Glacial acetic acid could be released up to 20 times per day.

Glacial acetic acid is a concentrated form of acetic acid, which is a colorless liquid that gives vinegar its sour taste and pungent smell. Acetic acid is highly soluble in water, and has many industrial and household uses. Acetic acid-producing bacteria are ubiquitous throughout the world, and have been widely used for fermentation processes throughout history. Acetic acid occurs throughout the environment and is a normal metabolite in animals; hence, people are continually exposed to low concentrations of it through the ingestion of food and the inhalation of air (Hazardous Substances Data Bank 2008a). Although acetic acid commonly occurs in the environment in dilute form, in concentrated form such as glacial acetic acid, it is harmful to skin, eyes, and the respiratory system.

Triethyl phosphate. Triethyl phosphate is a colorless liquid with a slight pleasant or sweet odor (Lewis et al. 2001) that is soluble in most organic solvents, alcohol, and ether, and is completely miscible in water (Lewis 1999). For testing purposes, triethyl phosphate is applied in a manner similar to glacial acetic acid—dispersed by spraying a fine mist into a high speed airflow so the simulant forms a vapor cloud approximately 100 ft. above the sea surface. Up to 10 gallons are released per aircraft or vessel pass to produce a cloud of vapor. Triethyl phosphate could be released up to 20 times per day.

Triethyl phosphate is used primarily in industry, but is also used as a flame retardant. Consumer exposure to triethyl phosphate via inhalation during its use as a flame retardant in plastic materials was calculated to be approximately 0.001 mg/m^3 (Hazardous Substances Data Bank 2008b). Triethyl phosphate is considered for use as a G agent (e.g., sarin) simulant due to its physicochemical properties (Bartelt-Hunt et al. 2008). In aquatic systems, lethal doses (LD50, single doses required to kill 50 percent of a test population) ranged from more than 100 to 2,140 mg/kg for fish and from more than 100 to 2,705 mg/L for invertebrates in tests ranging from 48 to 96 hours (United Nations Environment Programme 1998). In a subchronic 21-day test, the concentration at which half the test individuals showed effects, known as the Effective Concentration 50 or EC50, for the water flea *Daphnia magna* was 729 mg/L (Verschueren 2001). The bioconcentration potential of triethyl phosphate in aquatic organisms is considered to be low (Hazardous Substances Data Bank 2008b). Triethyl phosphate is considered to be moderately toxic, with a probable oral lethal dose to humans of between 500 and 5,000 mg/kg, which equates to between 1 oz. and 16 oz. for a 150 lb. (68 kg) individual (Gosselin et al. 1984).

3.1.3.3.6.2 Gaseous Simulants

For testing purposes, the three gaseous simulants discussed below (sulfur hexafluoride, refrigerant-134, and refrigerant-152a) are released in small quantities in conjunction with releases of glacial acetic acid or triethyl phosphate because they are detectible by standoff infrared detectors (Neil 2013).

Sulfur hexafluoride. Sulfur hexafluoride is a colorless, odorless gas. It is soluble in potassium hydroxide and alcohol, but has a low solubility in water. It is primarily used in industry as a gaseous electrical insulating material and for the production of semiconductors (dry/plasma etching). As with other gases, direct exposure to large concentrations of sulfur hexafluoride could cause asphyxiation as a result of the displacement of oxygen (American Conference of Governmental Industrial Hygienists 1994-1995). Ordinarily, however, sulfur hexafluoride does not exist in a pure state (Sittig 2002). The degeneration products of sulfur hexafluoride (e.g., sulfur tetrafluoride) can be toxic, causing nose and ear irritation, nausea and vomiting, coughing, shortening of breath, tightness in the chest, and pulmonary edema. Because sulfur hexafluoride is on the EPA's Greenhouse Gas Action List, its use is being phased out and its future use in testing activities is unlikely.

Refrigerant-134 (R-134). Refrigerant-134 is an inert colorless, odorless gas used primarily as a high-temperature refrigerant for refrigerators and automobile air conditioners. In the 1990s, it began to replace dichlorodifluorometane (Freon-12), which was banned in the United States and other countries in 1994 because of its ozone-depleting properties. Refrigerant-134 exhibits relatively low toxicity in animals, with a 4-hour (acute toxicity) lethal concentration of 567,000 ppm (2,360 g/m^3) reported for rats and no effects observed at 81,000 ppm (337,770 mg/m^3) (World Health Organization/International Program on Chemical Safety 1998). At concentrations above 200,000 ppm (834,000 mg/m^3), exposure to 1,1,1,2-tetrafluoroethane depressed the central nervous system of rats (World Health Organization/International Program on Chemical Safety 1998). In aquatic systems, refrigerant-134 shows low toxicity for the few organisms it has been tested on. It also has a low estimated half-life of 3 hours for volatilization in a river (Hazardous Substances Data Bank 2008c). The low toxicity and high volatility indicate negligible risk to aquatic organisms (World Health Organization/International Program on Chemical Safety 1998). In addition, low estimated bioconcentration indicates that 1,1,1,2-tetrafluoroethane will not bioconcentrate in fish and aquatic organisms (Hazardous Substances Data Bank 2008c). There are no plans to release these gases into water.

Refrigerant-152a (R-152a). Refrigerant-152a is an inert colorless, odorless gas used primarily as a high-temperature refrigerant for refrigerators and air conditioners and as an aerosol propellant. Refrigerant-152a is recommended as an alternative refrigerant to refrigerant-134 because it has a lower global warming potential (U.S. Environmental Protection Agency 2008).

A 2-year inhalation study on rats evaluated the toxicity of refrigerant-152a, where rats were exposed to 0, 2,000, 10,000, or 25,000 ppm of 1,1-difluoroethane (equal to 0, 5399, 26,994, or 67,485 mg/m^3, respectively) (McAlack and Schneider 1982). The 25,000 ppm concentration was designated as a chronic “no adverse effect level,” as no significant respiratory, mortality, metabolic, or other effects were observed. Exposure to higher concentrations of refrigerant-152a in an acute study indicates that it is practically nontoxic.

3.1.3.3.6.3 Chemical Simulant Safety

All simulants tested or proposed for use have low toxicity to humans and the environment. Naval Surface Warfare Center, Dahlgren Division uses an air dispersion/deposition model to estimate the potential amount of each simulant that would be deposited on the water’s surface prior to testing. The analysis uses the DoD-approved Vapor, Liquid, and Solid Tracking Model (VLSTRACK: Version 3.1.1) to calculate the concentration and deposition levels resulting from testing under various release scenarios.

In addition to modeling, field test results were evaluated to understand airborne dispersal and surface deposition behavior for simulants. Field tests performed by Naval Surface Warfare Center, Dahlgren Division indicate that less than 1 percent of unvaporized liquid falls out on water surfaces. Tests conducted at the Potomac River Test Range showed fallout of 0.08 percent for glacial acetic acid and 0.35 percent for triethyl phosphate (Neil 2013). Calculated maximum water concentrations were 7 parts per billion for glacial acetic acid and 76 parts per billion for triethyl phosphate, assuming a 0.1-meter mixing depth (Neil 2013).

Additional modeling and testing performed in 2003, 2005, and 2009 showed no impacts from the testing of chemical simulants. No environmental effects were observed during or after testing (U.S. Department of the Navy 2009). Based on all of these findings, chemical simulants would not have measurable environmental impacts and will not be considered further.

3.1.3.3.6.4 Biological Simulants

Biological simulants are microorganisms that exhibit a quality similar to an actual biological threat agent but are a safe alternative. Biosafety Level 1 organisms are proposed for use as simulants. Because they rarely cause reactions or diseases, Biosafety Level 1 organisms are commonly used in high school and introductory college teaching laboratories. Examples of Biosafety Level 1 organisms are *Lactobacillus acidophilus,* which is used to turn milk into yogurt, and *Neurospora crassa*, a bread mold, which is used for genetic studies because its simple genome has been completely sequenced. All tests would be conducted in accordance with local, state, and federal regulations. Testing activities would use the following simulants, or similar Biosafety Level 1 organisms:

- Spore-forming bacteria: *Bacillus atrophaeus* (formerly known as *Bacillus globigii), Bacillus subtilis*, and *Bacillus thuringiensis*
- Non-spore-forming bacteria: *Pantoea agglomerans* (formerly known as *Erwinia herbicola*) and *Deinococcus radiodurans*
- The protein ovalbumin
- MS2 bacteriophages
- The fungus *Aspergillus niger*

These biological simulants are described below. Biological simulants would be applied as an aerosol and the amount of simulant used would be the minimum amount necessary to obtain the desired results, up to approximately 11 lb. (5 kg) dry weight per simulant per day.

Spore-Forming Bacteria: *Bacillus atrophaeus, Bacillus subtilis,* and *Bacillus thuringiensis.* *Bacillus* species produce an endospore, which is a dormant, tough, non-reproductive structure that allows the bacteria to survive through periods of environmental stress such as extreme heat and desiccation (U.S. Environmental Protection Agency 1997). Under most conditions, *Bacillus* are not biologically active but exist in endospore form. The endospores are ubiquitous in soil and rocks and are easily dispersed by wind and water (Moeller et al. 2004). *Bacillus* species are also commonly found in dust, air, water, and on wet surfaces throughout the world (Center for Research Information 2004). They generally occur at population levels of 10 to 100 per gram of soil (Alexander 1977). However, concentrations of *Bacillus* occurring naturally in the desert have been measured at 100,000 spores per gram of surface soil (U.S. Army 2003). Benign species of *Bacillus* are used to simulate the toxic sporeforming bacterium, *Bacillus anthracis*, commonly known as anthrax. *Bacillus subtilis* and similar *Bacillus* species are common in the environment and are uncommon causes of disease to healthy individuals (Department of Defense 2003).

Bacillus atrophaeus produces its own toxins, and can sicken people whose immune systems have been compromised. Human infection by *Bacillus atrophaeus* primarily results from deep incisions in the skin, such as penetrating injuries, surgical procedures, and catheters and intravenous lines, or a debilitated health state (Center for Research Information 2004). Infections are usually treated with antibiotics (Blue et al. 1995). Cases of long-term persistence or recurrence of extended latency have not been found (Center for Research Information 2004). However, based on a recent reevaluation of *Bacillus atrophaeus*, it is now considered a pathogen for humans (Center for Research Information 2004).

Bacillus thuringiensis is a naturally occurring bacterial disease of insects, and is used as an active ingredient in some insecticides (Cranshaw 2006). Several strains of *Bacillus thuringiensis* can infect and kill members of the order Lepidoptera (moths, butterflies, and caterpillars) by producing proteins that react with the cells of the gut lining of susceptible insects and paralyze the digestive system (Cranshaw 2006). Infected insects generally die from starvation, which can take several days. The most commonly used strain of *Bacillus thuringiensis* (*kurstaki* strain) kills only leaf- and needle-feeding caterpillars. Among the various strains, insecticidal activity is specific to the target insect group, and *Bacillus thuringiensis* is considered safe to people and nontarget species. Some formulations are considered safe to be used on food crops (Cranshaw 2006).

Because the *Bacillus* species proposed for use are ubiquitous in the environment, the releases expected from activities will not increase *Bacillus* populations in the environment.

Non-Spore-Forming Bacteria: *Pantoea agglomerans* and *Deinococcus radiodurans.* *Pantoea agglomerans* is a gram-negative, rod-shaped bacterium associated with plants. No adverse human health effects associated with *Pantoea agglomerans* have been observed through data reports submitted to EPA or public literature. Based on available data and its low toxicological significance, EPA classifies *Pantoea agglomerans* (strain E325) as having the lowest toxicity level, toxicity category IV (U.S. Environmental Protection Agency 2006). Toxicity categories for pesticide products range from toxicity category I, for products that are considered highly toxic or severely irritating, to toxicity category IV, for products that are practically non-toxic and non-irritating.

Deinococcus radiodurans is a gram-positive extremophilic bacterium—an organism that thrives in physically or geochemically extreme conditions. It is one of the most radioresistant (resistant to radiation) organisms known and can survive conditions that include cold, dehydration, vacuum, and acid (DeWeerdt 2002). While *Deinococcus radiodurans* is quite hardy, it is a relatively weak competitor. It is not considered a human pathogen and a *Deinococcus*-related bacterium has been found living inside the human stomach (Bik et al. 2006).

Ovalbumin. Ovalbumin is a glycoprotein (a conjugated protein having a carbohydrate as the nonprotein component). It is the main protein found in egg white, and is used as a key reference protein for immunization and biochemical studies. It can also be used to simulate protein toxins such as ricin, a protein extracted from the castor bean (*Ricinus communis*), and botulinum toxin, a potent neurotoxic protein produced by the bacterium *Clostridium botulinum* (O'Connell et al. 2002). Ovalbumin is commonly consumed in food products and used as a medium to grow vaccines.

Bacteriophage MS2. Bacteriophage MS2 (family *Leviviridae*) is a small, icosahedral, bacteriophage of *Escherichia coli,* a bacterium commonly found in the intestine of warm-blooded animals, including humans. A bacteriophage is a virus that infects bacteria. MS2 are ubiquitous and are found in places populated by their bacterial hosts such as soil or the intestines of animals. The small size of MS2, its simple structure, its ribonucleic acid genome, and harmlessness to humans, animals, plants, and other higher organisms, make it a useful simulant for deadly small ribonucleic acid viruses such as Ebola virus (*Ebolavirus*), Marburg virus (*Marburgvirus*), and smallpox (*Variola major* and *Variola minor*) (O'Connell et al. 2006). MS2 is used in place of pathogenic viruses in a wide variety of studies that range from the testing of compounds for disinfecting surfaces to studying the environmental fate and transport of pathogenic viruses in groundwater (O'Connell et al. 2006).

***Aspergillus niger*.** The fungus *Aspergillus niger* is one of the most common species of the genus *Aspergillus*. It causes a disease called black mold on certain fruits and vegetables such as grapes, onions, and peanuts, and is a common contaminant of food. It is ubiquitous in soil and is commonly reported in indoor environments. It is widely used in biotechnology and has been in use for many decades to produce extracellular (food) enzymes and citric acid (Schuster et al. 2002).

Aspergillus niger is less likely to cause human disease than some other *Aspergillus* species, but if large amounts of spores are inhaled, a serious lung disease, aspergillosis, can occur. Since *Aspergillus* is common in the environment, most people breathe in *Aspergillus* spores every day (Centers for Disease Control 2008). The spores do not harm people with healthy immune systems, but individuals with compromised immune systems breathing in many spores (such as in a very dusty environment) may become infected. Schuster et al. (2002) concluded in a review that with appropriate safety precautions, *Aspergillus niger* is a safe production organism.

3.1.3.3.6.5 Biological Simulant Safety

All of the biological simulants that could be used are considered to be Biosafety Level 1 organisms. Biosafety Level 1 represents the basic level of protection, and is appropriate for working with microorganisms that are not known to cause disease in normal healthy humans (Centers for Disease Control and National Institutes of Health 2007). Based on these findings, biological simulants would not have environmental impacts and will not be considered further.

3.1.3.3.7 Approach to Analysis

Activities involving the chemicals discussed above would be subject to state and federal sediment and water quality standards and guidelines; however, no state or federal sediment or water quality standards or guidelines exist that apply specifically to the chemicals discussed above. The areas within each range complex represent the region within which the chemicals discussed would be distributed. For properly functioning expended materials, the term “local” means the volume of water that a self-propelled subsurface training or testing device passes through. In these situations, water quality would be impacted by combustion byproducts. For lost or malfunctioning expended training items, the term “local” means a small zone around non-combusted propellant in sediments, perhaps a centimeter or two, and a smaller area if directly exposed to seawater.

3.1.3.3.8 Impacts from Chemicals

The following sections discuss the potential impacts on sediment and water quality of solid-fuel propellants from missiles and rockets, Otto Fuel II torpedo propellant, and combustion byproducts.

3.1.3.3.8.1 Solid-Fuel Propellants

Missiles and rockets typically consume 99 to 100 percent of their propellant when they function properly (U.S. Department of the Navy 2008b). The failure rate of rockets is 3.8 percent (Rand Corporation 2005; U.S. Army Corps of Engineers 2007). The remaining solid propellant fragments (i.e., 1 percent or less of the initial propellant weight) sink to the ocean floor and undergo physical and chemical changes in contact with sediments and seawater. Tests show that water penetrates about 0.06 in. (0.15 cm) into the propellant during the first 24 hours of immersion, and that fragments slowly release ammonium and perchlorate ions (Fournier and Brady 2005). These ions would disperse into the surrounding seawater, so local concentrations would be low. For example, a standard missile with 150 lb. (68.04 kg) of solid propellant would generate less than 1.5 lb. (0.6 kg) of propellant residue after completing its flight. If all the propellant deposited on the ocean floor were in the form of 4 in. (10.2 cm) cubes, about 0.42 percent of the propellant would be wetted during the first 24 hours of immersion. If all of the ammonium perchlorate leached out of the wetted propellant, then approximately 0.01 lb. (0.005 kg) of perchlorate would enter the surrounding seawater (U.S. Department of the Navy 2008b). This leach rate would decrease over time as the concentration of perchlorate in the propellant declined. The aluminum in the binder would be converted to aluminum oxide by seawater.

Perchlorate

Ammonium perchlorate accounts for 50 to 85 percent of solid propellant by weight (Missile Technology Control Regime 1996). Perchlorates are highly soluble and stable in water. According to the Agency for Toxic Substances and Disease Registry (2008), perchlorate “does not readily bind to soil particles or to organic matter, and does not readily form ionic complexes with other materials in solution.” Because of these characteristics, perchlorate is highly mobile in soils and does not readily leave solution through chemical precipitation. Thus, perchlorate could affect sediment and water quality because of its persistence in the environment.

Natural sources of perchlorate include Chilean caliche ore (U.S. Environmental Protection Agency 2008c) and ozone oxidation of atmospheric chlorine (Petrisor and Wells 2008). Martinelango (2006) stated that perchlorate was present in seawater at levels ranging from less than 0.07 µg/L to 0.34 µg/L (0.07 to 0.34 ppb). Studies indicate that it may accumulate in living organisms, such as fish and plants (Agency for Toxic Substances and Disease Registry 2008). Toxicity in plants and microbes is thought to be because of adverse impacts on metabolic enzymes (van Wijk and Hutchinson 1995). Research by Martinelango (2006) found that perchlorate can concentrate in marine algae from 200 to 5,000 times, depending on the species. Chaudhuri et al. (2002) noted that several species of microbes can metabolize chlorate and perchlorate. The end product is chloride. Logan et al. (2001) used sediment samples from a variety of marine and saline environments to demonstrate that microbial perchlorate reduction can occur in saline solutions greater than three percent. Seawater salinity is about 3.5 percent. The organism responsible for the perchlorate reduction was not identified in the study. However, Okeke et al. (2002) identified three species of halophilic ("salt-loving") bacteria that biodegrade perchlorate. The EPA has established a drinking water standard for perchlorate, but no standards or guidelines have been established for perchlorate in marine systems.

Polyesters

Regarding other solid-fuel components, marine microbes and fungi are known to degrade biologically produced polyesters, such as polyhydroxyalkanoates, a bacterial carbon and energy source (Doi et al. 1992). These organisms also can degrade other synthetic polymers, although at lower rates (Shah et al. 2008). The chemical structure of natural rubber is similar to that of polybutadiene (Tsuchii and Tokiwa 2006). Thus, although no specific studies were located that documented biodegradation of polybutadiene in marine ecosystems, the prospects seem likely based on the findings of researchers such as Tsuchii and Tokiwa (2006).

Nitriles

Nitriles are cyanide-containing organic compounds that are both natural and man-made. Several species of marine bacteria can metabolize acrylonitrile (Brandao and Bull 2003). The productivity of marine ecosystems is often limited by available nitrogen (Vitousek and Howarth 1991), so biodegradation of nitrate esters and nitrated plasticizers in the marine environment seems likely.

3.1.3.3.8.2 Otto Fuel II and Combustion Byproducts

Microbial degradation of the main components of Otto Fuel II (propylene glycol dinitrate and nitrodiphenylamine) has been demonstrated (Sun et al. 1996; Walker and Kaplan 1992). Although these studies did not involve marine microbes, other studies have demonstrated that marine bacteria in anaerobic sediments were able to degrade 2-nitrodiphenylamine (Drzyzga and Blotevogel 1997; Powell et al. 1998). According to the Agency for Toxic Substances and Disease Registry (1995), 2-nitrodiphenylamine tends to bind to sediments. The agency indicated that dibutyl sebacate "is readily degraded by environmental bacteria and fungi" (Agency for Toxic Substances and Disease Registry 1995).

Combustion byproducts of Otto Fuel II would be released into the ocean where they would dissolve, dissociate, or be dispersed and diluted in the water column. Except for hydrogen cyanide, combustion byproducts are not a concern (U.S. Department of the Navy 1996a,b) for the reasons listed below.

- Most Otto Fuel II combustion products, such as carbon dioxide, nitrogen, methane, and ammonia, occur naturally in seawater.
- Several of the combustion products are bioactive. Nitrogen is converted into nitrogen compounds through nitrogen fixation by certain cyanobacteria, providing nitrogen sources and

essential micronutrients for marine phytoplankton. Carbon dioxide and methane are integral parts of the carbon cycle in the oceans, and are taken up by many marine organisms.

- Carbon monoxide and hydrogen have low solubility in seawater and excess gases bubble to the surface.
- Trace amounts of nitrogen oxides may be present, but they are usually below detectable limits. nitrogen oxides in low concentrations are not harmful to marine organisms, and are a micronutrient source of nitrogen for aquatic plant life.
- Ammonia can be toxic to marine organisms in high concentrations, but releases from the combustion of Otto Fuel II are quickly diluted to negligible concentrations. Ammonia is present in exhaust from Otto Fuel II at estimated concentrations of 10 ppb (U.S. Department of the Navy 2007).

Hydrogen cyanide does not normally occur in seawater. Major releases of cyanide to water are from metal-finishing industries, iron and steel mills, and organic chemical industries (U.S. Environmental Protection Agency 1981). At high concentrations, cyanide can pose a risk to both humans and marine biota. Compared to recommendations of the EPA of 1.0 µg/L (1.0 ppb) (U.S. Environmental Protection Agency 2010), hydrogen cyanide released from MK 48 torpedoes would result in ambient concentrations ranging from 140 to 150 parts per billion
(U.S. Department of the Navy 1996b), well above the level recommended levels. However, because hydrogen cyanide is soluble in seawater, it would be diluted to less than 1 µg/L (1.0 ppb) at a distance of 18 ft. (5.5 m) from the center of the torpedo's path when first discharged. Additional dilution would occur thereafter.

Approximately 30,000 exercise tests of the MK 48 torpedo have been conducted over the last 25 years. Most of these launches have been on U.S. Navy test ranges where there have been no reports of harmful impacts on water quality from Otto Fuel II or its combustion products. Furthermore, Navy studies conducted at torpedo test ranges that have lower flushing rates than the open ocean did not detect residual Otto Fuel II in the marine environment (U.S. Department of the Navy 1996a,b).

3.1.3.3.8.3 Operational Failure – Torpedoes, Missiles, and Rockets

Some materials are recovered after use, such as torpedoes. However, sometimes these recoverable items are lost or they fail to perform correctly. For instance, the failure rate of rockets is 3.8 percent (Rand Corporation 2005; U.S. Army Corps of Engineers 2007). Corrosion of munitions in the marine environment is discussed in more detail in Section 3.1.3.2 (Metals).

3.1.3.3.9 Evaluation of Alternatives

Table 3.1-25 summarizes the types and amounts of military expended materials that contain chemicals other than explosives for all alternatives. The numbers represent amounts expended annually for each type of material under each alternative. The types and amounts of expended materials in the table were drawn from the tables in Chapter 2.

3.1.3.3.9.1 No Action Alternative

Under the No Action Alternative, chemicals other than explosives would be used in an estimated 3,008 expended military items. Over 78 percent of these materials would be expended during training activities. Numerically, torpedoes, which contain OTTO Fuel II, would account for 46 percent of military expended materials with chemicals other than explosives.

Table 3.1-25: Military Expended Materials with Chemical Components – All Alternatives

Type of Military Expended Material and Chemical Component	Hawaii Range Complex			Southern California Range Complex			HSTT Transit Corridor		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
Missiles (solid fuel propellants)									
Training	220	210	210	168	360	360	0	0	0
Testing	8	122	126	103	202	218	0	0	0
Total	228	332	336	271	558	574	0	0	0
Rockets (solid fuel propellant)									
Training	0	760	760	0	3,800	3,800	0	0	0
Testing	0	0	0	15	980	1,078	0	0	0
Total	0	760	760	15	4,780	4,878	0	0	0
Torpedoes (OTTO Fuel II)									
Training	536	631	631	400	511	511	0	0	0
Testing	194	408	620	268	468	648	0	0	0
Total	730	1,039	1,251	668	979	1,159	0	0	0
Expendable Subsurface Targets (OTTO Fuel II)									
Training	370	405	405	670	550	550	0	10	10
Testing	32	165	177	24	225	243	0	0	0
Total	402	570	582	694	775	793	0	10	10

Note: HSTT = Hawaii-Southern California Training and Testing

Training Activities

Under the No Action Alternative, chemicals other than explosives would be used in 2,364 ordnance items. Torpedoes represent 40 percent of these items. Within the Study Area, the number of items containing chemicals other than explosives expended during training activities would be similar between HRC and SOCAL Range Complex (1,126 items and 1,238 items, respectively). All practice torpedoes would be recovered after training activities, which would reduce the exposure of Otto Fuel II to the marine environment. Impacts of chemicals from unrecovered military expended materials on sediment and water quality would be short-term, local, and negligible with properly functioning materials and long-term, local, and negative with lost or malfunctioning items.

For properly functioning ordnance items, chemical, physical, or biological changes in sediment or water quality would not be detectable. Impacts would be minimal for the following reasons: (1) the size of the area in which expended materials would be distributed is large; (2) most propellant combustion byproducts are benign, while those of concern would be diluted to below detectable levels within a short time; (3) most propellants are consumed during normal operations; (4) the failure rate is low for such expended materials; and (5) most of the constituents of concern are biodegradable by various marine organisms or by physical and chemical processes common in marine ecosystems.

Testing Activities

Under the No Action Alternative, chemicals other than explosives would be used in 644 ordnance items during testing activities. Within the Study Area, approximately 64 percent (410 items) would be expended in SOCAL Range Complex during testing activities, with the remaining 36 percent (244 items) expended in HRC. Torpedoes represent 72 percent of these materials. All practice torpedoes would be recovered after testing activities, which would reduce the exposure of Otto Fuel II to the marine environment. Since chemicals other than explosives used during testing activities would be similar to those expended during training activities, impacts would be similar to training activities under No Action Alternative for the reasons enumerated above. Potential impacts on sediment and water quality of chemicals other than explosives from properly functioning ordnance would be short-term, local, and negative. Potential impacts on sediment and water quality of chemicals other than explosives from lost or malfunctioning ordnance would be long-term, local, and negative. In both cases, chemical, physical, or biological changes in sediment or water quality would not be detectable.

3.1.3.3.9.2 Alternative 1

Under Alternative 1, the number expended military items using chemicals other than explosives would increase from 3,008 to 9,797 (226 percent increase) compared to the No Action Alternative. Of those materials, rockets would account for 57 percent of the military expended materials, compared to less than 1 percent under the No Action. Torpedoes, which would be recovered following training and testing activities, would still account for 20 percent of military expended materials under Alternative 1.

Training Activities

Under Alternative 1, chemicals other than explosives would be used in 7,227 ordnance items. Within the Study Area, approximately 72 percent (5,221 items) would be expended in SOCAL Range Complex and 28 percent (2,006 items) would be expended in HRC. In addition, 10 expendable subsurface targets would be expended in the HSTT Transit Corridor. The increased number of items compared to the No Action Alternative (200 percent increase) would be from the introduction of rockets used during training activities. If rockets function properly, nearly all propellant would be consumed during operation. Torpedoes would represent 13 percent of ordnance items with chemicals. All practice torpedoes would be recovered after training activities.

Although these changes would be a notable increase compared to the No Action Alternative, impacts would be similar to the No Action Alternative for the reasons enumerated above. Potential impacts on sediment and water quality of chemicals other than explosives from properly functioning ordnance would be short-term, local, and negative. Potential impacts on sediment and water quality of chemicals other than explosives from lost or malfunctioning ordnance would be long-term, local, and negative. In both cases, chemical, physical, or biological changes in sediment or water quality would not be detectable.

Testing Activities

Under Alternative 1, chemicals other than explosives would be used in 2,570 ordnance items, a 300 percent increase compared to the No Action Alternative. Within the Study Area, approximately 73 percent (1,875 items) would be expended in SOCAL Range Complex during testing activities, with the remaining 27 percent (695 items) expended in HRC. Torpedoes represent 34 percent of these materials. All practice torpedoes would be recovered after testing activities, which would reduce the exposure of Otto Fuel II to the marine environment. Although these changes would be a notable increase compared to the No Action Alternative, impacts would be similar to the No Action Alternative for the reasons enumerated above. Potential impacts on sediment and water quality of chemicals other than explosives from properly functioning ordnance would be short-term, local, and negative. Potential impacts on sediment and water quality of chemicals other than explosives from lost or malfunctioning ordnance would be long-term, local, and negative. In both cases, chemical, physical, or biological changes in sediment or water quality would not be detectable.

3.1.3.3.9.3 Alternative 2

Under Alternative 2, the number of expended military items containing chemicals other than explosives would increase from 3,008 to 10,337 (240 percent increase) compared to the No Action Alternative. Of those materials, rockets would account for 55 percent of military expended materials. Torpedoes would account for 23 percent of the number of military expended materials. The majority of torpedoes would be recovered following training and testing activities.

Training Activities

Under Alternative 2, the number of training activities and amounts of expended ordnance would be the same as under Alternative 1. Therefore, chemicals in military expended materials would have the same environmental impacts as under Alternative 1.

Testing Activities

Under Alternative 2, chemicals other than explosives would be used in 3,110 ordnance items. Within the Study Area, approximately 70 percent (2,187 items) would be expended in SOCAL Range Complex during testing activities, with the remaining 30 percent (923 items) expended in HRC. Torpedoes represent 41 percent of these materials. All practice torpedoes would be recovered after testing activities, which would reduce the exposure of Otto Fuel II to the marine environment. Although these changes would be a notable increase compared to the No Action Alternative, impacts would be similar to the No Action Alternative for the reasons enumerated above. Potential impacts on sediment and water quality of chemicals other than explosives from properly functioning ordnance would be short-term, local, and negative. Potential impacts on sediment and water quality of chemicals other than explosives from lost or malfunctioning ordnance would be long-term, local, and negative. In both cases, chemical, physical, or biological changes in sediment or water quality would not be detectable.

3.1.3.3.9.4 Summary and Conclusions for Chemicals Other than Explosives

Chemicals other than explosives from military expended materials in the Study Area would be from residual solid propellant, OTTO Fuel II, and pyrotechnic materials. Solid propellants would leach perchlorates. Perchlorates are readily soluble, with a low affinity for sediments. Based on the small amount of residual propellant from training and testing activities, perchlorates would not be expected in concentrations that would be harmful to aquatic organisms in the water column or in marine sediments. OTTO Fuel II and its combustion byproducts would be introduced into the water column in small amounts. All torpedoes would be recovered following training and testing activities, and OTTO Fuel II would not be expected to come into direct contact with marine sediments. Most combustion byproducts would form naturally occurring gases in the water column, and cyanide concentrations would be well below harmful concentrations.

3.1.3.4 Other Materials

3.1.3.4.1 Introduction

Under the Proposed Action, other materials include marine markers and flares, chaff, towed and stationary targets, and miscellaneous components of other materials. These materials and components are made mainly of non-reactive or slowly reactive materials (e.g., glass, carbon fibers, and plastics) or they break down or decompose into benign byproducts (e.g., rubber, steel, iron, and concrete). Most of these objects would settle to the sea floor where they would (1) be exposed to seawater, (2) become lodged in or covered by sea floor sediments, (3) become encrusted by chemical processes such as rust, (4) dissolve slowly, or (5) be covered by marine organisms such as coral. Plastics may float or descend to the bottom, depending upon their buoyancy. Markers and flares are largely consumed during use.

Steel in ordnance normally contains a variety of metals; some of them are a potential concern. However, these other metals are present at low concentrations (1–5 percent of content), such that steel is not generally considered a potential source of metal contamination. Metals are discussed in more detail in Section 3.1.3.2 (Metals). Various chemicals and explosives are present in small amounts (mostly as components of flares and markers) that are not considered likely to cause adverse impacts. Chemicals other than explosives are discussed in more detail in Section 3.1.3.3 (Chemicals other than Explosives), and explosives and explosion byproducts are discussed in more detail in Section 3.1.3.1 (Explosives and Explosion Byproducts).

Towed and stationary targets include floating steel drums, towed aerial targets, the trimaran, and inflatable, floating targets. The trimaran is a three-hulled boat with a 4 ft. (1.2 m) square sail that is towed as a moving target. Large, inflatable, plastic targets can be towed or left stationary. Towed aerial targets are either (1) rectangular pieces of nylon fabric 7.5 ft. by 40 ft. (2.3 m by 12.2 m) that reflect radar or lasers; or (2) aluminum cylinders with a fiberglass nose cone, aluminum corner reflectors (fins), and a short plastic tail section. This second target is about 10 ft. long (30.5 m) and weighs about 75 lb. (34 kg). These four targets are recovered after use, and will not be considered further.

3.1.3.4.2 Marine Markers and Flares

Marine markers are pyrotechnic devices that are dropped on the water's surface during training exercises to mark a position, to support search and rescue activities, or as a bomb target. The MK 58 marker is a tin tube that weighs about 12 lb. (5.4 kg). Markers release smoke at the water surface for 40 to 60 minutes. After the pyrotechnics are consumed, the marine marker fills with seawater and sinks. Iron and aluminum constitute 35 percent of the marker weight. To produce the lengthy smoke effect, approximately 40 percent of the marker weight is made up of pyrotechnic materials. The propellant, explosive, and pyrotechnic constituents of the MK 58 include red phosphorus (2.19 lb. [0.99 kg]) and manganese (IV) dioxide (1.40 lb. [0.64 kg]). Other constituents include magnesium powder (0.29 lb. [0.13 kg]), zinc oxide (0.12 lb. [0.05 kg]), nitrocellulose (0.000017 lb. [0.000008 kg]), nitroglycerin (0.000014 lb. [0.000006 kg]), and potassium nitrate (0.2 lb. [0.1 kg]). The failure rate of marine markers is approximately 5 percent (U.S. Department of the Navy 2010b).

Flares are used to signal, to illuminate surface areas at night in search and attack operations, and to assist with search and rescue activities. They range in weight from 12 to 30 lb. (5 to 14 kg). The major constituents of flares include magnesium granules and sodium nitrate. Containers are constructed of aluminum, and the entire assembly is usually consumed during flight. Flares may also contain a primer such as TNT, propellant (ammonium perchlorate), and other explosives. These materials are present in small quantities (e.g., 1.0×10^{-4} ounces [oz.] of ammonium perchlorate and 1.0×10^{-7} oz. of explosives). Small amounts of metals are used to give flares and other pyrotechnic materials bright and distinctive colors. Combustion products from flares include magnesium oxide, sodium carbonate, carbon dioxide, and water. Illuminating flares and marine markers are usually entirely consumed during use; neither is intended to be recovered. Table 3.1-26 summarizes the components of markers and flares (U.S. Department of the Navy 2010b).

Table 3.1-26: Summary of Components of Marine Markers and Flares

Flare or Marker	Constituents
LUU-2 Paraflare	Magnesium granules, sodium nitrate, aluminum, iron, TNT, royal demolition explosive, ammonium perchlorate, potassium nitrate, lead, chromium, magnesium, manganese, nickel
MK45 Paraflare	Aluminum, sodium nitrate, magnesium powder, nitrocellulose, TNT, copper, lead, zinc, chromium, manganese, potassium nitrate, pentaerythritol-tetranitrate, nickel, potassium perchlorate
MK58 Marine Marker	Aluminum, chromium, copper, lead, lead dioxide, manganese dioxide, manganese, nitroglycerin, red phosphorus, potassium nitrate, silver, zinc, zinc oxide

3.1.3.4.3 Chaff

Chaff consists of small, thin glass fibers coated in aluminum that are light enough to remain in the air anywhere from 10 minutes to 10 hours. Chaff is an electronic countermeasure designed to confuse enemy radar by deflecting radar waves and thereby obscuring aircraft, ships, and other equipment from radar tracking sources. Chaff is typically packaged in cylinders approximately 6 in. by 1.5 in. (15.2 cm by 3.8 cm), weigh about 5 oz. (140 g), and contain a few million fibers. Chaff may be deployed from an aircraft or may be launched from a surface vessel.

The chaff fibers are approximately the thickness of a human hair (generally 25.4 microns in diameter), and range in length from 0.3 to 2 in. (0.8 to 5.1 cm). The major components of the chaff glass fibers and the aluminum coating are provided in Table 3.1-27 (U.S. Air Force 1994).

Table 3.1-27: Major Components of Chaff

Component	Percent by Weight
Glass Fiber	
Silicon dioxide	52–56
Alumina	12–16
Calcium oxide, magnesium oxide	16–25
Boron oxide	8–13
Sodium oxide, potassium oxide	1–4
Iron oxide	≤ 1
Aluminum Coating	
Aluminum	99.45 (min.)
Silicon and Iron	0.55 (max.)
Copper	0.05
Manganese	0.05
Zinc	0.05
Vanadium	0.05
Titanium	0.05
Others	0.05

3.1.3.4.4 Additional Examples of Other Materials

Miscellaneous components of other materials include small parachutes used with sonobuoys and flares, nylon cord, plastic casing, and antenna float used with sonobuoys; natural and synthetic rubber, carbon or Kevlar fibers used in missiles; and plastic end-cap and piston used in chaff cartridges.

3.1.3.4.5 Approach to Analysis

Most activities involving ordnance containing the other materials discussed above would be conducted more than three nautical miles offshore in each range complex. Most of the other materials are benign. In the analysis of alternatives, "local" means the area in which the material comes to rest. No state or federal sediment and water quality standards or guidelines specifically apply to major components of the other materials discussed above.

3.1.3.4.6 Impacts from Other Materials

The rate at which materials deteriorate in marine environments depends on the material and conditions in the immediate marine and benthic environment. Usually when buried deep in ocean sediments, materials decompose at lower rates than when exposed to seawater (Ankley 1996). With the exception of plastic parts, sediment burial appears to be the fate of most ordnance used in marine warfare (Canadian Forces Maritime Experimental and Test Ranges 2005). The behavior of these other materials in marine systems is discussed in more detail below.

3.1.3.4.6.1 Flares

Most of the pyrotechnic components of marine markers are consumed and released as smoke in the air. Thereafter, the aluminum and steel canister sinks to the bottom. Combustion of red phosphorus produces phosphorus oxides, which have a low toxicity to aquatic organisms. The amount of flare residue is negligible. Phosphorus contained in the marker settles to the sea floor, where it reacts with the water to produce phosphoric acid until all phosphorus is consumed by the reaction. Phosphoric acid is a variable, but normal, component of seawater (U.S. Department of the Navy 2006). The aluminum and iron canisters are expected to be covered by sand and sediment over time, to become encrusted by chemical corrosion, or to be covered by marine plants and animals. Elemental aluminum in seawater tends to be converted by hydrolysis to aluminum hydroxide, which is relatively insoluble and adheres to particulates, and transported to the bottom sediments (Monterey Bay Research Institute 2010).

Red phosphorus, the primary pyrotechnic ingredient, constitutes 18 percent of the marine marker weight. Toxicological studies of red phosphorus revealed an aquatic toxicity in the range of 10 to 100 mg/L (10 to 100 ppm) for fish, *Daphnia* (a small aquatic crustacean), and algae (European Flame Retardants Association 2011). Red phosphorus slowly degrades by chemical reactions to phosphine and phosphorus acids. Phosphine is very reactive and usually undergoes rapid oxidation (California U.S. Environmental Protection Agency 2003). The final products, phosphates, are harmless (U.S. Department of the Navy 2010b). A study by the U.S. Air Force (1997) found that, in salt water, the degradation products of flares that do not function properly include magnesium and barium.

3.1.3.4.6.2 Chaff

Chaff can remain suspended in air from 10 minutes to 10 hours, and can travel considerable distances from its release point (Arfsten et al. 2002; U.S. Air Force 1997). Factors influencing chaff dispersion include the altitude and location where it is released, prevailing winds, and meteorological conditions (Hullar et al. 1999). Doppler radar has tracked chaff plumes containing approximately 31.8 oz. (901.5 g) of chaff drifting 200 mi. (321.9 km) from the point of release, with the plume covering a volume of greater than 400 mi.^{3} (Arfsten et al. 2002). Based on the dispersion characteristics of chaff, large areas of open water would be exposed to chaff, but the chaff concentrations would be low. For example, Hullar et al. (1999) calculated that an area 4.97 mi. by 7.46 mi. (8 km by 12 km) (37 mi.^{2} [96 km^2] or 28 nm^2) would be affected by deployment of a single cartridge containing 5.3 oz. (150 g) of chaff. The resulting chaff concentration would be about 5.4 g/nm^2. This corresponds to less than 179,000 fibers/nm^2, or less than 0.005 fiber/ft.^{2}, assuming that each canister contains 5 million fibers.

Chaff is generally resistant to chemical weathering and likely remains in the environment for long periods. However, all the components of chaff's aluminum coating are present in seawater in trace amounts, except magnesium, which is present at 0.1 percent (Nozaki 1997). Aluminum and silicon are the most common minerals in the earth's crust as aluminum oxide and silicon dioxide, respectively. Aluminum is the most common metal in the Earth's crust, and is a trace element in natural waters. Ocean waters are in constant exposure to crustal materials, so the addition of small amounts of chaff should not affect water or sediment composition (Hullar et al. 1999).

The dissolved concentration of aluminum in seawater ranges from 1 to 10 µg/L (1 to 10 ppb). For comparison, the concentration in rivers is 50 µg/L (50 ppb). In the ocean, aluminum concentrations tend to be higher on the surface, lower at middle depths, and higher again at the bottom (Li et al. 2008). Aluminum is a very reactive element, and is seldom found as a free metal in nature except under highly acidic (low pH) or alkaline (high pH) conditions. It is found combined with other elements, most commonly with oxygen, silicon, and fluorine. These chemical compounds are commonly found in soil, minerals, rocks, and clays (Agency for Toxic Substances and Disease Registry 2008; U.S. Air Force 1994). Elemental aluminum in seawater tends to be converted by hydrolysis to aluminum hydroxide, which is relatively insoluble, and is scavenged by particulates and transported to bottom sediments (Monterey Bay Research Institute 2010).

Because of their light weight, chaff fibers tend to float on the water surface for a short period. The fibers are quickly dispersed by waves and currents. They may be accidentally or intentionally ingested by marine life, but the fibers are non-toxic. Chemicals leached from the chaff would be diluted by the surrounding seawater, reducing the potential for chemical concentrations to reach levels that can affect sediment quality or benthic habitats.

Systems Consultants, Inc. (1977) placed chaff samples in Chesapeake Bay water for 13 days. No increases in concentration of greater than one ppm of aluminum, cadmium, copper, iron, or zinc were detected. Accumulation and concentration of chaff constituents is not likely under natural conditions. A U.S. Air Force study of chaff analyzed nine elements under various pH conditions: silicon, aluminum, magnesium, boron, copper, manganese, zinc, vanadium, and titanium. Only four elements were detected above the 0.02 mg/L detection limit (0.02 ppm): magnesium, aluminum, zinc, and boron (U.S. Air Force 1994). Tests of marine organisms detected no negative impacts of chaff exposure at levels above those expected in the Study Area (Systems Consultants 1977; Farrell and Siciliano 2007).

3.1.3.4.6.3 Additional Components of Other Materials

Most components of other materials are plastics. Although plastics are resistant to degradation, they do gradually breakdown into smaller particles as a result of photodegradation and mechanical wear (Law et al. 2010). The fate of plastics that sink beyond the continental shelf is largely unknown, although marine microbes and fungi are known to degrade biologically-produced polyesters (Doi et al. 1992) as well as other synthetic polymers, although the latter occurs more slowly (Shah et al. 2008).

Parachutes and other plastic items expended during training and testing activities are designed to sink. Parachutes are typically made of nylon. Nylon and other plastic materials are generally resistant to natural biodegradation. On the seafloor, photodegradation and mechanical wear are limited, and parachutes break down slowly, most likely taking years to fully degrade. Nylon is not toxic and is not expected to affect sediment or water quality. Over time, the breakdown of parachutes and other plastic materials into increasingly smaller fragments could produce microplastics. While microplastics are not generally toxic, persistent organic pollutants present in seawater may adhere to microplastics and be incorporated into the water column and sediments, as described in Section 3.1.2.1.3 (Marine Debris, Military Materials, and Marine Sediments) and Section 3.1.2.2.3 (Marine Debris and Marine Water Quality). Because plastic materials themselves do not affect sediment or water quality, these materials are not analyzed further in this section. Potential effects of ingesting or becoming entangled in plastic materials or parachutes are discussed in the biological resources sections.

3.1.3.4.7 Evaluation of Alternatives

The following sections evaluate each alternative in terms of the information provided in Section 3.1.3.4 (Other Materials). The types and amounts of expended materials in the tables were drawn from the summary tables in Chapter 2. Table 3.1-28 summarizes the annual number of flares and chaff for the No Action Alternative and Alternatives 1 and 2.

Table 3.1-28: Summary of Annual Military Expended Materials Involving Other Materials – All Alternatives

Type of Military Expended Material	Hawaii Range Complex			Southern California Range Complex		
	No Action Alternative	Alternative 1	Alternative 2	No Action Alternative	Alternative 1	Alternative 2
Flares						
Training	1,750	1,750	1,750	8,300	8,300	8,300
Testing	0	0	0	0	100	110
Total	1,750	1,750	1,750	8,300	8,400	8,410
Chaff Canisters						
Training	200	2,600	2,600	20,750	20,750	20,750
Testing	0	300	300	0	204	254
Total	200	2,900	2,900	20,750	20,954	21,004

3.1.3.4.7.1 No Action Alternative

Under the No Action Alternative, an estimated 31,000 military items composed of other materials would be expended in the Study Area during training and testing activities. Training activities would account for all of military expended materials composed of other materials. Within the Study Area, approximately 94 percent (29,050 items) would be expended in SOCAL Range Complex during training and testing activities, with the remaining 6 percent (1,050 items) expended in HRC.

Training Activities

Under the No Action Alternative, approximately 31,000 training items composed of other materials would be expended in the Study Area. These items consist of chaff cartridges (67 percent) and flares (33 percent). Potential impacts of these other materials on sediment and water quality would be short- and long-term, local, and negative. Chemical, physical, or biological changes in sediment or water quality would not be detectable. The composition of chaff is much like clay minerals common in ocean sediments (“aluminosilicates”), and studies indicate that negative impacts are not anticipated even at concentrations many times the level anticipated during proposed training activities. Most pyrotechnics in marine markers and flares are consumed during use and expended in the air. The failure rate is low (5 percent), and the remaining amounts are small, and subject to additional chemical reactions and subsequent dilution in the ocean. Plastics and other floating expended materials would either degrade over time or wash ashore. Materials would be widely scattered on the sea floor in areas used for training.

Testing Activities

No testing items composed of other materials would be used during testing activities under the No Action Alternative. Therefore, these activities would have no effect on sediments or water quality.

3.1.3.4.7.2 Alternative 1

Under Alternative 1, an estimated 34,004 items composed of other materials would be expended, a 10 percent increase compared to the No Action Alternative. Training activities would account for over 98 percent of military expended materials composed of other materials. Within the Study Area, approximately 86 percent (29,354 items) would be expended in SOCAL Range Complex during training and testing activities, with the remaining 14 percent (4,650 items) expended in HRC.

Training Activities

Under Alternative 1, the number of training items composed of other materials would increase to an estimated 33,400 items. These items would consist of chaff cartridges (70 percent) and flares (30 percent). The potential impacts of other materials on sediment and water quality would be short- and long-term, local, and negative. The small increase in other materials, coupled with the nature of those materials, indicate that the potential impacts would be similar to those under the No Action Alternative. Chemical, physical, or biological changes in sediment or water quality would not be detectable.

Testing Activities

Under Alternative 1, the number of testing items composed of other materials would introduce 604 items per year into the Study Area. These items would consist of chaff cartridges (83 percent) and marine markers and flares (17 percent). The potential impacts of other materials on sediment and water quality would be short- and long-term, local, and negative. The small increase in other materials, coupled with the nature of those materials, indicate that the potential impacts would be similar to those under the No Action Alternative. Chemical, physical, or biological changes in sediment or water quality would not be detectable.

3.1.3.4.7.3 Alternative 2

Under Alternative 2, approximately 34,064 items composed of other materials would be expended, a 10 percent increase compared to the No Action Alternative. Within the Study Area, approximately 86 percent (29,414 items) would be expended in SOCAL Range Complex during testing activities, with the remaining 14 percent (4,650 items) expended in HRC.

Training Activities

Under Alternative 2, the number of training activities and expended training items would be the same as under Alternative 1. Therefore, the other materials in training items would have the same impacts as they would under Alternative 1.

Testing Activities

Under Alternative 2, the number of testing items composed of other materials would increase to 664 items per year. These items would consist of chaff cartridges (83 percent) and marine markers and flares (17 percent). The potential impacts of other materials on sediment and water quality would be short- and long-term, local, and negative. The small increase in other materials, coupled with the nature of those materials, indicate that the potential impacts would be similar to those under the No Action Alternative. Chemical, physical, or biological changes in sediment or water quality would not be detectable.

3.1.3.4.7.4 Summary and Conclusions for Other Materials

Other military expended materials include plastics, marine markers, flares, and chaff. Some expended plastics from training and testing activities are unavoidable because they are used in ordnance or targets. Targets, however, would typically be recovered following training and testing activities. Chaff fibers are composed of non-reactive metals and glass, and would be dispersed by ocean currents as they float and slowly sink toward the bottom. The fine, neutrally buoyant chaff streamers would act like particulates in the water, temporarily increasing the turbidity of the ocean’s surface. The chaff fibers would quickly disperse and turbidity readings would return to normal.

3.1.4 Summary of Potential Impacts (Combined Impact of All Stressors) on Sediments and Water Quality

The stressors that may impact sediment and water quality include explosives and explosion byproducts, metals, chemicals other than explosives, and other military expended materials.

3.1.4.1 No Action Alternative

When considered together, the impact of the four stressors would be additive. Under the No Action Alternative, chemical, physical, or biological changes in sediment or water quality would not be detectable, and would be below or within existing conditions or designated uses. This conclusion is based on the following reasons:

- Although individual training and testing activities may occur within a fairly small area, overall military expended materials and activities are widely dispersed in space and time.
- When multiple stressors occur at the same time, it is usually for a brief period.
- Many components of expended materials are inert or corrode slowly.
- Numerically, most of the metals expended are small- and medium-caliber projectiles, metals of concern comprise a small portion of the alloys used in expended materials, and metal corrosion is a slow process that allows for dilution.
- Most of the components are subject to a variety of physical, chemical, and biological processes that render them benign.
- Potential areas of negative impacts would be limited to small zones adjacent to the explosive, metals, or chemicals other than explosives.
- The failure rate is low for explosives and materials with propellant systems, limiting the potential impacts from the chemicals other than explosives involved.

3.1.4.2 Alternative 1

Under Alternative 1, when considered separately, the impacts of the four stressors would not be additive:

- The impact of chemicals other than explosives and other materials on sediment and water quality would be short- and long-term and local. Chemical, physical, or biological changes in sediment or water quality would not be detectable, and would be below or within existing conditions or designated uses.
- The impact of explosives, explosion byproducts, and metals on sediment and water quality would also be short- and long-term and local. However, chemical, physical, or biological changes in sediment or water quality would be measurable, but below applicable standards and guidelines, and would be below or within existing conditions or designated uses.

When considered together, the impact of the four stressors would be additive. Chemical, physical, or biological changes in sediment or water quality would be measurable, but would still be below applicable standards and guidelines. Although most types of expended materials would increase, some considerably, over the No Action Alternative, this conclusion is based on the reasons provided under the No Action Alternative.

3.1.4.3 Alternative 2

Under Alternative 2, when considered separately, the impact of the four stressors on sediment and water quality would be the same as discussed under Alternative 1 because the types and amounts of military expended materials are similar under the two alternatives.

When considered together, the impact of the four stressors would be additive, and changes in sediment or water quality would be measurable, but would still be below applicable standards and guidelines. Because the types and amounts of military expended materials are similar under Alternatives 1 and 2, the reasons for this conclusion are the same as those discussed under the No Action Alternative.

REFERENCES

Agency for Toxic Substances and Disease Registry. (1995). Toxicological Profile for Otto Fuel II and Its Components. Atlanta, GA: Public Health Service, U.S. Department of Health and Human Services.

Agency for Toxic Substances and Disease Registry. (1999). Toxicological Profile for Mercury. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Agency for Toxic Substances and Disease Registry. (2000). Toxicological Profile for Polychlorinated Biphenyls (PCBs). U.S. Department of Health and Human Services, Public Health Service. November.

Agency for Toxic Substances and Disease Registry. (2005). Public Health Assessment for Pearl Harbor Naval Complex, Pearl Harbor, Hawaii. EPA Facility ID: HI4170090076. December 28.

Agency for Toxic Substances and Disease Registry. (2007). Toxicological Profile for Lead. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

Agency for Toxic Substances and Disease Registry. (2008). Toxicological Profile for Perchlorates. U.S. Department of Health and Human Services, Public Health Service. September 2008.

Alexander, M. (1977). Introduction to Soil Microbiology. New York: John Wiley & Sons, Inc.

American Conference of Governmental Industrial Hygienists (1994-1995). Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Presented at the American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio.

Anderson, B., Nicley, P., Philips, B., and Hunt, J. (2004). Sediment Quality Assessment Study at the B Street/Broadway Piers, Downtown Anchorage, and Switzer Creek, San Diego Bay. Phase I Final Report. March 2004.

Anderson, B., Hunt, J., and Phillips, B. (2005). TMDL Sediment Quality Assessment Study at the B Street/Broadway Piers, Downtown Anchorage, and Switzer Creek, San Diego. Phase II Final Report. June 2005.

Anderson, D. M., Gilbery, P. M. & Burkholde, J. M. (2002). Harmful Algal Blooms and Eutrophication: Nutrient Sources, Composition, and Consequences. Estuaries, 25(4), 704-726.

Ankley, G. T. (1996). Evaluation of metal/acid-volatile sulfide relationships in the prediction of metal bioaccumulation by benthic macroinvertebrates. *Environmental Toxicology and Chemistry, 15*, 2138-2146.

Anthony, K. R. N., Kline, D. I., Diaz-Pulido, G., Dove, S. & Heogh-Guldberg, O. (2008). Ocean acidification causes bleaching and productivity loss in coral reef builders. *Proceedings of the National Academy of Sciences of the United States of America, 105*(45), 17442-17446.

Arfsten, D.P., C.L. Wilson, and B.J. Spargo. (2002). Radio frequency chaff: The effects of its use in training on the environment. Ecotoxicology and Environmental Safety 53:1-11.

Bartelt-Hunt, S. L., D.R.U., K. & M.A., B. (2008). A Review of Chemical Warfare Agent Simulants for the Study of Environmental Behavior. Retrieved from http://www.epa.gov/ordnhsrc/pubs/paperCWAbehavior012208.pdf, 22 September 2008.

Bik, E. M., Eckburg, P. B., Gill, S. R., Nelson, K. E., Purdom, E. A., Francois, F., . . . D.A., R. (2006). Molecular analysis of the bacterial microbiota in the human stomach. *Proceedings of the National Academy of Science, 103*(3), 732-737.

Blue, S. R., Singh, V. R. & SaubolleM.A. (1995). Bacillus Licheniformis Bacteremia: Five Cases Associated with Indwelling Central Venous Catheters. *Clinical Infectious Diseases 20*(3), 629- 633.

Blumer, M., Ehrhardt, M. & Jones, J. H. (1973). The environmental fate of stranded crude oil. Deep-Sea Research, 20, 239-259.

Boehm, P. D. & Requejo, A. G. (1986). Overview of the Recent Sediment Hydrocarbon Geochemistry of Atlantic and Gulf Coast Outer Continental Shelf Environments. Estuarine, Coastal and Shelf Science, 23, 29-58.

Boesch, D. F., Anderson, D. M., Horner, R. A., Shumway, S. E., Tester, P. A. & Whitledge, T. E. (1997). Harmful algal blooms in coastal waters: Options for prevention, control and mitigation NOAA Coastal Ocean Program (Decision Analysis Series No. 10, pp. 46 & appendix). Silver Spring, Maryland: NOAA Coastal Ocean Office.

Borener, S. & Maugham, J. (1998). Volpe AtoN [Aid to Navigation] Battery Scientific Assessment *United States Coast Guard AtoN Battery Scientific Assessment, DOT NVTSC-CG-98-01*.

Bottger, S. A., McClintock, J. B. & Klinger, T. S. (2001). Effects of inorganic and organic phosphates on feeding, feeding absorption, nutrient allocation, growth and righting responses of the sea urchin *Lytechinus variegatus*. *Marine Biology, 138*, 741-751.

Boudreau, B. P. (1998). Mean mixed depth of sediments: the wherefore and the why. Limnology and Oceanography, 43(3), 524-526.

Brandao, P. F. B. & Bull, A. T. (2003). Nitrile hydrolysing activities of deep-sea and terrestrial mycolate actinomycetes. *Antonie van Leeuwenhoek, 84*, 89-98.

Breitbarth, E., E. P. Achterberg, M. V. Ardelan, A. R. Baker, E. Bucciarelli, F. Chever, P. L. Croot, S. Duggen, M. Gledhill, M. Hassellov, C. Hassler, L. J. Hoffmann, K. A. Hunter, D. A. Hutchins, J. Ingri, T. Jickells, M. C. Lohan, M. C. Nielsdottir, G. Sarthou, V. Schoemann, J. M. Trapp, D. R. Turner, and Y. Ye. (2010). Iron biogeochemistry across marine systems – progress from the past decade. *Biogeosciences* 7: 1075–1097.

Bricker, S. B., Clement, C. G., Pirhalla, D. E., Orlando, S. P. & Farrow, D. R. G. (1999). National Estuarine Eutrophication Assessment: Effects of Nutrient Enrichment in the Nation's Estuaries. Silver Spring, MD: NOAA National Ocean Serivice, Special Projects Office and the National Centers for Coastal Ocean Science.

Bruland, K. W. (1992). Complexation of cadmium by natural organic ligands in the Central North Pacific. Limnology and Oceanography, 37(5), 1008-1017.

Buchman, M. F. (2008). NOAA Screening Quick Reference Tables. NOAA OR&R Report 08-1. Office of Response and Restoration Division. National Oceanic and Atmospheric Administration. Retrieved from http://response.restoration.noaa.gov/book_shelf/122_NEW-SQuiRTs.pdf, 2011, February 18.

Byrne, R. H., Kump, L. R. & Cantrell, K. J. (1988). The influence of temperature and pH on trace metal speciation in seawater. Marine Chemistry, 25, 163-181.

Byrne, R. H. (1996). Specific problems in the measurement and interpretation of complexation phenomena in seawater. Pure and Applied Chemistry, 68(8), 1639-1656.

California Environmental Protection Agency. (2003). Red Phosphorus. Technical Support Document: Toxicology Clandestine Drug Labs/Methamphetamine, Volume 1, Number 12. Sacramento, CA: Office of Environmental Health Hazard Assessment.

Canadian Forces Maritime Experimental and Test Ranges. (2005). CFMETR Environmental Assessment. Environmental Sciences Group. Royal Military College of Canada. Kingston, Ontario.

Carberry, H. (2008). New Jersey's Reefs: An Underwater Metropolis. *New Jersey Fish and Wildlife Digest*.

Carmody, D. J., Pearce, J. B. & Yasso, W. E. (1973). Trace metals in sediments of New York Bight. Marine Pollution Bulletin, 4, 132-135.

Carr, R. S. & Nipper, M. (2003). Assessment of Environmental Effects of Ordnance Compounds and Their Transformation Products in Coastal Ecosystems. (Technical Report TR-2234-ENV). Port Hueneme, CA: Naval Facilities Engineering Service Center.

Centers for Disease Control and Prevention (2008). Aspergillosis (Aspergillus). General Information. Retrieved from http://www.cdc.gov/nczved/divisions/dfbmd/diseases/aspergillosis, 1 September 2011.

Centers for Disease Control and Prevention & National Institutes of Health. (2007). Biosafety in Microbiological and Biomedical Laboratories, Fifth Edition. Washington, DC: US Department of Health and Human Services, Public Health Service.

Center for Ocean Solutions. (2009). Pacific Ocean Synthesis: Scientific Literature Review of Coastal and Ocean Threats, Impacts, and Solutions. The Woods Center for the Environment, Stanford University. California.

Center for Research Information Inc. (2004). Health Effects of Project Shad Biological Agent: Bacillus Globigii [Bacillus licheniformis] [Bacillus subtilis var. niger] Bacillus atrophaeus]. National Academies.

Chang, G. C., Dickey, T. D. & Williams, A. J., III. (2001). Sediment resuspension over a continental shelf during Hurricanes Edouard and Hortense. Journal of Geophysical Research, 106(C5), 9517-9531.

Chapman, P. M., Wang, F., Janssen, C. R., Goulet, R. R. & Kamunde, C. N. (2003). Conducting Ecological Risk Assessments of Inorganic Metals and Metalloids: Current Status. Human and Ecogolical Risk Assessment, 9(4), 641-697.

Chaudhuri, S. K., O'Connor, S. M., Gustavson, R. L., Achenbach, L. A. & Coates, J. D. (2002). Environmental factors that control microbial perchlorate reduction. *Applied Environmental Microbiology, 68*, 4425-4430.

Chester, R. (2003). Marine Geochemistry (2nd ed.). Oxford, UK: Blackwell Science, Ltd.

Churchill, J. H. (1989). The effect of commercial trawling on sediment resuspension and transport over the Middle Atlantic Bight continental shelf. Continental Shelf Research, 9(9), 841-864.

City of San Diego. (2003). Annual Receiving Waters Monitoring Report for the South Bay Outfall.

Clausen, J. L., Scott, C. & Cramer, R. J. (2007). Development of Environmental Data for Navy, Air Force, and Marine Munitions. (ER-1480) U.S. Army Corps of Engineers. Prepared for Strategic Environmental Research and Development Program.

Cloern, J. E. (2001). Our evolving conceptual model of the coastal eutrophication problem. Marine Ecology Progress Series, 210, 223-253.

Coleman, J. M. & Prior, D. B. (1988). Mass wasting on continental margins. Annual Review of Earth Planet Science, 16, 101-119.

Cranshaw, W. S. (2006). Bacillus thuringiensis. Colorado State University Extension Service. Retrieved from http://www.ext.colostate.edu/pubs/insect/05556.html, 20 June 2013.

Crocker, F. H., Indest, K. J. & Fredrickson, H. L. (2006). Biodegradation of the cyclic nitramine explosives RDX, HMX, and CL-20. *Applied Microbiology and Biotechnology, 73*, 274-290.

Cruz-Uribe, O., Cheney, D. P. & Rorrer, G. L. (2007). Comparison of TNT removal from seawater by three marine macroalgae. *Chemsphere, 67*, 1469-1476.

Defense Science Board. (2003). Final Report of the Defense Science Board Task Force on Unexploded Ordnance. Washington, D.C.: Office of the Under Secretary of Defense For Acquisition, Technology, and Logisitics.

Demina, L. L. & Galkin, S. V. (2009). Geochemical features of heavy metal bioaccumulation in the Guaymas Basin of the Gulf of California. Oceanology, 49(5), 697-706.

Department of Defense. (2003). Fact Sheet Deseret Test Center Project SHAD Half Note. Office of the Assistant Secretary of Defense (Health Affairs) Deployment Health Support Directorate. Retrieved from http://mcm.dhhq.health.mil/Libraries/CBexposuresDocs/half_note.sflb.ashx, 20 June 2013.

DeWeerdt, S. (2002). The World's Toughest Bacterium. Retrieved from http://www.genomenewsnetwork.org/articles/07_02/deinococcus.shtml, July 5, 2002.

Diaz, R. J. & Rosenberg, R. (1995). Marine benthic hypoxia: A review of its ecological effects and the behavioural responses of benthis macrofauna. Oceanograophy and Marine Biology: An Annual Review, 33, 245-303.

Doi, Y., Kanesawa, Y., Tanahashi, N. & Kumagai, Y. (1992). Bidegradation of microbial polyesters in the marine environment. Polymer Degradation and Stability, 36, 173-177.

Drzyzga, O. & Blotevogel, K. H. (1997). Microbial Degradation of Diphenylamine Under Anoxic Conditions. *Current Microbiology, 35*, 343-347.

Durrach, M. R., Chutjian, A. & Plett, G. A. (1998). Trace Explosives Signatures from World War II Unexploded Undersea Ordnance. *Environmental Science and Technology, 32*, 1354-1358.

Duursma, E. K. & Gross, M. G. (1971). Marine Sediments and Radioactivity Radioactivity in the Marine Environment (pp. 147-160). Washington, D.C.: National Academy of Sciences.

Edwards, K. P., Hare, J. A., Werner, F. E. & Blanton, B. O. (2006). Lagrangian circulation on the Southeast U.S. continental shelf: implications for larval dispersal and retention. Continental Shelf Research, 26(12-13), 1375-1394.

Eggleton, J. & Thomas, K. V. (2004). A review of factors affecting the release and bioavailability of contaminants during sediment disturbance events. Environment International, 30, 973-980.

Environmental Protection Agency. (1997). Attachment I-Final Risk Assessment of Bacillus subtilis. Retrieved from http://www.epa.gov/biotech_rule/pubs/pdf/fra009.pdf, 20 June 2013.

Environmental Protection Agency. (2006). *National guidance: Best management practices for preparing vessels intended to create artificial reefs*. Prepared by U.S. Environmental Protection Agency and the U.S. Maritime Administration.

Environmental Protection Agency. (2008). Alternatives to HFC-134a in mobile air conditioners. Retrieved from http://www.epa.gov/cpd/mac/alternatives.

European Flame Retardants Association. Flame Retardant Fact Sheet, Red Phosphorus (RP). Retrieved from http://www.cefic-efra.com/Objects/2/Files/RedPhosphorusFactSheet.pdf as accessed on 2011, February 24.

Fabry, V. J., Seibel, B. A., Feely, R. A. & Orr, J. C. (2008). Impacts of ocean acidification on marine fauna and ecosystem processes. ICES Journal of Marine Science, 65(3), 414-432.

Farrell, R. E. & Siciliano, S. D. (2007). Environmental Effects of Radio Frequency (RF) Chaff Released during Military Training Exercises: A Review of the Literature. Prepared for Goose Bay Office of the Department of National Defense.

Fitzgerald, W. F., Lamborg, C. H. & Hammerschmidt, C. R. (2007). Marine Biogeochemical Cycling of Mercury. Chemical Reviews, 107, 641-662.

Fisheries Research Services Report. (1996). Surveys of the Beaufort's Dyke Explosives Disposal Site, November 1995–July 1996. (Final Report No. 15/96). Aberdeen, Scotland: Marine Laboratory, Scottish Office Agriculture, Environmenta and Fisheries Department.

Fournier, E.W. and B.B. Brady. (2005). Perchlorate Leaching from Solid Rocket Motor Propellant in Water. Journal of Propulsion and Power, Vol. 21, No. 5, September–October 2005.

Geiselbrecht, A. D., Hedlund, B. P., Tichi, M. A. & Staley, J. T. (1998). Isolation of Marine Polycyclic Aromatic Hyrocarbon (PAH)-Degrading Cycloclasticus Strains from the Gulf of Mexico and Comparison of Their PAH Degradation Ability with that of Puget Sound Cycloclasticus Strains. Applied and Environmental Microbiology, 64(12), 4703-4710.

Gosselin, R. E., Smith, R. P. & Hodge, H. C. (1984). Clinical Toxicology of Commercial Products (5th ed.). Baltimore: Williams and Wilkins.

Haderlein, S. B., Weissmahr, K. & Schwarzenbach. (1996). Specific Adsorption of Nitroaromatic Explosives and Pesticides to Clay Minerals. *Environmental Science and Technology, 20*, 612-622.

Hameedi, M. J., Pait, A. S. & Warner, R. A. (2002). Environmental Contaminant Monitoring in the Gulf of Maine. Silver Spring, Maryland: Center for Coastal Monitoring and Assessment, National Oceanic and Atmospheric Administration.

Hawaii Department of Health. (2000). Hawaii's Implementation Plan for Polluted Runoff Control, Appendix F: Detailed Descriptions of Hawaii's 18 Water Quality Limited Segments. Hawaii Department of Business and Department of Health. July.

Hawaii Department of Health. (2008). 2006 State of Hawaii Water Quality Monitoring and Assessment Report: Integrated Report to the U.S. Environmental Protection Agency and the U.S. Congress Pursuant to Sections §303(d) and §305(b), Clean Water Act (P.L. 97-117). Honolulu, Hawaii.

Hawaii Department of Health. (2009). Water Quality Standards. Amendment and Compilation of Chapter 11-54 Hawaii Administrative Rules.

Hawaii Undersea Military Munitions Assessment. (2010). Final Investigation Report HI-05 South of Pearl Harbor, O'ahu, Hawai'i. Prepared by University of Hawai'i at Monoa and Environet, Inc. Honolulu, HI. Prepared for The National Defense Center for Energy and Environment.

Hazardous Substances Data Bank. (2008a). Acetic acid. Retrieved from http://toxnet.nlm.nih.gov/cgibin/ sis/htmlgen?HSDB, August 19, 2011.

Hazardous Substances Data Bank. (2008b). Triethyl phosphate. Retrieved from http://toxnet.nlm.nih.gov/cgibin/ sis/htmlgen?HSDB, August 19, 2011.

Hazardous Substances Data Bank. (2008c). 1,1,1,2-Tetrafluoroethane. Retrieved from http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB, August 19, 2011.

Hedges, J. I. & Oades, J. M. (1997). Comparative organic geochemistries of soils and marine sediments. Organic Geochemistry, 27(7/8), 319-361.

Helly, J. J. & Levin, L. A. (2004). Global distribution of naturally occuring marine hypoxia on continental margins. Deep-Sea Research I, 51, 1159-1168.

Ho, T. Y., Wen, L. S., You, C. F. & Lee, D. C. (2007). The trace-metal composition of size-fractionated plankton in the South China Sea: biotic versus abiotic sources. Limnology and Oceanography, 52(5), 1776-1788.

Hoffsommer, J. C., Glover, D. J. & Rosen, J. M. (1972). Analysis of Explosives in Sea Water and in Ocean Floor Sediments and Fauna. Silver Spring, MD: Naval Ordnance Laboratory.

Hughes, T. P. & Connell, J. H. (1999). Multiple stressors on coral reefs; a long-term perspective. *Limnology and Oceanography, 44*(3, part 2), 932-940.

Howarth, M. J., Simpson, J. H., Sundermann, J. & Van Haren, H. (2002). Processes of Vertical Exchange in Shelf Seas (PROVESS). Journal of Sea Research, 47(199-208).

Hullar, T.L., S.L. Fales, H.F. Hemond, P. Koutrakis, W.H. Schlesinger, R.R. Sobonya, J.M. Teal, & J.G. Watson. (1999). Environmental Effects of RF Chaff: A Select Panel Report to the Undersecretary of Defense for Environmental Security, NRL/PU/6110--99-389, Naval Research Laboratory.

Jones, K. C. & de Voogt, P. (1999). Persistent organic pollutants (POPs): state of the science. Environmental Pollution, 100, 209-221.

Juhasz, A. L. & Naidu, R. (2007). Explosives: Fate, Dynamics, and Ecological Impact in Terrestrial and Marine Environments. *Reviews of Environmental Contamination and Toxicology, 191*, 163-215.

Kalmaz, E. V. & Kalmaz, G. D. (1979). Transport, Distribution and Toxic Effects of Polychlorinated Biphenyls in Ecosystems: Review. *Ecological Modelling, 6*, 223-251.

Keller, A. A., Fruh, E. L., Johnson, M. M., Simon, V. & McGourty, C. (2010). Distribution and abundance of anthropogenic marine debris along the shelf and slope of the US West Coast. Marine Pollution Bulletin, 60, 692-700.

Kletzin, A. & Adams, M. W. W. (1996). Tungsten in biological systems. *FEMS Microbiology Reviews, 18*(1), 5-63.

Koutsospyros, A., Braida, W., Christodoulatos, C., Dermatas, D. & Strigul, N. (2006). A review of tungsten: From environmental obscurity to scrutiny. *Journal of Hazardous Materials, 136*, 1-19.

Kszos, L. A., Beauchamp, J. J. & Stewart, A. J. (2003). Toxicity of lithium to three freshwater organisms and the antagonistic effect of sodium. Ecotoxicology, 12(5), 427-437.

Kvenvolden, K. A. & Cooper, C. K. (2003). Natural seepage of crude oil into the marine environment. Geo-Marine Letter, 23, 140-146.

Law, K. L., Moret-Ferguson, S., Maximenko, N. A., Proskurowski, G., Peacock, E. E., Hafner, J. & Reddy, C. M. (2010). Plastic Accumulation in the North Atlantic Subtropical Gyre. Science, 329(3), 1185-1188.

Lewis, M. A., Moore, J. C., Goodman, L. R., Patrick, J. M., Stanley, R. S., Roush, T. H. & Quarles, R. L. (2001). The effects of urbanization on the chemical quality of three tidal bayous in the Gulf of Mexico. *Water, Air, and Soil Pollution, 127*, 65–91.

Lewis, R. J. (1999). Sax's Dangerous Properties of Industrial Materials (10th ed., Vol. 1 to 3). New York: John Wiley & Sons, Inc.

Li, M., Zhong, L., Boicourt, W., Zhang, S. & Zhang, D. L. (2006). Hurricane-induced storm surges, currents and destratification in a semi-enclosed bay. Geophysical Research Letters, 33, 4.

Li, J., Ren, J., Zhang, J. & Liu, S. (2008). The distribution of dissolved aluminum in the Yellow and East China seas. Journal of the Ocean University of China, 7(1), 48-54.

Libes, S. M. (2009). Introduction to Marine Biogeochemistry (2nd ed.). London, UK: Elsevier.

Logan, B. E., Wu, J. & Unz, R. F. (2001). Biological Perchlorate Reduction in High-salinity Solutions. *Water Resources, 35*(12), 3034-3038.

Long, E. R., MacDonald, D. D., Smith, S. L. & Calder, F. D. (1995). Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environmental Management, 19(1), 81–97.

Lynch, J. C., Brannon, J. M. & Delfino, J. J. (2002). Dissolution rates of three high explosive compounds: TNT, RDX, and HMX. *Chemosphere, 47*(7), 725-734.

Mackay, D. & McAuliffe, C. D. (1988). Fate of Hydrocarbons Discharged at Sea. Oil & Chemical Pollution, 5, 1-20.

Mann, K. H. & Lazier, J. R. N. (1996). Dynamics of Marine Ecosystems: Biological-Physical Interactions in the Oceans (2nd ed.). Boston, Massechusetts: Blackwell Scientific Publications.

Martinelango, P. (2006). Oxalate and Perchlorate: Two Trace Components in the Environment. [Ph.D Dissertation].

Mato, Y., Isobe, T., Takada, H., Kanehiro, H., Ohtake, C. & Kaminuma, T. (2001). Plastic resin pellets as a transport medium for toxic chemicals in the marine environment. Environmental Science and Technology, 35(2), 318-324.

McAlack, J. W. & Schneider, J. P. W. (2009). Two-year inhalation study with ethane, 1,1- difluoro (FC-152a) in rats. E.I. Du Pont de Nemours and Co., Inc. Haskell Laboratory for Toxicology and Industrial Medicine, Newark, DE. Haskell Lab.

McCain, B.B., D.W. Brown, S.-L. Chan, J.T. Landahl, W.D. MacLeod, Jr., M.M. Krahn, C.A. Sloan, K.L. Tilbury, S.M. Pierce, D.G. Burrows, and U. Varanasi. (2000). National benthic surveillance project: Pacific Coast. Organic chemical contaminants, cycle I to vii (1984-90). U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-NWFSC-40, 121 p.

Means, J. C. (1995). Influence of salinity upon sediment-water partitioning of aromatic hydrocarbons. Marine Chemistry, 51, 3-16.

Meylan, W. M. & Howard, P. H. (1993). Computer estimation of the atmospheric gas-phase reaction rate of organic compounds with hydroxyl radicals and ozone. *Chemosphere, 26*, 2293-2299.

Milliman, J. D., Pilkey, O. H. & Ross, D. A. (1972). Sediments of the Continental Margin off the Eastern United States. Geological Society of America Bulletin, 83(5), 1315-1334.

Missile Technology Control Regime. (1996). Missile Technology Control Regime Annex Handbook.

Mitchell, C. P. & Gilmour, C. C. (2008). Methylmercury production in a Chesapeake Bay salt marsh. Journal of Geophysical Research, 113, 14.

Mitsch, W. J. & Gosselink, J. G. (2007). Wetlands (4th ed.). New York, New York: John Wiley and Sons.

Moeller, R., Horneck, G., Stackebrandt, E., Edwards, H. G. M. & Villar, S. E. J. (2004). Do endogenous pigments protect Bacillus spores against UV-radiation? Retrieved from http://adsabs.harvard.edu/full/2004ESASP.545..241M, March 26, 2008.

Monteil-Rivera, F., Paquet, L., Giroux, R. & Hawari, J. (2008). Contribution of Hydrolysis in the Abiotic Attenuation of RDX and HMX in Coastal Waters. *Journal of Environmental Quality, 37*, 858-864.

Monterey Bay Research Institute. (2010). Periodic Table of Elements in the Ocean The MBARI Chemical Sensor Program. Retrieved from www.mbari.org/chemsensor/pteo.htm as accessed on 2011, January 27.

Montgomery, M. T., Walker, S. W., Boyd, T. J., Hamdan, L. J. & Osburn, C. L. (2008). Bacterial Degradation of Nitrogenous Energetic Compounds (NEC) in Coastal Waters and Sediments. (NRL/MR/6110-08-9139). Washington, D.C.: Naval Research Laboratory, United States Navy.

Morel, F. M. M. & Price, N. M. (2003). The biogeochemical cycles of trace metals in the oceans. Science, 300, 994-947.

National Oceanic and Atmospheric Administration. (1999). Sediment Quality Guidelines Developed for the National Status and Trends Program.

National Oceanographic Data Center. (2011a). Coastal Water Temperature Guide: Pacific Coast: South. National Oceanographic and Atmospheric Administration. Website: http://www.nodc.noaa.gov/dsdt/cwtg/spac.html. Data Accessed: 21 September 2011.

National Oceanographic Data Center. (2011b). Coastal Water Temperature Guide: Hawaiian Island Coast. National Oceanographic and Atmospheric Administration. Website: http://www.nodc.noaa.gov/dsdt/cwtg/hawaii.html. Data Accessed: 21 September 2011.

Naval Facilities Engineering Command. (1993). Report on Continuing Action: Standard Range Sonobuoy Quality Assurance Program, San Clemente Island, California. San Diego, CA.

Naval Ocean Systems Center. (2002). Sediment Bioassays for NAVSTA San Diego Dredging Project. 49.

Neil, R. (2013), Naval Surface Warfare Center, Dahlgren. Simulant testing information session draft meeting minutes. email N. Gluch, Naval Sea Systems Command.

Nipper, M., Carr, R. S., Biedenbach, J. M., Hooten, R. L. & Miller, K. (2002). Toxicological and chemical assessment of ordnance compounds in marine sediments and porewaters. *Marine Pollution Bulletin, 44*, 789-806.

Nixon, S. W., Ammerman, J. W., Atkinson, L. P., Berounsky, V. M., Billen, G., Boicourt, W. C., Seitzinger, S. P. (1996). The fate of nitrogen and phosphorus at the land-sea margin of the North Atlantic. Ocean Biochemistry, 35, 141-180.

Nozaki, Y. (1997). A Fresh Look at Element Distribution in the North Pacific. EOS, Transactions of the American Geophysical Union, 78(21), 221. Retrieved from http://www.agu.org/pubs/eos-news/supplements/1995-2003/97025e.shtml.

O'Connell, K. P., Bucher, J. R., Anderson, P. E., Cao, C. J., Khan, A. S., Gostomski, M. V. & Valdes, J. J. (2006). Real-Time Fluorogenic Reverse Transcription-PCR Assays for Detection of Bacteriophage MS2. *Applied and Environmental Microbiology 72*(1), 478–483.

O'Connell, K. P., Khan, A. S., Anderson, P. E., Valdes, J. J. & Cork, S. (2002). Recombinant Antibodies for the Detection of Bacteriophage MS2 and Ovalbumin. Edgewood Chemical Biological Center, Aberdeen Proving Ground, Maryland.

Okeke, B. C., Giblin, T. & Frankenberger, W. T., Jr. (2002). Reduction of perchlorate and nitrate by salt tolerant bacteria. *Environmental Pollution, 118*, 357-363.

Organization for Economic Cooperation and Development. n.d. Triethylphosphate.

Pait, A. S., Mason, A. L., Whitall, D. R., Christensen, J. D. & Hartwell, S. I. (2010). Chapter 5: Assessment of Chemical Contaminants in Sediments and Corals in Vieques L. J. Bauer and M. S. Kendall (Eds.), *An Ecological Characterization of the Marine Resources of Vieques, Puerto Rico*. (pp. 101-150). Silver Spring, MD: NOAA MCCOS 110.

Pavlostathis, S. G. & Jackson, G. H. (2002). Biotransformation of 2,4,6-trinitrotoluene in a continuous-flow Anabaena sp. system. *Water Research, 36*, 1699-1706.

Pennington, J. C. & Brannon. (2002). Environmental fate of explosives. *Thermochimica Acta, 384*(1-2), 163-172.

Pennington, J.C., Jenkins, T.F., Ampleman, G., Thiboutot, S., Brannon, J.M., Hewitt, A.D., Dontsova, K. (2006). Distribution and Fate of Energetics on DoD Test and Training Ranges: Final Report. (ERDC TR-06-13). Arlington, VA: U.S. Army Corps of Engineers.

Petrisor, I. G. & Wells, J. T. (2008). Perchlorate – Is Nature the Main Manufacturer? Environmental Forensics. *Environmental Science and Technology, 26*, 105-129.

Port of San Diego. (2002). San Diego Harbor Deepening EIS/EIR. Prepared by USACOE November 25, 2002.

Powell, S., Franzmann, P. D., Cord-Ruwisch, R. & Toze, S. (1998). Degradation of 2-nitrodiphenylamine, a component of Otto Fuel II, by Clostridium spp. *Anaerobe, 4*, 95-102.

Rabalais, N. N., Turner, R. E. & Scavia, D. (2002). Beyond Science into Policy: Gulf of Mexico Hypoxia and the Mississippi River. BioScience, 52(2), 129-142.

Rand Corporation. (2005). Unexploded ordnance cleanup costs: implications of alternative protocols. Santa Monica, CA.

Regional Water Quality Control Board. (2007). Water Quality Control Plan for the San Diego Basin. http://www.swrcb.ca.gov/rwqcb9/. Accessed December 2008.

Rodacy, P. J., Walker, P. K., Reber, S. D., Phelan, J. & Andre, J. V. (2000). Explosive Detection in the Marine Environment and on Land Using Ion Mobility Spectroscopy. (Sandia Report SAD2000-0921). Albuquerque, NM: Sandia National Laboratory.

Rubel, G. O. (1989). Measurement of the Solubility of Methyl Salicylate in Aqueous Droplets Technical Report. Chemical Research Development and Engineering Center, Aberdeen Proving Ground, Maryland.

Sauer, T. C., Jr., Durell, G. S., Brown, J. S., Redford, D. & Boehm, P. D. (1989). Concentrations of Chlorinated Pesticides and PCBs in Microlayer and Seawater Samples Collected in Open-Ocean Waters off the U.S. East Coast and in the Gulf of Mexico. Marine Chemistry, 27, 235-257.

Schuster E., Dunn-Coleman, N., Frisvad, J. C. & Van Dijck, P. W. (2002). On the safety of Aspergillus niger – a review. *Applied Microbiology and Biotechnology 59*(4-5), 426–435.

Seiwell, H. R. (1934). The distribution of oxygen in the western basin of the North Atlantic. Papers in Physical Oceanography and Meteorology, 3(1).

Seitzinger, A. T., Grasso, P. S., White, W. E., Stuempfle, A. K. & Birenzvige, A. (1990). Use of Methyl Salicylates as a Trialing Chemical Agent Simulant. US Army Armament Munitions Chemical Command, Aberdeen Proving Ground, Maryland. Prepared by Chemical Research Development and Engineering Center.

Shah, A. A., Hasan, F., Hameed, A. & Ahmed, S. (2008). Biological degradation of plastics: a comprehensive review. Biotechnology Advances, 26, 246-265.

Sheavly, S. B. (2007). National Marine Debris Monitoring Program: Final Program Report, Data Analysis and Summary. Washington, D.C.: Ocean Conservancy. Prepared for U.S. Environmental Protection Agency.

Sheavly, S. B. (2010). National Marine Debris Monitoring Program, Lessons Learned. (EPA 842-R-10-001). Prepared for U.S. Environmental Protection Agency Oceans and Coastal Protection Division Marine Pollution Control Branch.

Singh, R., Soni, P., Kumar, P., Purohit, S. & Singh, A. (2009). Bidegradation of high explosive production effluent containing RDX and HMX by dentrifying bacteria. *World Journal of Microbiology and Biotechnology, 25*, 269-275.

Sittig, M. (2002). Handbook of Toxic and Hazardous Chemicals and Carcinogens (4th ed.). Norwich: Noyes Publications.

Spencer, K. L. & MacLeod, C. L. (2002). Distribution and partitioning of heavy metals in estuarine sediment cores and implications for the use of sediment quality standards. Hydrology and Earth Systems Sciences, 6(6), 989-998.

Southern California Coastal Water Research Project. (2003). Southern California Bight 1998, regional monitoring program, executive summary.

Srokosz, M.A. (no date). Ocean Surface Salinity – The Why, What, and Whether. Remote Sensing Applications Development Unit. National Oceanography Centre, Southampton. University of Southampton and Natural Environmental Research Council.

State of California. (2003). An Ecological Assessment of San Diego Bay: A Component of the Bight '98 Regional Survey. Prepared for Regional Water Quality Control Board, San Diego Region. Prepared by City of San Diego. December 2003.

State of California. (2009). California Ocean Plan: Water Quality Control Plan for the Ocean Water of California. California Environmental Protection Agency.

Stevenson, C. (2011). Plastic Debris in the California Marine Ecosystem: A Summary of Current Research, Solution Strategies, and Data Gaps. University of Southern California Sea Grant. Synthetic Report. California Ocean Science Trust, Oakland, CA.

Stoffyn-Egli, P. & Machenzie, F. T. (1984). Mass balance of dissolved lithium in the oceans' *Geochemical et Cosmochimica Acta, 48*, 859-872.

Summers, J. K., Wade, T. L., Engle, V. D. & Malaeb, Z. A. (1996). Normalization of metal conentrations in estuarine sediments from the Gulf of Mexico. Estuaries, 19(581-594).

Sun, W. Q., Meng, M., Kumar, G., Geelhaar, L. A., Payne, G. F., Speedie, M. K. & Stacy, J. R. (1996). Biological denitration of propylene glycol dinitrate by Bacillus sp. ATCC 51912. *Applied Microbiology and Biotechnology, 45*, 525-529.

Systems Consultants, Inc. (1977). Effects of Aluminized Fiberglass on Representative Chesapeake Bay Marine Organisms. Prepared for Naval Research Laboratory, Washington, D.C.

Tanabe, S. & Tatsukawa, R. (1983). Vertical Transport and Residence Time of Chlorinated Hydrocarbons in the Open Ocean Column. Journal of the Oceanograhical Society of Japan, 39, 53-62.

Teuten, E. L., Rowland, S. J., Galloway, T. S. & Thompson, R. C. (2007). Potential for Plastics to Transport Hydrophobic Contaminants. Environmental Science and Technology, 41, 7759-7764.

Thompson, R. C., Olsen, Y., Mitchell, R. P., Davis, A., Rowland, S. J., John, A. W. G., Russell, A. E. (2004). Lost at Sea: Where Is All the Plastic? Science, 304(5672), 838.

Tsuchii, A. & Tokiwa, Y. (2006). Microbial Degradation of the Natural Rubber in Tire Tread Compound by a Strain of Nocardia. *Journal of Polymers and the Environment, 14*, 403-409.

Turekian, K. K. (1977). The fate of metals in the oceans. Geochimica et Cosmochimica Acta, 41, 1139-1144.

Turner, R. E. & Rabalais, N. N. (2003). Linking landscape and water quality in the Mississippi River Basin for 200 Years. BioScience, 53(6), 563-572.

United Nations Environmental Program. (1998). Triethylphosphate CAS N°: 78-40-0. Retrieved from http://www.inchem.org/documents/sids/sids/78400.pdf, 20 June 2013.

U.S. Air Force. (1994). *Technical reports on chaff and flares. Technical report No. 5: Laboratory analysis of chaff and flare materials.* Prepared for U.S. Air Force Headquarters Air Combat Command, Langley Air Force Base, VA.

U.S. Air Force. (1997). Environmental Effects of Self-Protection Chaff and Flares. Final Report. U.S. Air Force Air Combat Command, Langley Air Force Base, VA.

U.S. Army. (2003). Final Environmental Impact Statement for Activities Associated with Future Programs at US Army Dugway Proving Ground.

U.S. Army Corps of Engineers. (2002). Silver Strand Shoreline Final General Reevaluation Report.

U.S. Army Corps of Engineers. (2003). Estimates for Explosives Residue from the Detonation of Army Munitions. Cold Regions Research and Engineering Laboratory. ERDC/CRREL TR-03-16. September 2003.

U.S. Army Corps of Engineers. (2007). *Explosives residues resulting from the detonation of common military munitions: 2002-2006*. (ERDC/CRREL TR-07-2). Prepared by Cold Regions Research and Engineering Laboratory. Hanover, NH. Prepared for Strategic Environmental Research and Development Program. Arlington,VA.

U.S. Coast Guard. (1994). *Aids to navigation (AtoN) battery release reporting requirements*. (COMDTINST 16478.10).

U.S. Commission on Ocean Policy. (2004). An Ocean Blueprint for the 21st Century. (Final Report). Washington, D.C.

U.S. Department of the Navy. (1996a). Draft Environmental Assessment of the Use of Selected Navy Test Sites for Development Tests and Fleet Training Exercises of the MK46 and MK50 Torpedoes. (U) (CONFIDENTIAL). Program Executive Office Undersea Warfare, Program Manager for Undersea Weapons.

U.S. Department of the Navy. (1996b). Environmental Assessment of the Use of Selected Navy Test Sites for Development Tests and Fleet Training Exercises of the MK48 Torpedoes. (U) (CONFIDENTIAL). Program Executive Office Undersea Warfare, Program Manager for Undersea Weapons.

U.S. Department of the Navy. (1998). Environmental Assessment; MCON Project P-144, Explosive Ordnance Disposal Mobile Unit Three Waterfront Operations Facility. Naval Amphibious Base, Coronado. Naval Facilities Engineering Command, Southwest Division. June.

U.S. Department of the Navy. (1999). Scientific Management Decision Point (a) USEPA Step and 2/U.S. Navy Tier 1 Screening Ecological Risk Assessment, Pearl Harbor Sediment RI/FS – Section 2: Problem

Formulation. Comprehensive Long-Term Environmental Action Navy, Contract No. N62742-90-D-0019. Prepared by Ogden Environmental and Energy Services Co., Inc. Honolulu, Hawaii.

U.S. Department of the Navy. (2000). Quantifying In Situ Metal Contaminant Mobility in Marine Sediments. Technical Report 1826.

U.S. Department of the Navy. (2004). *Overseas environmental assessment for use of glacial acetic acid (GAA) and triethlyphosphate (TEP) as chemical warfare agent stimulants during testing of the joint services lightweight stand-off chemincal agent detector (JSLSCAD).*

U.S. Department of the Navy. (2006). Final environmental assessment, San Clemente Island wastewater treatment plant increase in maximum allowable discharge volume.

U.S. Department of the Navy. (2007). Overseas Environmental Assessment/Environmental Assessment for MK 48 Mod 6 Torpedo Exercises in Hawaiian Waters. Naval Undersea Warfare Center Division, Newport, Rhode Island. June-July 2007.

U.S. Department of the Navy (2008a). Atlantic Fleet Active Sonar Training Environmental Impact Statement/Overseas Environmental Impact Statement. Chapter 4: Environmental Consequences. Naval Facilities Engineering Command, Atlantic, Norfolk Virginia. December 2008.

U.S. Department of the Navy. (2008b). *Southern California Range Complex environmental impact statement/overseas environmental impact statement*. (Final). San Diego, CA: Naval Facilities Engineering Command Southwest.

U.S. Department of the Navy. (2009). Test Matrix and Simulant Releases and Results. Naval Surface Warfare Center Dahlgren Laboratory.

U.S. Department of the Navy. (2010a). Remedial Investigation Addendum, Pearl Harbor Sediment (Draft Final). Pearl Harbor Hawaii. Naval Facilities Engineering Command, Pacific. Contract Number N62742-03-D-1837, CTO 0034.

U.S. Department of the Navy. (2010b). *Water range assessment for the VACAPES Range Complex*. (Final Report). Prepared by Parsons, Norfolk, VA. Prepared for Naval Facilities Engineering Command, Atlantic Division.

U.S. Environmental Protection Agency. (1981). An Exposure and Risk Assessment for Cyanide. (EPA 440/4-85-008). Washington, D.C.: Office of Water Regulations and Standards.

U.S. Enivronmental Protection Agency. (1991). Technical Support Document for Water Quality-based Toxics Control. (EPA 505/2-90-001). Washington, D.C.: Office of Water.

U.S. Environmental Protection Agency. (1999). August 1999 SINKEX Letter of Agreement between the Environmental Protection Agency and the Navy.

U.S. Environmental Protection Agency. (2006). National Guidance: Best Management Practices for Preparing Vessels Intended to Create Artificial Reefs. Prepared by U.S. Environmental Protection Agency and the U.S. Maritime Administration.

U.S. Environmental Protection Agency. (2008a). National Coastal Condition Report III. Chapter 8: Coastal Condition of Alaska, Hawaii, and the Island Territories, Part 2 of 2. December 2008.

U.S. Environmental Protection Agency. (2008b). Interim Drinking Water Health Advisory For Perchlorate. (EPA 822-R-08-025).

U.S. Environmental Protection Agency. (2008c). Toxicity Characteristic Leaching Procedure (TCLP) for VOCs, SVOCs, Chlorinated Pesticides and Herbicides, and Metals by SW-846 Method 1311 and Analysis.

U.S. Environmental Protection Agency. (2009). National Recommended Water Quality Criteria.

U.S. Environmental Protection Agency. (2010). Water Quality Criteria – Suspended and Bedded Sediments. Appendix 3.

U.S. Environmental Protection Agency. (2011). Palos Verdes Shelf. Region 9 Superfund. Date Accessed: 09 November 2011. Website: http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/3dec8ba3252368428825742600743733/e61d5255780dd68288257007005e9422!OpenDocument.

U.S. Environmental Protection Agency. (2012). National Coastal Condition Report IV. EPA-842-R-10-003. Office of Research and Development/Office of Water. April 2012.

U.S. Patent Office (2003). US Patent Chemical agent simulant training composition 6566138. Retrieved from http://www.patentstorm.us/patents/6566138-description.html, August 29, 2011.

Valette-Silver, N. J. (1993). The Use of Sediment Cores to Reconstruct Historical Trends in Contamination of Estuarine and Coastal Sediments. Estuaries, 16(3B), 577-588.

Van Wijk, D.J. & Hutchinson, T.H. (1995). The ecotoxicity of chlorate to aquatic organisms: a critical review. *Exotoxicology and Envrionmental Safety, 32,* 244-253.

Verschueren, K. (2001). Handbook of Environmental Data on Organic Chemicals (4th ed., Vol. 1-2). New York: John Wiley & Sons, Inc.

Vitousek, P. M. & Howarth, R. W. (1991). Nitrogen Limitation on Land and in the Sea: How Can it Occur? *Biogeochemistry, 13*(2), 87-115.

Walker, J. E. & Kaplan, D. L. (1992). Biological degradation of explosives and chemical agents. *Biodegradation, 3*, 369-385.

Walker, S. W., Osburn, C. L., Boyd, T. J., Hamdan, L. J., Coffin, R. B., Smith, J. P., Montgomery, M. (2006). Mineraliztion of 2,4,6-Trinitrotoluene (TNT) *Coastal Waters and Sediments*.

Wallace, G. T., Hoffman, G. L., Jr. & Duce, R. A. (1977). The influence of organic matter and atmospheric deposition on the particulate trace metal concentration of northwest Atlantic surface seawater. Marine Chemistry, 5, 143-170.

Wang, W. X., Yan, Q. L., Fan, W. & Xu, Y. (2002). Bioavailability of sedimentary metals from a contaminated bay. Marine Ecology Progress Series, 240, 2-38.

Wiseman, W. J. & Garvine, R. W. (1995). Plumes and coastal currents near large river mouths. Estuaries, 18(3), 509-517.

World Health Organization/International Program on Chemical Safety. (1998). Concise International Chemical Assessment Document No. 11. 1,1,1,2-Tetrafluoroethane. Retrieved from https://apps.who.int/dsa/cicads.htm, 20 June 2013.

Wren, P. A. & Leonard, L. A. (2005). Sediment transport on the mid-continental shelf in Onslow Bay, North Carolina during Hurricane Isabel. Estuarine, Coastal and Shelf Science, 63, 43-56.

Wu, J. & Boyle, E. A. (1997). Lead in the western North Atlantic Ocean: completed repsonse to leaded gasoline phaseout. Geochimica et Cosmochimica Acta, 61(15), 3279-3283.

Wurl, O. & Obbard, J. P. (2004). A review of pollutants in the sea-surface microlayer (SML): a unique habitat for marine organisms. Marine Pollution Bulletin, 48, 1016-1030.

Young, G. A. & Willey, R. A. (1977). Techniques for Monitoring the Environmental Effects of Routine Underwater Explosion Tests. Naval Surface Weapons Center.

Zehr, J. P. & Ward, B. B. (2002). Nitrogen Cycling in the Ocean: New Perspectives on Processes and Paradigms. Applied Environmental Microbiology, 68(3), 1015-1024.

Zhao, J. S., Greer, C. W., Thiboutot, S., Ampleman, G. & Hawari, J. (2004). Bidodegradation of the nitramine explosives hexahydro-1,3,5-triazine and octahydro-1,3,5,7-tetranitro. *Canadian Journal of Microbiology, 50*, 91-96.

3.2 Air Quality

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

This Page Intentionally Left Blank

3.2 AIR QUALITY

AIR QUALITY SYNOPSIS

The United States Department of the Navy considered all potential stressors, and the following have been analyzed for air quality:

- Criteria air pollutants
- Hazardous air pollutants

Preferred Alternative

- All reasonably foreseeable direct and indirect emissions of criteria air pollutants in nonattainment and maintenance areas do not equal or exceed applicable *de minimis* levels.
- The public would not be exposed to substantial concentrations of hazardous air pollutants.

3.2.1 INTRODUCTION AND METHODS

3.2.1.1 Introduction

Air pollution can threaten public health and damage the environment. Congress passed the Clean Air Act (CAA) and its amendments, which set regulatory limits on air pollutant emissions and help to ensure basic public health and environmental protection from air pollution. Air pollution damages trees, crops, other plants, lakes, and animals. In addition to damaging the natural environment, air pollution damages the exteriors of buildings, monuments, and statues. It can create haze or smog that reduces visibility in national parks and cities or that interferes with aviation.

Air quality is defined by atmospheric concentrations of specific air pollutants—pollutants the United States (U.S.) Environmental Protection Agency (EPA) determined may affect the health or welfare of the public. The six major air pollutants of concern, called "criteria pollutants," are: carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), suspended particulate matter (PM), and lead (Pb). Suspended particulate matter is further categorized as particulates less than or equal to 10 microns in diameter (PM_{10}) and fine particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$). The EPA established National Ambient Air Quality Standards for these criteria pollutants.

In addition to the six criteria pollutants, the EPA designated 188 substances as hazardous air pollutants under the federal CAA. Hazardous air pollutants are air pollutants known to cause or suspected of causing cancer or other serious health effects, or adverse environmental effects (U.S. Environmental Protection Agency 2010b). The State of Hawaii recognizes only the 188 federally designated hazardous air pollutants. The State of California regulates over 250 toxic air contaminants, including all of the federally designated hazardous air pollutants.

National Ambient Air Quality Standards have not been established for hazardous air pollutants. However, the EPA has developed rules that limit emissions of hazardous air pollutants from specific industrial sources. These emissions control standards are known as "maximum achievable control technologies" and "generally achievable control technologies." They are intended to achieve the maximum degree of reduction in emissions of hazardous air pollutants, taking into consideration the cost of emissions control, non-air quality health and environmental impacts, and energy requirements. Examples of hazardous air pollutants include benzene, which is found in gasoline; perchloroethylene, which is emitted by some dry cleaning facilities; and methylene chloride, a solvent and paint stripper used in some industries. Hazardous air pollutants are regulated under the CAA's National Emission Standards for Hazardous Air Pollutants, which apply to specific sources of hazardous air pollutants; and under the Urban Air Toxics Strategy, which applies to area sources.

Air pollutants are classified as either primary or secondary pollutants, based on how they are formed. Primary air pollutants are emitted directly into the atmosphere from the source, and retain their chemical form. Examples of primary pollutants are the CO produced by a power plant burning fuel and volatile organic compounds emitted by a dry cleaner (U.S. Environmental Protection Agency 2010b). Secondary air pollutants are formed through atmospheric chemical reactions – reactions that usually involve primary air pollutants (or pollutant precursors) and normal constituents of the atmosphere (U.S. Environmental Protection Agency 2010b). O_3, a major component of photochemical smog that is the greatest air quality concern in California, is a secondary air pollutant. O_3 precursors consist of two groups of chemicals: nitrogen oxides (NO_X) and organic compounds. NO_X consists of nitric oxide (NO) and NO_2. Organic compound precursors of O_3 are routinely described by various terms, including volatile organic compounds, reactive organic compounds, and reactive organic gases. Finally, some air pollutants are a combination of primary and secondary pollutants. PM_{10} and $PM_{2.5}$ are both emitted as primary air pollutants by various mechanical processes (e.g., abrasion, erosion, mixing, or atomization) or combustion processes. They are generated as secondary air pollutants through chemical reactions or through the condensation of gaseous pollutants into fine aerosols.

Air pollutant emissions are reported as the rate (by weight or volume) at which specific compounds are emitted into the atmosphere by a source. Typical units for emission rates from a source are pound (lb.) per thousand gallons of fuel burned, lb. per U.S. ton of material processed, and grams (g) per vehicle-mile (mi.) traveled.

Ambient air quality is reported as the atmospheric concentrations of specific air pollutants at a particular time and location. The units of measure are expressed as a mass per unit volume (e.g., micrograms per cubic meter [$\mu g/m^3$] of air) or as a volume fraction (e.g., parts per million [ppm] by volume).The ambient air pollutant concentrations measured at a particular location are determined by the pollutant emissions rate, local meteorology, and atmospheric chemistry. Wind speed and direction, the vertical temperature gradient of the atmosphere, and precipitation patterns affect the dispersal, dilution, and removal of air pollutant emissions from the atmosphere.

3.2.1.2 Methods

Section 176(c)(1) of the CAA, commonly known as the General Conformity Rule, requires federal agencies to ensure that their actions conform to applicable implementation plans for achieving and maintaining the National Ambient Air Quality Standards for criteria pollutants.

3.2.1.2.1 Application of Regulatory Framework

3.2.1.2.1.1 National Ambient Air Quality Standards

National Ambient Air Quality Standards for criteria pollutants are set forth in Table 3.2-1. Areas that exceed a standard are designated as “nonattainment” for that pollutant, while areas that are in compliance with a standard are in “attainment” for that pollutant. An area may be nonattainment for some pollutants and attainment for others simultaneously.

Table 3.2-1: National Ambient Air Quality Standards

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide (CO)	9 ppm (10 mg/m^3)	8-hour(1)	None	
	35 ppm (40 mg/m^3)	1-hour(1)	None	
Lead (Pb)	0.15 $\mu g/m^3$ (2)	Rolling 3-month average	Same as Primary	
Nitrogen Dioxide (NO_2)	53 ppb(3)	Annual (arithmetic mean)	Same as Primary	
	100 ppb	1-hour(4)	None	
Particulate Matter (PM_{10})	150 $\mu g/m^3$	24-hour(5)	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 $\mu g/m^3$	Annual(6) (arithmetic mean)	Same as Primary	
	35 $\mu g/m^3$	24-hour(7)	Same as Primary	
Ozone (O_3)	0.075 ppm (2008 std)	8-hour(8)	Same as Primary	
	0.08 ppm (1997 std)	8-hour(9)	Same as Primary	
	0.12 ppm	1-hour(10)	Same as Primary	
Sulfur Dioxide (SO_2)	0.03 ppm(11)(1971 std)	Annual (arithmetic mean)	0.5 ppm	3-hour(1)
	0.14 ppm(11) (1971 std)	24-hour(1)		
	75 ppb(12)	1-hour	None	

Source: U.S. Environmental Protection Agency 2011b, Updated 4 August 2011.

Notes: mg/m^3 = milligrams/cubic meter, $\mu g/m^3$ = micrograms/cubic meter, ppm = parts per million, ppb = parts per billion, std = standard

(1) Not to be exceeded more than once per year.

(2) Final rule signed 15 October 2008. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

(3) The official level of the annual nitrogen dioxide standard is 0.053 parts per million (ppm), equal to parts per billion (53 ppb), which is shown here for the purpose of a clearer comparison with the 1-hour standard.

(4) To attain this standard, the three-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective 22 January 2010).

(5) Not to be exceeded more than once per year on average over three years.

(6) To attain this standard, the three-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 micrograms per cubic meter ($\mu g/m^3$).

(7) To attain this standard, the three-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu g/m^3$ (effective 17 December 2006).

(8) To attain this standard, the three-year average of the fourth-highest daily maximum 8-hour average O_3 concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective 27 May 2008).

(9) (a) To attain this standard, the three-year average of the fourth-highest daily maximum 8-hour average O_3 concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as the U.S. Environmental Protection Agency (EPA) undertakes rulemaking to address the transition from the 1997 O_3 standard to the 2008 O_3 standard.
(c) The EPA is reconsidering these standards (established in March 2008).

(10) (a) The EPA revoked the 1-hour O_3 standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").
(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is $\leq$ 1.

(11) The 1971 sulfur dioxide standards remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

(12) Final rule signed 2 June 2010. To attain this standard, the three-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

States, through their air quality management agencies, are required to prepare and implement State Implementation Plans for nonattainment areas, which demonstrate how the area will meet the National Ambient Air Quality Standards. Areas that have achieved attainment may be designated as "maintenance areas," subject to maintenance plans showing how the area will continue to meet federal air quality standards. Nonattainment areas for some criteria pollutants are further classified, depending upon the severity of their air quality problem, to facilitate their management:

- O_3 – marginal, moderate, serious, severe, and extreme
- CO – moderate and serious
- PM – moderate and serious

The EPA delegates the regulation of air quality to the state once the state has an approved State Implementation Plan. The CAA also allows states to establish air quality standards more stringent than the National Ambient Air Quality Standards.

The Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area) is offshore of California and Hawaii, and some elements of the Proposed Action occur within or over state waters. The attainment status for most of the Study Area is unclassified because only areas within state boundaries are classified. The federal CAA has no provision for classifying waters outside of the boundaries of state waters. Air quality in adjacent onshore areas may be affected by emissions of air pollutants from Study Area sources; however, because of the prevailing onshore winds during certain seasons and at certain times of day. The National Ambient Air Quality Standards attainment status of adjacent onshore areas is considered in determining whether appropriate controls on air pollution sources in the adjacent offshore state waters are warranted.

3.2.1.2.1.2 Conformity Analyses in Nonattainment and Maintenance Areas

General Conformity Evaluation

Federal actions are required to conform with the approved State Implementation Plan for those areas of the United States that are designated as nonattainment or maintenance air quality areas for any criteria air pollutant under the CAA (40 Code of Federal Regulations [C.F.R.] §§ 51 and 93). The purpose of the General Conformity Rule is to demonstrate that the Proposed Action would not cause or contribute to a violation of an air quality standard and that the Proposed Action would not adversely affect the attainment and maintenance of federal ambient air quality standards. A federal action would not conform if it increased the frequency or severity of any existing violations of an air quality standard or delayed the attainment of a standard, required interim emissions reductions, or delayed any other air quality milestone. To ensure that federal activities do not impede local efforts to control air pollution, Section 176(c) of the CAA (42 U.S. Code [U.S.C.] § 7506(c)) prohibits federal agencies from engaging in or approving actions that do not conform to an approved State Implementation Plan. The emissions thresholds that trigger the conformity requirements are called *de minimis* thresholds.

Federal agency compliance with the General Conformity Rule can be demonstrated in several ways. The requirement can be satisfied by a determination that the Proposed Action is not subject to the General Conformity Rule, by a Record of Non-Applicability, or by a Conformity Determination. Compliance is presumed if the net increase in emissions from a federal action would be less than the relevant *de minimis* threshold. If net emissions increases exceed the *de minimis* thresholds, then a formal Conformity Determination must be prepared. *De minimis* thresholds are shown in Table 3.2-2.

Table 3.2-2: *De Minimis* Thresholds for Conformity Determinations

Pollutant	Nonattainment or Maintenance Area Type	*De Minimis* Threshold (TPY)
Ozone (VOC or NO_x)	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other areas outside an ozone transport region	100
Ozone (NO_x)	Marginal and moderate nonattainment inside an ozone transport region	100
	Maintenance	100
Ozone (VOC)	Marginal and moderate nonattainment inside an ozone transport region	50
	Maintenance within an ozone transport region	50
	Maintenance outside an ozone transport region	100
CO, SO_2 and NO_2	All nonattainment & maintenance	100
PM_{10}	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
$PM_{2.5}$	All nonattainment & maintenance	100
Lead (Pb)	All nonattainment & maintenance	25

Notes: NO_X = nitrogen oxides, Pb = lead, PM_{10} = particulate matter under 10 microns, SO_x = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

Source: U.S. Environmental Protection Agency 2011a

Certain U.S. Department of the Navy (Navy) training and testing activities occur in nonattainment or maintenance areas. These nonattainment and maintenance areas are identified by Air Basin or by Air Quality Control Region (federally designated areas within which communities share common air pollution problems). Two Air Basins in California (South Coast and San Diego; Figure 3.2-1) may be affected by Proposed Action training or testing activities. Coastal waters within 3 nautical miles (nm) of the coast are under the same air quality jurisdiction as the contiguous land area.

South Coast Air Basin (California)

The Proposed Action includes activities in South Coast Air Basin, which is classified as an extreme nonattainment area for the federal 8-hour O_3 standard, as a maintenance area for CO and NO_2, as a serious nonattainment area for PM_{10}, and as a nonattainment area for $PM_{2.5}$. The Proposed Action is required to demonstrate conformity with the approved State Implementation Plan. However, the General Conformity Rule exempts a federal action from the requirements of a full conformity demonstration for those criteria air pollutants for which emissions increases are below specific *de minimis* emissions thresholds. The *de minimis* thresholds for nonattainment and maintenance pollutants in South Coast Air Basin under the General Conformity Rule are shown in Table 3.2-2.

San Diego Air Basin (California)

The Proposed Action includes activities that occur in San Diego Air Basin, which is designated a marginal nonattainment area for the 2008 federal 8-hour O_3 standard and a maintenance area for CO.[1] The Proposed Action is required to demonstrate conformity with the approved State Implementation Plan. However, the General Conformity Rule states that a federal action is exempt from the requirements of a full conformity demonstration for those criteria air pollutants for which emissions increases are below

[1] San Diego County Air Pollution Control District is requesting redesignation of the county to attainment of the 1997 8-hour ozone National Ambient Air Quality Standards.

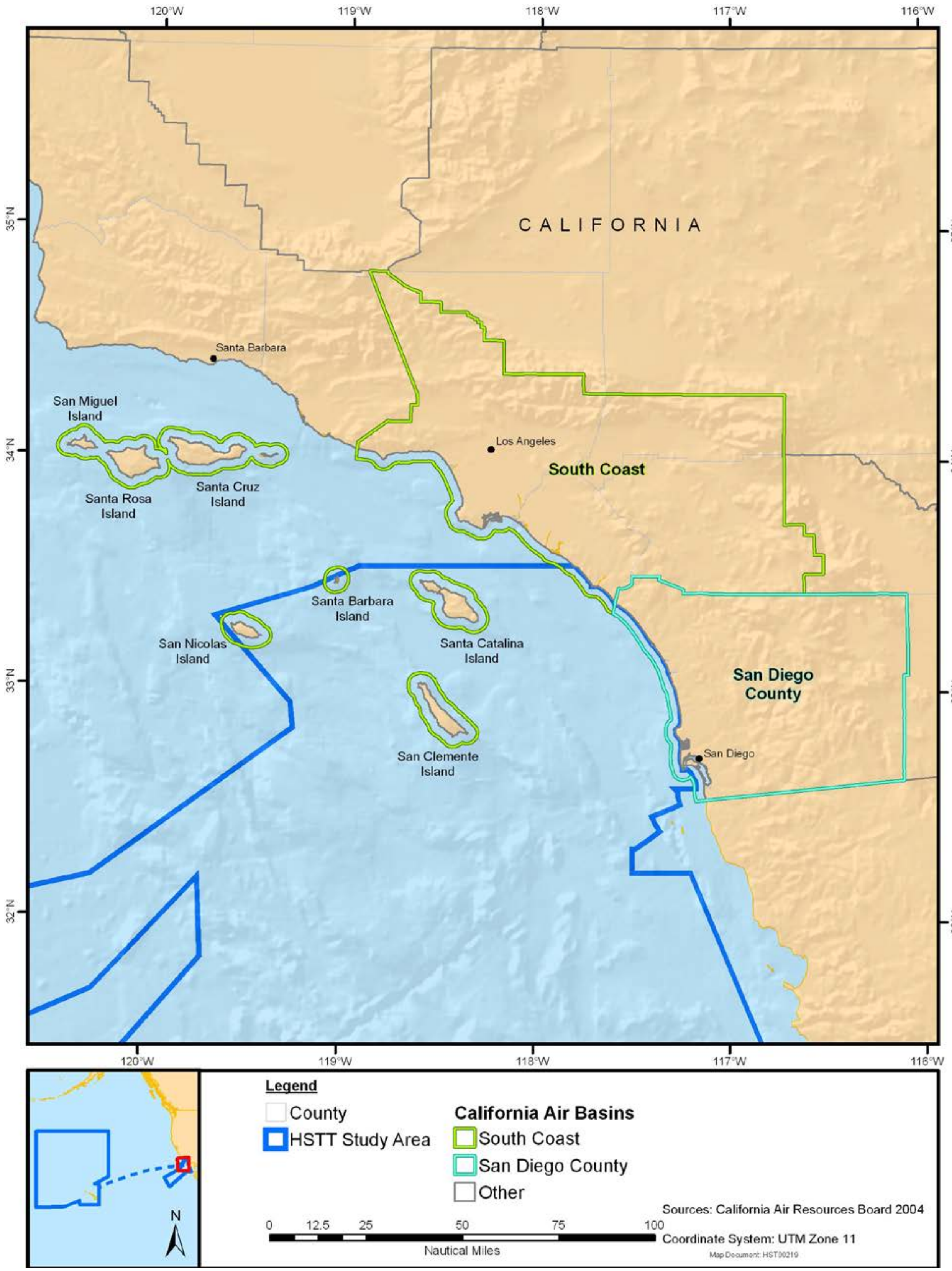


Figure 3.2-1: Southern California Air Basins Adjacent to the Study Area

specific *de minimis* emissions levels. The de minimis levels for nonattainment and maintenance pollutants in the San Diego Air Basin under the General Conformity Rule are shown in Table 3.2-2.

Other Air Basins Adjacent to the Study Area

As mentioned, the conformity review can be satisfied by a determination that the Proposed Action is not subject to the General Conformity Rule, by a Record of Non-Applicability, or by a Conformity Determination. Actions not subject to the Rule include actions that occur in attainment areas, and that do not generate emissions in nonattainment areas. If National Environmental Policy Act (NEPA) documentation is prepared for an agency action, the determination that the Proposed Action is not subject to the General Conformity Rule is described in that documentation. Otherwise, no documentation is required. This Environmental Impact Statement (EIS)/Overseas EIS (OEIS) includes the determination that actions in attainment areas that do not emit air pollutants in nonattainment areas are not subject to the General Conformity Rule.

With the exception of activities in California's South Coast and San Diego Air Basins, training and testing in the Study Area take place either within an attainment area (e.g., State of Hawaii waters) or they take place more than 3 nm from shore in unclassified portions of the Study Area. Although some Operating Areas and special use airspace are adjacent to Air Basins in California classified as nonattainment areas for O_3, training and testing in these offshore sea and air spaces are conducted beyond state waters (at least 3 nm offshore and typically more than 12 nm) within areas whose attainment status is unclassified. The CAA does not provide for any classification of waters beyond the boundaries of state waters.

3.2.1.2.1.3 Prevention of Significant Deterioration

Class I areas are defined by the CAA as federally owned properties for which air quality-related values are highly prized and for which very little decrease in air quality, including visibility, can be tolerated. The Proposed Action does not include any stationary sources constructed or modified after enactment of the CAA regulations, so the Prevention of Significant Deterioration Class I requirements do not apply.

On 13 May 2010, the EPA issued a final rule that established a commonsense approach to addressing greenhouse gas emissions from stationary sources under the CAA permitting programs (U.S. Environmental Protection Agency 2010a). This final rule sets thresholds for greenhouse gas emissions that define when permits under the New Source Review Prevention of Significant Deterioration and Title V Operating Permit programs are required for new and existing industrial facilities. The Navy aircraft, vessel, system, and munitions training and testing included in the Proposed Action do not involve any new or existing industrial facilities or stationary sources subject to the greenhouse gas tailoring rule.

3.2.1.2.2 Approach to Analysis

The air quality impact evaluation requires two separate analyses: (1) impacts of air pollutants emitted by Navy training and testing in U.S. territorial seas (i.e., within 12 nm of the coast) are assessed under NEPA, and (2) impacts of air pollutants emitted by Navy training and testing activities outside of U.S. territorial seas are evaluated under Executive Order (EO) 12114. State waters are within the jurisdiction of the respective state and, because each state has a distinct State Implementation Plan, the air quality evaluation separately analyzes those activities that emit air pollutants within each state's jurisdiction. Portions of the Study Area that lie within 3 nm of the coastline are within state air quality jurisdictions.

The analysis of health-based air quality impacts under NEPA includes estimates of criteria air pollutants for all training and testing activities where aircraft, missiles, or targets operate at or below 3,000 feet (ft.) (914 meters [m]) above ground level or which involve vessels in U.S. territorial seas. The analysis of health-based air quality impacts under EO 12114 includes emissions estimates of only those training and testing activities in which aircraft, missiles, or targets operate at or below 3,000 ft. (914 m) above ground level, or that involve vessels outside of U.S. territorial seas. Air pollutants emitted more than 3,000 ft. (914 m) above ground level are considered to be above the atmospheric inversion layer and, therefore, do not affect ground-level air quality (U.S. Environmental Protection Agency 1992). These emissions thus do not affect the concentrations of air pollutants in the lower atmosphere, measured at ground-level monitoring stations, upon which federal, state, and local regulatory decisions are based. For the analysis of the impacts on global climate change, however, all emissions of greenhouse gases from aircraft and vessels participating in training and testing activities, as well as targets and ordnance expended, are included regardless of altitude (see Chapter 4).

Criteria air pollutants are generated by the combustion of fuel by surface vessels and by fixed-wing and rotary-wing aircraft. They also are generated by the combustion of explosives and propellants in various types of munitions. Propellants used in small-, medium-, and large-caliber projectiles generate criteria pollutants when detonated. Non-explosive practice munitions contain spotting charges and propellants that generate criteria air pollutants when they function. Powered targets require fuel, generating criteria air pollutants during their operation, and towed targets generate criteria air pollutants secondarily because another aircraft or vessel is required to provide power. Targets may generate criteria air pollutants if portions of the item burn in a high-order detonation. Chaff cartridges used by ships and aircraft are launched by an explosive charge that generates small quantities of criteria air pollutants. Countermeasure flares, parachute flares, and smoke floats are designed to burn for a prescribed period, emitting criteria pollutants in the process.

The air quality analysis also includes estimating the amounts of hazardous air pollutants emitted by the proposed activities and assessing their potential impacts on air quality. Trace amounts of hazardous air pollutants would be emitted by combustion sources and use of ordnance. Hazardous air pollutants, such as rocket motor exhaust and unspent missile fuel vapors, may be emitted during missile and target use. Hazardous air pollutants are generated, in addition to criteria air pollutants, by combustion of fuels, explosives, propellants, and the materials of which targets, munitions, and other training and testing materials are constructed (e.g., plastic, paint, wood). Fugitive volatile and semi-volatile petroleum compounds also may be emitted whenever mechanical devices are used. These emissions are typically one or more orders of magnitude smaller than concurrent emissions of criteria air pollutants, and only become a concern when large amounts of fuel, explosives, or other materials are consumed during a single activity or in one location.

Emissions of hazardous air pollutants are intermittent and dispersed over a vast ocean area. Because only small quantities of hazardous air pollutants are emitted into the lower atmosphere, which is well mixed over the ocean, the potential for exposure is very low and the risk presented by the emissions is similarly very low. The primary emissions from many munition types are carbon dioxide (CO_2), CO, and particulate matter; hazardous air pollutants are emitted at low levels (U.S. Environmental Protection Agency 2008). A quantitative evaluation of hazardous air pollutant emissions is thus not warranted and was not conducted.

Electronic warfare countermeasures generate emissions of chaff, a form of particulate not regulated under the federal Clean Air Act as a criteria air pollutant (virtually all radio frequency chaff is 10 to 100 times larger than particulate matter under PM_{10} and $PM_{2.5}$ [Spargo et al. 1999]). The types of training and testing that produce these other emissions may take place throughout the Study Area but occur primarily within special use airspace. Chaff emissions during training and testing primarily occur 3 nm or more from shore and at altitudes over 3,000 ft. (914 m) (above the mixing layer). Chaff released over the ocean would disperse in the atmosphere and then settle onto the ocean surface. The air quality impacts of chaff were evaluated by the Air Force in *Environmental Effects of Self-Protection Chaff and Flares* (U.S. Air Force 1997). The study concluded that most chaff fibers maintain their integrity after ejection. Although some fibers are likely to fracture during ejection, it appears this fracturing does not release particulate matter. Tests indicated that the explosive charge in the impulse cartridge results in minimal releases of particulate matter. A later study at Naval Air Station Fallon found that the release of 50,000 cartridges of chaff per year over 10,000 square miles would result in an annual average PM_{10} or $PM_{2.5}$ concentration of 0.018 $\mu g/m^3$ (far below the then National Ambient Air Quality Standard of 50 $\mu g/m^3$ for PM_{10} and 15 $\mu g/m^3$ for $PM_{2.5}$ [Agency for Toxic Substances and Disease Registry 2003]).[2] Therefore, chaff is not further evaluated as an air quality stressor in this EIS/OEIS.

The NEPA analysis includes a CAA General Conformity Analysis to support a determination pursuant to the General Conformity Rule (40 C.F.R. Part 93B). This analysis focuses on training and testing activities that could impact nonattainment or maintenance areas within the region of influence. To evaluate the conformity of the Proposed Action with the State Implementation Plan elements for each California Air Basin, air pollutant emissions within these regions are estimated, based on an assumed distribution of the proposed training and testing activities within the respective portions of the Study Area.

Air pollutant emissions outside of U.S. territorial seas are estimated and their potential impacts on air quality are assessed under EO 12114. The General Conformity Rule does not apply to activities outside of U.S. territorial seas because the CAA does not apply to actions outside of the United States.

Data for the air quality analysis are based, wherever possible, on information from Navy subject matter experts and established training requirements. These data were used to estimate the numbers and types of aircraft, surface ships and vessels, submarines, and munitions (i.e., potential sources of air emissions) that would be involved in training and testing activities under each alternative. Emissions sources and the approach used to estimate emissions under the No Action Alternative, Alternative 1, and Alternative 2 are presented herein.

3.2.1.2.3 Emissions Estimates

3.2.1.2.3.1 Aircraft Activities

To estimate aircraft emissions, the operating modes (e.g., “cruise” mode), number of hours of operation, and types of engine for each type of aircraft were evaluated. All aircraft are assumed to travel to and from training ranges at or above 3,000 ft. (914 m) above ground level and, therefore, their transits to and from the ranges do not affect surface air quality. Air combat maneuvers and air-to-air missile exercises are primarily conducted at altitudes well in excess of 3,000 ft. (914 m) above ground level and, therefore, are not included in the estimated emissions of criteria air pollutants. Activities or portions of those training or testing activities occurring below 3,000 ft. (914 m) are included in emissions estimates. Examples of activities typically occurring below 3,000 ft. (914 m) include those involving helicopter platforms such as mine warfare, anti-surface warfare, and anti-submarine warfare training and testing activities. All training and testing activities and the estimated time spent above or below 3,000 ft. (914 m) for calculation purposes are included in the air quality emissions estimates presented in Appendix D-1.

[2] The current standard for PM_{10} is 150 $\mu g/m^3$ over a 24-hour average time (see Table 3.2-1).

The types of aircraft used and the numbers of flights flown under the No Action Alternative are derived from historical data. The types of aircraft identified include the typical aircraft platforms that conduct a particular training or testing exercise (or the closest surrogate when information is not available), including range support aircraft (e.g., non-Navy commercial air services). For Alternatives 1 and 2, estimates of future aircraft sorties are based on evolutionary changes in the Navy's force structure and mission assignments. Where there are no major changes in types of aircraft, future activity levels are estimated from the distribution of baseline activities. The types of aircraft used in each training or testing activity and numbers of sorties flown by such aircraft are included in the air quality emissions estimates presented in Appendix D-1.

Time on range (activity duration) under the No Action Alternative was calculated from average times derived from range records and Navy subject matter experts. To estimate time on range for each aircraft activity in Alternatives 1 and 2, the average flight duration approximated in the baseline data was used in the calculations. Estimated altitudes of activities for all aircraft were obtained from aircrew members in operational squadrons. Several testing activities are similar to training activities, and therefore similar assumptions were made for such activities in terms of aircraft type, altitude, and flight duration. Table 2.8-2 lists Naval Air Systems Command testing activities similar to certain training activities. Where aircraft testing activities were dissimilar to training activities, assumptions for time on range were derived from Navy subject matter experts.

Air pollutant emissions were estimated based on the Navy's Aircraft Environmental Support Office Memorandum Reports for individual aircraft categories (Aircraft Emission Estimates: Mission Operations). For aircraft for which Aircraft Environmental Support Office emission factors were not available, emission factors were obtained from other published sources.

The emissions calculations for each alternative conservatively assume that each aircraft activity listed in Tables 2.8-1 to 2.8-5 is separately conducted. In practice, a testing activity may be conducted during a training flight. Two or more training activities also may be conducted during one flight (e.g., chaff or flare exercises may occur during electronic warfare operations; or air-to-surface gunnery and air-to-surface bombing activities may occur during a single flight operation). Using conservative assumptions may produce elevated aircraft emissions estimates, but accounts for the possibility (however remote) that each aircraft training and testing activity is separately conducted.

3.2.1.2.3.2 Surface Ship Activities

Marine vessel traffic in the Study Area includes military ship and boat traffic, unmanned surface vessels, and range support vessels providing services for military training and testing activities. Nonmilitary commercial vessels and recreational vessels also are regularly present. These commercial vessels are not evaluated in the air quality analysis because they are not part of the Proposed Action. The methods of estimating marine vessel emissions involve evaluating the type of activity, the number of hours of operation, the type of propulsion, and the type of onboard generator for each vessel type.

The types of surface ships and numbers of activities for the No Action Alternative are derived from range records and Navy subject matter experts regarding vessel participant data. For Alternatives 1 and 2, estimates of future ship activities are based on anticipated evolutionary changes in the Navy's force structure and mission assignments. Where there are no major changes in types of ships, estimates of future activities are based on the historical distribution of ship use. Navy aircraft carriers and submarines are nuclear-powered, and have no air pollutant emissions associated with propulsion.

For surface ships, the durations of activities were estimated by taking an average over the total number of activities for each type of training and testing. Emissions for baseline activities and for future activities were estimated based on discussions with exercise participants. In addition, information provided by subject-matter experts was used to develop a breakdown of time spent at each operational mode (i.e., power level) used during activities in which marine vessels participated. Several testing activities are similar to training activities, and therefore similar assumptions were made for such activities in terms of vessel type, power level, and activity duration.

Emission factors for marine vessels were obtained from the database developed for Naval Sea Systems Command by John J. McMullen Associates, Inc. (John J. McMullen Associates 2001). Emission factors were provided for each marine vessel type and power level. The resulting calculations provided information on the time spent at each power level in each part of the Study Area, emission factors for that power level (in pounds of pollutant per hour), and total emissions for each marine vessel for each operational type and mode.

The pollutants for which calculations are made include exhaust total hydrocarbons, CO, NO_x, PM, CO_2, and SO_2. For non-road engines, all particulate matter emissions are assumed to be smaller than PM_{10}, and 92 percent of the particulate matter from gasoline and diesel-fueled engines is assumed to be smaller than $PM_{2.5}$ (U.S. Environmental Protection Agency 2002). For gaseous-fueled engines (liquefied petroleum gas/compressed natural gas), 100 percent of the particulate matter emissions are assumed to be smaller than $PM_{2.5}$ (U.S. Environmental Protection Agency 2002).

The emissions calculations for each alternative conservatively assume that each vessel activity listed in Chapter 2, Tables 2.8-1 to 2.8-5 is separately conducted and separately produces vessel emissions. In practice, one or more testing activities may take advantage of an opportunity to travel at sea aboard and test from a vessel conducting a related or unrelated training activity. It is also probable that two or more training activities may be conducted during one training vessel movement (e.g., a ship may conduct large-, medium-, and small-caliber surface-to-surface gunnery exercises during one vessel movement). Furthermore, multiple unit level training activities may be conducted during a larger composite training unit exercise. Using conservative assumptions may produce elevated vessel emissions estimates, but accounts for the possibility (however remote) that each training or testing activity is separately conducted.

3.2.1.2.3.3 Submarine Activities

No U.S. submarines burn fossil fuel under normal operating conditions (they are nuclear-powered); therefore, no air pollutants are emitted during submarine training or testing activities.

3.2.1.2.3.4 Naval Gunfire, Missiles, Bombs, Other Munitions and Military Expended Material

Naval gunfire, missiles, bombs, and other types of munitions used in training and testing activities emit air pollutants. To estimate the amounts of air pollutants emitted by ordnance during their use, the numbers and types of munitions used during training or testing activities are first totaled. Then generally accepted emissions factors (AP-42, Compilation of Air Pollutant Emission Factors, Chapter 15: Ordnance Detonation [U.S. Environmental Protection Agency 1995]) for criteria air pollutants are applied to the total amounts. Finally, the total amounts of air pollutants emitted by each munition type are summed to produce total amounts of each criteria air pollutant under each alternative.

3.2.1.2.4 Sensitive Receptors

Identifying sensitive receptors is part of describing the existing air quality environment. Sensitive receptors are individuals in residential areas, schools, parks, hospitals, and other sites for whom there is a reasonable expectation of continuous exposure during periods of peak ambient air pollutant concentrations. In the Study Area, crews of vessels and recreational users of the ocean may encounter air pollutants generated by the Proposed Action. Few such individuals are typically present, however, and the durations of their exposures to substantial concentrations of these pollutants are limited because the areas are cleared of nonparticipants before activities commence. These potential receptors within the Study Area are thus not considered sensitive.

3.2.1.3 Climate Change

Greenhouse gases are compounds that contribute to the greenhouse effect—a natural phenomenon in which gases trap heat in the lowest layer of the earth's atmosphere (surface-troposphere system), causing heating (radiative forcing) at the surface of the earth. The primary long-lived greenhouse gases directly emitted by human activities are CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (SF_6). CO_2, CH_4, and N_2O occur naturally in the atmosphere. However, their concentrations have increased from the preindustrial era (1750) to 2007 to 2008: CO_2 (38 percent), CH_4 (149 percent), and N_2O (23 percent) (U.S. Environmental Protection Agency 2009b). These gases influence global climate by trapping heat in the atmosphere that would otherwise escape to space. The heating effect of these gases is considered the probable cause of the global warming observed over the last 50 years (U.S. Environmental Protection Agency 2009b). Climate change can affect many aspects of the environment. Not all impacts of greenhouse gases are related to climate. For example, elevated concentrations of CO_2 can lead to ocean acidification and stimulate terrestrial plant growth, and CH_4 emissions can contribute to higher O_3 levels.

The administrator of the EPA determined that six greenhouse gases taken in combination endanger both the public health and the public welfare of current and future generations. The U.S. Environmental Protection Agency specifically identified CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, and SF_6 as greenhouse gases (U.S. Environmental Protection Agency 2009d; 74 Federal Register 66496, 15 December 2009).

To estimate the global warming potential, the United States quantifies greenhouse gas emissions using the 100-year timeframe values established in the Intergovernmental Panel on Climate Change Second Assessment Report (Intergovernmental Panel on Climate Change 1995), in accordance with United Nations Framework Convention on Climate Change (United Nations Framework Convention on Climate Change 2004) reporting procedures. All global warming potentials are expressed relative to a reference gas, CO_2), which is assigned a global warming potential equal to 1. The five other greenhouse gases have a greater global warming potential than CO_2, ranging from 21 for CH_4, 310 for N_2O, 140 to 6,300 for hydrofluorocarbons, 6,500 to 9,200 for perfluorocarbons, and up to 23,900 for sulfur hexafluoride. To estimate the CO_2 equivalency of a non-CO_2 greenhouse gas, the appropriate global warming potential of that gas is multiplied by the amount of the gas emitted. All six greenhouse gases are multiplied by their global warming potential and the results are added to calculate the total equivalent emissions of CO_2 (CO_2e. The dominant greenhouse gas emitted is CO_2, mostly from fossil fuel combustion (85.4 percent) (U.S. Environmental Protection Agency 2009c). Weighted by global warming potential, CH_4 is the second largest component of emissions, followed by N_2O. Global warming potential-weighted emissions are presented in terms of equivalent emissions of CO_2, using units of teragrams (1 million metric tons or 1 billion kilograms [Tg]) of CO_2e (Tg CO_2e). The Proposed Action is anticipated to release greenhouse gases to the atmosphere. These emissions are quantified for the proposed Navy training and testing in the Study Area, and estimates are presented in Chapter 4.

The potential impacts of proposed greenhouse gas emissions are by nature global; individual sources of greenhouse gas emissions are not large enough to have any noticeable effect on climate change but may have cumulative impacts. Therefore, the impact of proposed greenhouse gas emissions on climate change is discussed in the context of cumulative impacts in Chapter 4.

3.2.1.4 Other Compliance Considerations, Requirements, and Practices

3.2.1.4.1 Executive Order 12088

Executive Order 12088, *Federal Compliance with Pollution Control Standards*, requires each federal agency to comply with applicable pollution control standards, defined as, “the same substantive, procedural, and other requirements that would apply to a private person.” The EO further requires federal agencies to cooperate with EPA, state, and local environmental regulatory agencies.

3.2.1.4.2 Chief of Naval Operations Instruction 5090.1

The Navy developed Chief of Naval Operations Instruction (OPNAVINST) 5090.1 series, which contains guidance for environmental evaluations. Chapter 7 and Appendix F of this series contain guidance for air quality analysis and General Conformity determinations. The analysis in this EIS/OEIS was performed in compliance with this instruction.

3.2.1.4.3 Current Requirements and Practices

Equipment used by military units in the Study Area, including ships and other marine vessels, aircraft, and other equipment, are properly maintained and fueled in accordance with applicable Navy requirements. Operating equipment meets federal and state emission standards, where applicable. For example, in accordance with the OPNAVINST 5090.1 series, Chapter 7, Navy commands shall comply with Navy and regulatory requirements for composition of fuels used in all motor vehicles, equipment, and vessels. To prevent misfueling, installations shall enforce appropriate controls to ensure that any fuel that does not meet low-sulfur requirements is not dispensed to commercial motor vehicles, equipment, or vessels that are not covered under a national security exemption.

3.2.2 AFFECTED ENVIRONMENT

3.2.2.1 Region of Influence

The region of influence for air quality is a function of the type of pollutant, emission rates of the pollutant source, proximity to other emission sources, and local and regional meteorology. For inert pollutants (all pollutants other than O_3 and its precursors), the region of influence is generally limited to a few miles downwind from the source. For a photochemical pollutant such as O_3, however, the region of influence may extend much farther downwind. O_3 is a secondary pollutant formed in the atmosphere by photochemical reactions of previously emitted pollutants, or precursors (volatile organic compounds and NO_X). The maximum impacts of precursors on O_3 levels tend to occur several hours after the time of emission during periods of high solar load, and may occur many miles from the source. O_3 and O_3 precursors transported from other regions can also combine with local emissions to produce high local O_3 concentrations. Therefore, the region of influence for air quality includes the Study Area as well as adjoining land areas several miles inland, which may from time to time be downwind from emission sources associated with the Proposed Action.

3.2.2.2 Climate of the Study Area

The climate of the Study Area influences air quality. The climate of the Pacific Ocean and adjacent land areas is influenced by the temperatures of the surface waters and water currents as well as by wind blowing across the water. Offshore climates are moderate, and seldom have extreme seasonal variations because the ocean is slow to change temperature. Ocean currents influence climate by moving warm and cold water between regions. Adjacent land areas are affected by the wind that is cooled or warmed when blowing over these currents. In addition to its influence on temperature, the wind moves evaporated moisture from the ocean to adjacent land areas and is a major source of rainfall.

Atmospheric stability and mixing height provide measures of the amount of vertical mixing of pollutants. Over water, the atmosphere tends to be neutral to slightly unstable. Over land, atmospheric stability is more variable, being unstable during the day, especially in summer due to rapid surface heating, and stable at night, especially under clear conditions in winter. The mixing height over water typically ranges from 1,640 to 3,281 ft. (500 to 1,000 m) with a slight diurnal (daytime) variation (U.S. Environmental Protection Agency 1972). The air quality analysis presented in this EIS/OEIS assumes that 3,000 ft. (914 m) above ground level is the typical maximum afternoon mixing height, and thus air pollutants emitted above this altitude do not affect ground-level air pollutant concentrations.

3.2.2.2.1 Hawaii

The climate of the Pacific Ocean offshore of the Hawaiian Islands is subtropical. Offshore winds are predominantly from the north, northeast, and east at 10 to 20 miles per hour (5 to 10 meters/second [m/s]). Air temperatures are moderate, and vary slightly by season, ranging from about 70 to 80 degrees Fahrenheit (°F) (21 to 27 degrees Celsius [°C]). Estimated annual rainfall in ocean areas offshore of Hawaii is estimated at about 25 inches (in.) (64 centimeters [cm]), with most rainfall during the winter season (Western Regional Climate Center 2010).

The climate of Hawaii influences air quality in several ways. The prevailing trade winds provide strong, regular regional ventilation that quickly disperses air pollutants and breaks up inversion layers. Frequent rainfall on windward sides of the islands washes dust and other air pollutants out of the atmosphere. During mild Kona (i.e., absence of daily trade winds) weather, local air pollutant concentrations may temporarily increase and volcanic organic gases emissions from the Island of Hawaii may temporarily affect the other islands in the Main Hawaiian Islands.

3.2.2.2.2 Southern California

The climate of coastal Southern California and adjacent offshore Pacific Ocean waters consists of warm, dry summers and cool, wet winters. One of the main influences on the climate is a semi-permanent high-pressure system (the Pacific High) in the eastern Pacific Ocean. This high-pressure cell maintains clear skies in Southern California for much of the year. When the Pacific High moves south during the winter, this pattern changes and low-pressure centers migrate into the region, causing widespread precipitation.

The Pacific High influences the large-scale wind patterns of California. The predominant regional wind directions are westerly and west-southwesterly during all four seasons. Surface winds typically are from the west (onshore) during the day and from the east (offshore) at night; this diurnal wind pattern is dominant in winter but is weak or absent in summer, when onshore winds may occur both day and night. Along the coast, average wind speeds are low at night, increase during morning hours to a midday peak, then decrease through the afternoon.

Precipitation in coastal Southern California falls almost exclusively as rain. Most of this precipitation falls from late fall through early spring. No measurements are available for the open ocean; rainfall in coastal San Diego County averages about 9.9 in. (25 cm) per year (San Diego County Water Authority 2010).

3.2.2.3 Regional Emissions

Unknown quantities of air pollutants are emitted by commercial and recreational aircraft and vessels operating in the Study Area. The types of air pollutants emitted from vessels operating in the Study Area can include CO, NO_x, SO_x and PM from diesel fuel combustion (Markle and Brown 1995) and CO, NO_x, sulfur oxides (SO_x), polycyclic aromatic hydrocarbons, and formaldehyde from Jet Propellant-8 combustion (Ritchie et al. 2001). Other common fuels combusted by recreational aircraft and vessels include 100-Low-Lead (resulting in lead emissions in addition to those previously listed) and gasoline.

3.2.2.3.1 Hawaii

No major stationary sources of air pollutant emissions exist within the Hawaii portion of the Study Area. However, air pollutants generated in adjacent land areas may be transported into the Study Area.

The largest point sources of air pollutants in the Hawaiian Islands are power-generating stations, petroleum refining, and agriculture. Most stationary air pollutant sources are located on Oahu. Maui County emissions total about one-third of Oahu emissions, Kauai emissions are about one-half of Maui County emissions, and the Island of Hawaii accounts for less than 10 percent of total emissions. Heavy volumes of automobile traffic during commute hours in urban areas may occasionally cause concentrations of primary pollutants to exceed short-term air quality standards. The small number of major sources, dispersed population centers, and generally good ventilation from daily trade winds combine, however, to assure that air quality in Hawaii is good to excellent. Volcanic organic gases from volcanic eruptions on the Island of Hawaii are a major natural source of air pollution in Hawaii. Volcanic organic gases have an especially strong influence on air quality in the Hawaiian Islands during Kona weather, when winds are from the south.

3.2.2.3.2 Southern California

The Southern California ranges lie partly within South Coast Air Basin and partly within San Diego Air Basin (Figure 3.2-1). Stationary sources of air pollutants within the California region of the Study Area are limited to terrestrial emissions sources on the Channel Islands, which are not included in the at-sea training and testing activities addressed in this EIS/OEIS. Mobile sources of air pollutants in this region include commercial, recreational, institutional, governmental, and scientific vessel and aircraft traffic. Air pollutants generated in adjacent land areas (e.g., coastal Southern California) may be transported into the Study Area and thus may adversely affect its air quality.

3.2.2.3.2.1 South Coast Air Basin

South Coast Air Basin includes Orange County and portions of Los Angeles, Riverside, and San Bernardino Counties, as well as some marine areas (e.g., San Clemente Island and its adjacent waters within 3 nm). With 15 million inhabitants, South Coast Air Basin encompasses about 43 percent of California's population, accounts for 40 percent of all vehicle miles traveled, and is responsible for 28 percent of all air pollutant emissions in the State (California Air Resources Board 2010). Motor vehicles are the largest sources of CO, NO_x, and volatile organic compounds in the Air Basin. The Air

Basin has a heavy concentration of industrial facilities, several major airports, two major shipping ports, and a dense freeway and surface street network.

3.2.2.3.2.2 San Diego Air Basin

San Diego Air Basin, consisting of San Diego County, encompasses about 8 percent of the State of California's population. San Diego Air Basin accounts for about 9 percent of vehicle miles traveled in California. It includes industrial facilities, an international airport, and a large seaport. Seven percent of California's air pollutant emissions are generated in San Diego Air Basin (California Air Resources Board 2010).

3.2.2.3.2.3 Regional Transport of Air Pollutants

Air pollutant emissions from offshore coastal areas may affect onshore air quality. Over the past decade, the California Air Resources Board has prepared a series of technical assessments of transport relationships among air basins in California. The assessments identify transport couples, consisting of an upwind and a downwind area. The studies characterize the contributions of transported air pollutants as overwhelming, significant, or inconsequential. The influence of transport on a downwind air basin can vary widely depending on the weather. Transport from the South Coast Air Basin to the San Diego Air Basin has been identified as a transport couple.

In 1997, California Air Resources Board established that transport from the South Coast Air Basin to the San Diego Air Basin contributes to pollutants in the latter basin. Meteorological data indicate that pollutants are transported southeasterly, so emissions in offshore areas do not contribute to pollutant concentrations in the South Coast Air Basin. Air emissions in the California offshore ranges are transported to the east and south, affecting the San Diego Air Basin and Baja California (Mexico). In particular, air pollutants emitted in the southern portion of Warning Area 291 (W-291), including the Tactical Maneuvering areas, Fleet Training Area Hot, and Missile Range areas, could affect air quality in Mexico.

The California Air Resources Board and the South Coast Air Quality Management District have determined that emissions of air pollutants on and around San Clemente Island have no effect on the attainment status of South Coast Air Basin, and thus have exempted both stationary and mobile sources of air pollutants on and around San Clemente Island (within 3 nm) from some air quality control measures designed to reduce air pollutant emissions (U.S. Department of the Navy 2008).

3.2.2.4 Existing Air Quality

Air quality in offshore ocean areas is generally higher than the air quality of adjacent onshore areas because there are few or no large sources of criteria air pollutants offshore. Much of the air pollutants found in offshore areas are transported there from adjacent land areas by low-level offshore winds, so concentrations of criteria air pollutants generally decrease with increasing distance from land. No criteria air pollutant monitoring stations are located in offshore areas, so air quality in the Study Area must be inferred from the air quality in adjacent land areas where air pollutant concentrations are monitored.

3.2.2.4.1 Hawaii

Air quality in Hawaii is generally good to excellent, because of the small number of major sources and strong ventilation provided by frequent trade winds. Monitored air pollutant concentrations are generally well below State of Hawaii or federal air quality standards. Between 2001 and 2005, none of the air quality monitoring stations in Hawaii recorded criteria air pollutant concentrations that exceeded the annual average ambient air quality standards. The entire State of Hawaii is in attainment of the National Ambient Air Quality Standards and State Ambient Air Quality Standards for all criteria air pollutants. Therefore, a Conformity Determination is not required for those elements of the Proposed Action that occur in Hawaii state waters.

3.2.2.4.2 Southern California

3.2.2.4.2.1 South Coast Air Basin

Air quality in South Coast Air Basin is generally fair to poor, relative to other regions. South Coast Air Basin is classified as an extreme non-attainment area for O_3 (8-hour average concentration) under the National Ambient Air Quality Standards, a CO maintenance area, a maintenance area for NO_2, a serious non-attainment area for PM_{10}, and a non-attainment area for $PM_{2.5}$.

3.2.2.4.2.2 San Diego Air Basin

Coastal waters in San Diego Air Basin are classified as a non-attainment area for O_3 (8-hour average concentration) under the National Ambient Air Quality Standards, and are classified as a maintenance area for CO. The EPA designated San Diego County as a “moderate” O_3 nonattainment area under the 1997 8-hour O_3 standard, effective in June 2012. San Diego County Air Pollution Control District is requesting redesignation of the County to attainment of the 1997 8-hour O_3 National Ambient Air Quality Standard. The EPA designated San Diego County as a “marginal” O_3 nonattainment area under the 2008 8-hour O_3 standard, effective in July 2012. The General Conformity *de minimis* levels of volatile organic compounds and NO_x would remain at 100 tons (90,719 kilograms [kg]) per year.

3.2.2.4.3 Transit Corridor

Air quality in the Transit Corridor, which is more remote from major sources of air pollutants than either the SOCAL or the Hawaii Range Complex, is unknown but is expected to be of higher quality than either of these areas.

3.2.3 Environmental Consequences

This section evaluates how and to what degree the activities described in Chapter 2 could impact air quality within the Study Area. Tables 2.8-1 through 2.8-5 present the baseline and proposed training and testing activity locations for each alternative (including number of activities and ordnance expended). The air quality stressors vary in intensity, frequency, duration, and location within the Study Area. The stressors applicable to air quality in the Study Area that are analyzed below include the following:

- Criteria air pollutants
- Hazardous air pollutants

In this analysis, criteria air pollutant emissions were estimated for vessels, aircraft, and ordnance. For each alternative, emissions were estimated by sub-region of the Study Area and by type of activity (training or testing). Details of the emission estimates are provided in Appendix D-1. Hazardous air pollutants are analyzed qualitatively in relation to the prevalence of the sources emitting hazardous air pollutants during training and testing activities.

3.2.3.1 Criteria Air Pollutants

The potential impacts of criteria air pollutants are evaluated by first estimating the emissions from training and testing activities in the Study Area for each alternative. These estimates are then used to determine the potential impact of the emissions on the attainment status of the adjacent Air Quality Control Region. Emissions of criteria air pollutants may affect human health directly by degrading local or regional air quality or indirectly by their impacts on the environment. Air pollutant emissions may also have a regulatory effect separate from their physical effect, if additional air pollutant emissions change the attainment status of an Air Quality Control Region.

The estimates of criteria air pollutant emissions for each alternative are organized by activity (i.e., either training or testing). These emissions are further categorized by region (e.g., by range complex) so that differences in background air quality, atmospheric circulation patterns, regulatory requirements, and sensitive receptors can be addressed. Total air pollutant emissions for Navy training and testing activities in the Study Area under each alternative are also estimated.

3.2.3.1.1 No Action Alternative

3.2.3.1.1.1 Training

Table 3.2-3 lists training-related criteria air pollutant and precursor emissions in the Study Area. Emissions are totaled for each major training region of the Study Area (e.g., Hawaii, Southern California). Total emissions for each of the major training regions are then summed to arrive at the total emissions within the Study Area. Totals include aircraft and vessel emissions based on estimated numbers of vessels and aircraft involved in training activities. The air pollutants emitted in the greatest quantity are NO_x, SO_x, and CO.

Under the No Action Alternative, the annual numbers of Navy training activities in the Study Area would remain at baseline (existing) levels. The criteria pollutant that would be emitted in the greatest quantities by aircraft is NO_x, followed by CO and PM (PM_{10} and $PM_{2.5}$). These emissions are associated with aircraft involvement in a variety of training activities, including anti-air warfare, electronic warfare, and mine warfare. The air pollutant emitted in the greatest quantities by surface vessels is NO_x, followed by CO and SO_x. These emissions are associated with vessel involvement in a variety of training activities, including anti-submarine warfare, anti-surface warfare, and electronic warfare. The air pollutant emitted in the greatest quantity by munitions is CO, which would be emitted under the No Action Alternative by a variety of munitions, including bombs, rockets, missiles, smokes, flares, and gun rounds.

Training activities in Southern California generate approximately 86 percent (4,058 tons/4,692 tons [3,689 metric tons/4,265 metric tons]) of training-related criteria pollutant emissions in the Study Area under the No Action Alternative, while Southern California ranges constitute less than 4 percent (120,000 square nautical miles [nm^2]/2.84 million nm^2, not including the Transit Corridor) of the Study Area. The other approximately 14 percent of training-related criteria air pollutants are emitted in the waters around Hawaii (the Transit Corridor is not included in the No Action Alternative). The spatial distribution of emissions reflects the locations where Navy training most regularly occurs. Air pollutants emitted in the Study Area may be carried ashore by prevailing winds; 55 percent of training activity would occur within 3 nm of shore under the No Action Alternative. However, natural atmospheric mixing would substantially disperse these pollutants before they reached the coast. The contributions of air pollutants generated in the Study Area to the air quality in adjacent Air Basins (California) or Air Quality Control Region (Hawaii) are minimal, and unlikely to measurably add to existing onshore pollutant concentrations because of the large areas over which they are emitted, the distances these offshore pollutants would be transported, and their substantial dispersion during transport.

Table 3.2-3: Annual Criteria Air Pollutant Emissions from Training under the No Action Alternative

Source	Air Pollutant Emissions (TPY)						
	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	Total
Hawaii							
Aircraft	36	65	4	17	35	35	157
Vessels	178	146	15	112	19	17	470
Ordnance	6	1	0	0	0	0	7
Total	**220**	**212**	**19**	**129**	**54**	**52**	**634**
Southern California							
Aircraft	49	74	5	18	41	41	187
Vessels	975	1,486	507	766	109	101	3,843
Ordnance	27	1	0	0	0	0	28
Total	**1,051**	**1,561**	**512**	**784**	**150**	**142**	**4,058**
Study Area Total	**1,271**	**1,773**	**531**	**913**	**204**	**194**	**4,692**

Notes: (1) Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding. $PM_{2.5}$ is included in PM_{10}. (2) CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter ≤ 10 microns in diameter, SO_x = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

3.2.3.1.1.2 Testing

Table 3.2-4 lists testing-related criteria air pollutant and precursor emissions in the Study Area. Emissions are totaled for each major testing region of the Study Area (e.g., Southern California, Hawaii). Total emissions for each region are then summed to arrive at the total testing emissions within the Study Area. Totals include aircraft and vessel emissions based on estimated numbers of vessels and aircraft involved in tests. The air pollutants emitted in the greatest quantity are NO_x and CO.

Table 3.2-4: Annual Criteria Air Pollutant Emissions from Testing under the No Action Alternative

Source	Air Pollutant Emissions (TPY)						
	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	Total
Hawaii							
Aircraft	3	10	1	1	5	5	20
Vessels	5	3	0	1	0	0	9
Ordnance	0	0	0	0	0	0	0
Total	**8**	**13**	**1**	**2**	**5**	**5**	**29**
Southern California							
Aircraft	5	22	1	1	11	11	40
Vessels	9	6	1	2	0	0	18
Ordnance	0	0	0	0	0	0	0
Total	**14**	**28**	**2**	**3**	**11**	**11**	**58**
Study Area Total	**22**	**41**	**3**	**5**	**16**	**16**	**87**

Notes: (1) Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding. $PM_{2.5}$ is included in PM_{10}. (2) CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter ≤ 10 microns in diameter, So_x = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

Under the No Action Alternative, the annual numbers of Navy testing activities in the Study Area would remain at baseline (existing) levels. Criteria pollutants emitted in the Study Area may be transported ashore by periodic changes in prevailing winds, but would not affect the air quality in air basins along the coast for the reasons described in Section 3.2.3.1.1.1. The air pollutant that would be emitted in the greatest quantities by aircraft is NO_x, followed by particulate matter (PM_{10} and $PM_{2.5}$) and CO. These emissions are associated with aircraft involvement in a variety of testing activities, including anti-air warfare, electronic warfare, and mine warfare. The air pollutants that would be emitted in the greatest quantities by surface vessels are CO and NO_x. These emissions are associated with vessel involvement in a variety of testing activities, including anti-submarine warfare, anti-surface warfare, and electronic warfare. The air pollutant that would be emitted in the greatest quantity by munitions is CO, which is emitted by a variety of munitions, including bombs, rockets, missiles, smokes, flares, and gun rounds.

As shown in Table 3.2-4, testing activities in Southern California account for about 67 percent of the Study Area testing emissions, while Southern California ranges constitute less than about 4 percent of the Study Area. The remaining approximately 33 percent of testing-related air pollutants are generated in Hawaii. The spatial distribution of emissions reflects the locations where Navy testing most regularly occurs. Approximately 89 percent of criteria air pollutants from testing activities would be emitted at least 12 nm from shore.

The contributions of testing-related air pollutants generated in the Study Area to the air quality in adjacent Air Basins (California) or Air Quality Control Region (Hawaii) would be minimal, and unlikely to measurably add to existing onshore pollutant concentrations because of the large areas over which they are emitted, the distances these offshore pollutants would be transported, and their substantial dispersion during transport.

3.2.3.1.1.3 Criteria Pollutant Emissions in Nonattainment or Maintenance Areas

The amounts of criteria air pollutants that would be emitted under the No Action Alternative by Navy aircraft, vessels, targets, and munitions during training and testing activities in the two Southern California air basins of the Study Area are presented in Table 3.2-5. Portions of the Study Area along the San Diego coast lie within San Diego Air Basin while the waters around San Clemente Island lie within South Coast Air Basin (San Clemente Island is part of Los Angeles County); air pollutants that would be generated in these two Air Basins were separately estimated. The largest source of air pollutants associated with the proposed Navy training and testing activities in the Southern California region is vessels and the smallest source is ordnance.

South Coast Air Basin

The amounts of criteria air pollutants that would be emitted under the No Action Alternative by Navy training and testing activities in South Coast Air Basin are presented in Table 3.2-5. NO_x, SO_x, and volatile organic compounds (VOC), primarily from Navy vessels, account for most of the emissions.

San Diego Air Basin

The amounts of criteria air pollutants that would be emitted under the No Action Alternative by Navy training and testing activities within San Diego Air Basin are presented in Table 3.2-5. NO_x, SO_x, VOC, and CO, primarily from Navy vessels, account for most of the emissions.

Table 3.2-5: California Estimated Annual Criteria Air Pollutant Emissions by Air Basin, No Action Alternative

Source	Emissions by Air Pollutant (TPY)						
	CO	NO_X	VOC	SO_x	PM_{10}	$PM_{2.5}$	Total
South Coast Air Basin							
Aircraft	9	8	1	1	5	5	24
Vessels	217	532	284	264	37	34	1,334
Ordnance	3	0	0	0	0	0	3
Total	**229**	**540**	**285**	**265**	**42**	**39**	**1,361**
San Diego Air Basin							
Aircraft	17	15	1	7	10	10	50
Vessels	152	530	174	203	26	24	1,085
Ordnance	7	1	0	0	0	0	8
Total	**176**	**546**	**175**	**210**	**36**	**34**	**1,143**

Notes: (1) TPY = tons per year, CO = carbon monoxide, NO_X = nitrogen oxides, VOC = volatile organic compounds, SO_x = sulfur oxides, PM_{10} = particulate matter under 10 microns, $PM_{2.5}$ = particulate matter under 2.5 microns. (2) $PM_{2.5}$ is included in PM_{10}.

Summary of Non-Attainment Area Emissions Within the Study Area

The air pollutants expected to be emitted under the No Action Alternative would have no measurable impact on air quality over coastal waters or adjacent land areas because of the large areas over which they are generated, the distances from land at which the pollutants are emitted, and the generally strong ventilation resulting from regional meteorological conditions. Air pollutant emissions under the No Action Alternative would not result in violations of state or federal air quality standards because they would not have a measurable impact on air quality in land areas.

3.2.3.1.1.4 Summary – No Action Alternative

Criteria air pollutant emissions under the No Action Alternative are summarized in Table 3.2-6. While criteria air pollutants emitted within the territorial waters of the Study Area may be transported ashore, they would not affect the attainment status of coastal air quality control regions. The amounts of air pollutants emitted in the Study Area and subsequently transported ashore would have no substantial effect on air quality because (1) emissions from Navy training and testing activities are small compared to the amounts of air pollutants emitted by sources ashore, (2) the pollutants are emitted over large areas (i.e., the Study Area is an area source), (3) the distances the air pollutants would be transported are often large, and (4) the pollutants are substantially dispersed during transport. The criteria air pollutants emitted over nonterritorial waters within the Study Area would be dispersed over vast areas of open ocean and thus would not cause significant harm to environmental resources in those areas.

Table 3.2-6: Estimated Annual Criteria Air Pollutant Emissions in Study Area, No Action Alternative

Source	Emissions by Air Pollutant (TPY)						
	CO	NO_X	VOC	SO_x	PM_{10}	$PM_{2.5}$	Total
Training Activities	1,271	1,773	531	913	204	194	4,692
Testing Activities	22	41	3	5	16	16	87
Total Study Area	**1,293**	**1,814**	**534**	**918**	**220**	**210**	**4,779**

Notes: (1) Table includes criteria pollutant precursors (e.g., VOC). $PM_{2.5}$ is included in PM_{10}. (2) CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter ≤ 10 microns in diameter, SO_x = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

Estimates of air pollutant emissions under the No Action Alternative are a projection into the future of existing baseline emissions. Under the No Action Alternative, the annual numbers of Navy training and testing activities in the Study Area would remain at baseline levels. Emissions rates would remain constant for those pollutant sources that are not affected by other federal requirements to reduce air emissions. Any impacts of the No Action Alternative on regional air quality are reflected in the current ambient criteria air pollutant concentrations in air quality control regions ashore. The No Action Alternative is exempt from the federal General Conformity Rule because training and testing activities under the No Action Alternative would not increase criteria pollutant emissions above baseline levels.

3.2.3.1.2 Alternative 1

3.2.3.1.2.1 Training

Under Alternative 1, the annual number of Navy training activities in the Study Area would increase in comparison to the No Action Alternative (baseline) levels. Emissions of criteria pollutants from training activities would increase relative to emissions under the No Action Alternative, or remain about the same (e.g., SO_x). Table 3.2-7 lists the estimated training-related criteria air pollutant and precursor emissions in the Study Area by region under Alternative 1. About 34 percent of training emissions would be produced more than 12 nm from shore.

Table 3.2-7: Annual Criteria Air Pollutant Emissions from Training under Alternative 1

Source	Air Pollutant Emissions (TPY)						
	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	Total
Hawaii							
Aircraft	42	80	5	20	43	43	190
Vessels	208	161	18	122	21	19	530
Ordnance	7	0	0	0	0	0	7
Total	**257**	**241**	**23**	**142**	**64**	**62**	**727**
Southern California							
Aircraft	77	106	7	27	57	57	274
Vessels	1,002	1,467	510	759	110	101	3,848
Ordnance	18	1	0	0	1	1	20
Total	**1,097**	**1,574**	**517**	**786**	**168**	**159**	**4,142**
Transit Corridor							
Aircraft	0	0	0	0	0	0	0
Vessels	8	6	1	3	0	0	18
Ordnance	0	0	0	0	0	0	0
Total	**8**	**6**	**1**	**3**	**0**	**0**	**18**
Study Area Total – Alternative 1	**1,362**	**1,821**	**541**	**931**	**232**	**221**	4,887
No Action Alternative	**1,271**	**1,773**	**531**	**913**	**204**	**194**	4,692
Net Change (TPY)	91	48	10	18	28	27	**195**
Net Change (%)	7	3	2	2	14	14	**-4**

Notes: (1) Table includes criteria pollutant precursors (e.g., VOC). $PM_{2.5}$ is included in PM_{10}. (2) CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter ≤ 10 microns in diameter, SO_x = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

The air pollutant emitted in the greatest quantity by aircraft under Alternative 1 (see Table 3.2-7) is NO_x, followed by CO and PM. These pollutants are emitted by aircraft involved in a variety of training activities, including anti-air warfare, electronic warfare, and mine warfare. The air pollutant emitted in the greatest quantities by surface vessels (see Table 3.2-7) is NO_x, followed by CO and SO_x. These pollutants are emitted by vessels involved in a variety of training activities, including anti-submarine warfare, anti-surface warfare, and electronic warfare. The air pollutant emitted in the greatest quantity by munitions is CO, which would be emitted under Alternative 1 by the same variety of munitions as under the No Action Alternative, including bombs, rockets, missiles, smokes, flares, and gun rounds. Under Alternative 1, training emissions would increase by up to 14 percent (depending on the pollutant) in the Study Area compared to the No Action Alternative. About 47 percent of these training emissions would be produced at least 3 nm from shore.

3.2.3.1.2.2 Testing

Under Alternative 1, the annual number of Navy testing activities in the Study Area would increase in comparison to No Action Alternative (baseline) levels. Under Alternative 1, emissions of all criteria pollutants would increase within the Study Area relative to emissions under the No Action Alternative. Table 3.2-8 lists the estimated testing-related criteria air pollutant and precursor emissions in the Study Area by region under Alternative 1, and compares them to emissions under the No Action Alternative. Over 86 percent of testing emissions would be produced 3 nm or more from shore. Over 39 percent of these emissions would be produced at least 12 nm from shore.

Table 3.2-8: Annual Criteria Air Pollutant Emissions from Testing under Alternative 1

Source	Air Pollutant Emissions (TPY)						
	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	Total
Hawaii							
Aircraft	4	8	0	0	4	4	16
Vessels	465	256	36	99	14	13	870
Ordnance	0	0	0	0	0	0	0
Total	**469**	**264**	**36**	**99**	**18**	**17**	**886**
Southern California							
Aircraft	10	31	1	1	15	15	58
Vessels	932	525	72	195	28	26	1,752
Ordnance	2	0	0	0	0	0	2
Total	**944**	**556**	**73**	**196**	**43**	**41**	**1,812**
Study Area Total	**1,413**	**820**	**109**	**295**	**61**	**58**	**2,698**
No Action Alternative	**22**	**41**	3	5	16	**16**	**87**
Net Change (#)	**1,391**	**779**	**106**	**290**	**45**	**42**	**2,611**

Notes: (1) Table includes criteria pollutant precursors (e.g., VOC). $PM_{2.5}$ is included in PM_{10}. (2) CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter ≤ 10 microns in diameter, SO_x = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

As shown in Table 3.2-8, the air pollutant that would be emitted in the greatest quantity by aircraft under Alternative 1 is NO_x, followed by particulate matter (PM_{10} and $PM_{2.5}$) and CO. These emissions are associated with aircraft involvement in a variety of testing activities, including anti-air warfare, electronic warfare, and mine warfare. As shown in Table 3.2-8, the air pollutant that would be emitted in the greatest quantities by surface vessels is CO, followed by NO_x and SO_x. These emissions are associated with vessel involvement in a variety of testing activities, including anti-submarine warfare, anti-surface warfare, and electronic warfare. The air pollutant that would be emitted in the greatest quantity by munitions is CO, which would be emitted under Alternative 1 by the same variety of munitions as under the No Action Alternative, including bombs, rockets, missiles, smokes, flares, and gun rounds. Testing activities that expend ordnance would primarily occur 12 nm or more from shore, thus reducing the likelihood that offshore emissions under the Proposed Action would affect regional air quality and receptors ashore.

3.2.3.1.2.3 General Conformity Threshold Determinations

To address the requirements of the federal General Conformity Rule, the net changes in criteria pollutant emissions associated with the Proposed Action in nonattainment and maintenance areas within the Study Area under Alternative 1 were estimated, relative to their corresponding emissions under the No Action Alternative (Table 3.2-9). As shown in Tables 3.2-10 and 3.2-11, the increases in criteria pollutant emissions would be below the *de minimis* thresholds for a full Conformity Determination. The General Conformity Rule, therefore, is satisfied under Alternative 1. Representative air pollutant emissions calculations and a Record of Non-Applicability are provided in Appendix D-1.

Table 3.2-9: California State Estimated Annual Criteria Air Pollutant Emissions by Air Basin, Alternative 1

Source	Emissions by Air Pollutant (TPY)						
	CO	NO_X	VOC	SO_x	PM_{10}	$PM_{2.5}$	Total
South Coast Air Basin							
Aircraft	10	8	1	1	5	5	25
Vessels	234	527	282	265	37	34	1,345
Ordnance	2	0	0	0	0	0	2
Total	**246**	**535**	**283**	**266**	**42**	**39**	**1,372**
San Diego Air Basin							
Aircraft	29	25	3	10	15	15	82
Vessels	207	566	182	217	28	26	1,200
Ordnance	5	0	0	0	0	0	5
Total	**241**	**591**	**185**	**227**	**43**	**41**	**1,287**

Notes: (1) Individual values may not add exactly to total values due to rounding. $PM_{2.5}$ is included in PM_{10} (2) TPY = tons per year, CO = carbon monoxide, NO_X = nitrogen oxides, VOC = volatile organic compounds, SO_x = sulfur oxides, PM_{10} = particulate matter under 10 microns, $PM_{2.5}$ = particulate matter under 2.5 microns

<u>**South Coast Air Basin**</u>

To address the requirements of the federal General Conformity Rule, the net changes in criteria air pollutant emissions in the South Coast Air Basin portion of the Study Area under Alternative 1 were estimated, relative to their corresponding emissions under the No Action Alternative. As shown in Table 3.2-10, the emissions increases for nonattainment pollutants would be below the *de minimis* thresholds for a full Conformity Determination. The General Conformity Rule, therefore, is satisfied under Alternative 1. Representative air pollutant emissions calculations and Record of Non-Applicability are provided in Appendix D-1.

Table 3.2-10: South Coast Air Basin Emissions Increases Compared to *de Minimis* Thresholds, Alternative 1

Parameter	Emissions by Air Pollutant (TPY)				
	CO	NO_X	VOC	PM_{10}	$PM_{2.5}$
No Action Alternative	229	540	285	42	39
Alternative 1	246	535	283	42	39
Net Change	**17**	**-5**	**-2**	**0**	**0**
De Minimis Threshold	100	10	10	70	100
Exceeds Threshold?	No	No	No	No	No

Notes: (1) Table includes criteria pollutant precursors (e.g., VOC). (2) CO = carbon monoxide, NO_X = nitrogen oxides, TPY = tons per year, VOC = volatile organic compounds

San Diego Air Basin

To address the requirements of the federal General Conformity Rule, the net changes in criteria air pollutant emissions in the San Diego Air Basin portion of the Study Area under Alternative 1 were estimated, relative to their corresponding emissions under the No Action Alternative. As shown in Table 3.2-11, the emissions increases for nonattainment pollutants would be below the *de minimis* thresholds for a full conformity determination. The General Conformity Rule, therefore, is satisfied under Alternative 1. Representative air pollutant emissions calculations and Record of Non-Applicability are provided in Appendix D-1.

Table 3.2-11: San Diego Air Basin Emissions Increases Compared to *de Minimis* Thresholds, Alternative 1

Parameter	Emissions by Air Pollutant (TPY)		
	CO	NO_X	VOC
No Action Alternative	**176**	**546**	175
Alternative 1	**241**	**591**	**185**
Net Change	**65**	**45**	**10**
De Minimis Threshold	100	100	100
Exceeds Threshold?	No	No	No

Notes: (1) Table includes criteria pollutant precursors (e.g., VOC). (2) CO = carbon monoxide, NO_X = nitrogen oxides, TPY = tons per year, VOC = volatile organic compounds

3.2.3.1.2.4 Summary – Alternative 1

Total criteria air pollutant emissions under Alternative 1 are summarized in Table 3.2-12. Under Alternative 1, the annual numbers of Navy training and testing activities in the Study Area would increase. Emissions of all criteria pollutants would increase. Criteria air pollutants emitted in the Study Area within territorial waters could be transported ashore, but would not affect the attainment status of the relevant air quality control regions. The amounts of air pollutants emitted in the Study Area and subsequently transported ashore would be minor because (1) emissions from Navy training and testing activities would be small compared to the amounts of air pollutants emitted by sources ashore, (2) the pollutants are emitted over large areas (i.e., the Study Area is an area source), (3) the distances the air pollutants would be transported are often large, and (4) the pollutants would be substantially dispersed during transport. The criteria air pollutants emitted over nonterritorial waters within the Study Area would be dispersed over vast areas of open ocean and thus would not cause significant harm to environmental resources in those areas.

Table 3.2-12: Estimated Annual Criteria Air Pollutant Emissions in the Hawaii-Southern California Testing and Training Study Area, Alternative 1

Source	Emissions by Air Pollutant (TPY)						
	CO	NO_X	VOC	SO_x	PM_{10}	$PM_{2.5}$	Total
Training Activities	1,357	1,791	541	925	229	218	4,843
Testing Activities	1,413	820	109	295	61	58	2,698
Total Study Area	**2,770**	**2,611**	**650**	**1,220**	**290**	**276**	**7,541**
No Action Alternative	1,293	1,814	534	918	220	210	4,779
Net Change (#)	**1,477**	**797**	**116**	**302**	**70**	**66**	**2,762**
Net Change (%)	114	44	22	33	32	31	58

Notes: (1) Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding. $PM_{2.5}$ is included in PM_{10} (2) CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter ≤ 10 microns in diameter, SO_x = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

3.2.3.1.3 Alternative 2

3.2.3.1.3.1 Training

Under Alternative 2, the annual number of Navy training activities in the Study Area would increase in comparison to the No Action Alternative (baseline) levels. Emissions of all criteria pollutants would increase relative to emissions under the No Action Alternative. Table 3.2-13 lists the estimated training-related criteria air pollutant and precursor emissions in the Study Area by region under Alternative 2. About 47 percent of training-related emissions would be produced at least 3 nm from shore. Over 34 percent of training-related emissions would be produced at least 12 nm from shore.

Table 3.2-13: Annual Criteria Air Pollutant Emissions from Training under Alternative 2

Source	Air Pollutant Emissions (TPY)						
	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	Total
Hawaii							
Aircraft	42	80	5	20	43	43	190
Vessels	208	161	18	122	21	19	530
Ordnance	7	0	0	0	0	0	7
Total	**257**	**241**	**23**	**142**	**64**	**62**	**727**
Southern California							
Aircraft	79	110	8	29	63	63	289
Vessels	1,002	1,467	510	759	110	101	3,848
Ordnance	18	1	0	0	1	1	20
Total	**1,099**	**1,578**	**518**	**788**	**174**	**165**	**4,157**
Transit Corridor							
Aircraft	0	0	0	0	0	0	0
Vessels	8	6	1	3	0	0	18
Ordnance	0	0	0	0	0	0	0
Total	8	6	1	3	0	0	**18**
Study Area Total – Alternative 2	**1,364**	**1,825**	**542**	**933**	**238**	**227**	4,902
No Action Alternative	1,271	1,773	531	913	204	194	4,692
Net Change (#)	**93**	**52**	**11**	**20**	**34**	**33**	210
Net Change (%)	7	3	2	2	17	17	4

Notes: (1) Table includes criteria pollutant precursors (e.g., VOC). $PM_{2.5}$ is included in PM_{10}. (2) CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter ≤ 10 microns in diameter, SO_x = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

The air pollutant that would be emitted in the greatest quantity by aircraft under Alternative 2 (see Table 3.2-13) is NO_x, followed by CO and PM (PM_{10} and $PM_{2.5}$). These pollutants are emitted by aircraft involved in a variety of training activities, including anti-air warfare, electronic warfare, and mine warfare. The air pollutant that would be emitted in the greatest quantities by surface vessels (see Table 3.2-13) is NO_x, followed by CO and SO_x. These pollutants are emitted by vessels involved in a variety of training activities, including anti-submarine warfare, anti-surface warfare, and electronic warfare. The air pollutant that would be emitted in the greatest quantity by munitions is CO, which would be emitted under Alternative 2 by the same variety of munitions as the No Action Alternative, including bombs, rockets, missiles, smokes, flares, and gun rounds.

3.2.3.1.3.2 Testing

Under Alternative 2, the annual number of Navy testing activities in the Study Area would increase in comparison to the No Action Alternative (baseline) levels. Emissions of all criteria pollutants would increase relative to emissions under the No Action Alternative. Table 3.2-14 lists the estimated testing-related criteria air pollutant and precursor emissions in the Study Area by region under Alternative 2. About 86 percent of testing-related emissions would be produced at least 3 nm from shore. Over 40 percent of these emissions would be produced at least 12 nm from shore.

Table 3.2-14: Annual Criteria Air Pollutant Emissions from Testing under Alternative 2

Source	Air Pollutant Emissions (TPY)						
	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	Total
Hawaii							
Aircraft	4	9	1	0	5	5	19
Vessels	504	279	39	107	15	14	944
Ordnance	1	0	0	0	0	0	1
Total	**509**	**288**	**40**	**107**	**20**	**19**	**964**
Southern California							
Aircraft	11	34	1	1	17	17	64
Vessels	1,017	574	79	213	30	28	1,913
Ordnance	2	0	0	0	0	0	2
Total	**1,030**	**608**	**80**	**214**	**47**	**45**	**1,979**
Study Area Total	**1,539**	**896**	**120**	**321**	**67**	**64**	**2,943**
No Action Alternative	22	41	3	5	16	16	87
Net Change (#)	**1,517**	**855**	**117**	**316**	**51**	**48**	**2,856**

Notes: (1) Table includes criteria pollutant precursors (e.g., VOC). $PM_{2.5}$ is included in PM_{10}. (2) CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter ≤ 10 microns in diameter, SO_x = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

The air pollutant that would be emitted in the greatest quantity by aircraft under Alternative 2 (see Table 3.2-14) is NO_x, followed by particulate matter (PM_{10} and $PM_{2.5}$) and CO. These pollutants are emitted by aircraft involved in a variety of testing activities, including anti-air warfare, electronic warfare, and mine warfare. The air pollutant that would be emitted in the greatest quantities by surface vessels (see Table 3.2-14) is CO, followed by NO_x and SO_x. These pollutants are emitted by vessels involved in a variety of testing activities, including anti-submarine warfare, anti-surface warfare, and electronic warfare. The air pollutant that would be emitted in the greatest quantity by munitions is CO, which would be emitted under Alternative 2 by the same variety of munitions as the No Action Alternative, including bombs, rockets, missiles, smokes, flares, and gun rounds. Testing activities that expend ordnance primarily would occur 12 nm or more from shore, thus reducing the likelihood that offshore emissions under the Proposed Action would affect regional air quality and receptors ashore.

3.2.3.1.3.3 General Conformity Threshold Determinations

To address the requirements of the federal General Conformity Rule, the net changes in criteria air pollutant emissions associated with the Proposed Action in nonattainment and maintenance areas within the Study Area under Alternative 2 were estimated, relative to their corresponding emissions under the No Action Alternative (Table 3.2-15). As shown in Tables 3.2-16 and 3.2-17, the increases in emissions of nonattainment and maintenance pollutants would be below the *de minimis* thresholds for a full conformity determination. The General Conformity Rule, therefore, is satisfied under Alternative 2. Representative air pollutant emissions calculations and Record of Non-Applicability are provided in Appendix D-1.

Table 3.2-15: California State Estimated Annual Criteria Air Pollutant Emissions by Air Basin, Alternative 2

Source	Emissions by Air Pollutant (TPY)						
	CO	NO_X	VOC	SO_x	PM_{10}	$PM_{2.5}$	Total
South Coast Air Basin							
Aircraft	10	9	1	1	5	5	26
Vessels	240	531	283	267	37	34	1,358
Ordnance	2	0	0	0	0	0	2
Total	**252**	**540**	**284**	**268**	**42**	**39**	**1,386**
San Diego Air Basin							
Aircraft	28	24	2	10	15	15	79
Vessels	215	568	182	219	28	26	1,212
Ordnance	0	0	0	0	1	0	1
Total	**243**	**592**	**184**	**229**	**44**	**41**	**1,292**

Notes: (1) TPY = tons per year, CO = carbon monoxide, NO_X = nitrogen oxides, VOC = volatile organic compounds, SO_x = sulfur oxides, PM_{10} = particulate matter under 10 microns, $PM_{2.5}$ = particulate matter under 2.5 microns. (2) $PM_{2.5}$ is included in PM_{10}.

South Coast Air Basin

To address the requirements of the federal General Conformity Rule, the net changes in criteria air pollutant emissions in the South Coast Air Basin portion of the Study Area under Alternative 2 were estimated, relative to their corresponding emissions under the No Action Alternative. As shown in Table 3.2-16, the increases in emissions of nonattainment pollutants would be below the *de minimis* thresholds for a full conformity determination. The General Conformity Rule, therefore, is satisfied under Alternative 2. Representative air pollutant emissions calculations and Record of Non-Applicability are provided in Appendix D-1.

Table 3.2-16: South Coast Air Basin Emissions Increases Compared to *de Minimis* Thresholds, Alternative 2

Parameter	Emissions by Air Pollutant (TPY)				
	CO	NO_X	VOC	PM_{10}	$PM_{2.5}$
No Action Alternative	229	540	285	42	39
Alternative 2	252	540	284	42	39
Net Change	**23**	**0**	**-1**	**0**	**0**
De Minimis Threshold	100	10	10	70	100
Exceeds Threshold?	No	No	No	No	No

Notes: (1) Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding. (2) CO = carbon monoxide, NO_X = nitrogen oxides, PM_{10} = particulates under 10 microns, $PM_{2.5}$ = particulates under 2.5 microns, TPY = tons per year, VOC = volatile organic compounds

San Diego Air Basin

To address the requirements of the federal General Conformity Rule, the net changes in criteria air pollutant emissions in the San Diego Air Basin portion of the Study Area under Alternative 2 were estimated, relative to their corresponding emissions under the No Action Alternative. As shown in Table 3.2-17, the increases in emissions of nonattainment pollutants would be below the *de minimis* thresholds for a full conformity determination. The General Conformity Rule, therefore, is satisfied under Alternative 2. Representative air pollutant emissions calculations and Record of Non-Applicability are provided in Appendix D-1.

Table 3.2-17: San Diego Air Basin Emissions Increases Compared to *de Minimis* Thresholds, Alternative 2

Parameter	Emissions by Air Pollutant (TPY)		
	CO	NO_X	VOC
No Action Alternative	176	**546**	175
Alternative 2	243	592	184
Net Change	**67**	**46**	**9**
De Minimis Threshold	100	100	100
Exceeds Threshold?	No	No	No

Notes: (1) Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding. (2) CO = carbon monoxide, NO_X = nitrogen oxides, TPY = tons per year, VOC = volatile organic compounds

3.2.3.1.3.4 Summary – Alternative 2

Criteria air pollutant emissions under Alternative 2 are summarized in Table 3.2-18. Under Alternative 2, the annual numbers of Navy training and testing activities in the Study Area would increase. Emissions of all criteria pollutants would increase. Criteria air pollutants emitted in the Study Area within territorial waters could be transported ashore, but would not affect the attainment status of the relevant air quality control regions. The amounts of air pollutants emitted in the Study Area and subsequently transported ashore would be minimal because (1) emissions from Navy training and testing activities would be small compared to the amounts of air pollutants emitted by sources ashore, (2) the air pollutants would be emitted over a large area, (3) the distances the air pollutants would be transported are often large, and (3) the pollutants would be substantially dispersed during transport. The criteria air pollutants emitted over nonterritorial waters within the Study Area would be dispersed over vast areas of open ocean, and thus would not cause significant harm to environmental resources in those areas.

Table 3.2-18: Estimated Annual Criteria Air Pollutant Emissions in the Hawaii-Southern California Testing and Training Study Area, Alternative 2

Source	Emissions by Air Pollutant (TPY)						
	CO	NO_X	VOC	SO_x	PM_{10}	$PM_{2.5}$	Total
Training Activities	1,365	1,818	542	930	238	228	4,893
Testing Activities	1,539	896	120	321	67	64	2,943
Total Study Area	**2,904**	**2,714**	**662**	**1,25 1**	**305**	**292**	**7,836**
No Action Alternative	1,293	1,814	534	918	220	210	4,779
Net Change (#)	**1,611**	**900**	**128**	**333**	**85**	**82**	**3,057**
Net Change (%)	125	50	24	36	39	39	64

Notes: (1) Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding. $PM_{2.5}$ is included in PM_{10}. (2) CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter ≤ 10 microns in diameter, SO_x = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

3.2.3.1.4 Impact Conclusions for Criteria Air Pollutants

Based on the estimated levels of air pollutant emissions presented in Tables 3.2-3 through 3.2-18, (1) most of the air pollutants from training and testing activities would be released to the environment in a remote area with few other sources of air pollutants, and (2) training and testing emissions would rapidly disperse over a large ocean area where few individuals would be exposed to them.

3.2.3.2 Hazardous Air Pollutants

3.2.3.2.1 No Action Alternative

The EPA has designated 188 substances as hazardous air pollutants under Title III (Hazardous Air Pollutants), Section 112(g) of the CAA. Hazardous air pollutants are emitted by several processes associated with Navy training and testing activities, including fuel combustion. Trace amounts of hazardous air pollutants are emitted by combustion sources participating in training and testing activities, including aircraft, vessels, targets, and munitions. The amounts of hazardous air pollutants emitted are small compared to the emissions of criteria pollutants; emission factors for most hazardous air pollutants from combustion sources are roughly three or more orders of magnitude lower than emission factors for criteria pollutants (California Air Resources Board 2007). Emissions of hazardous air pollutants from munitions use are smaller still, with emission factors ranging from roughly 10^{-5} to 10^{-15} lb. of individual hazardous air pollutants per item for cartridges to 10^{-4} to 10^{-13} lb. of individual hazardous air pollutants per item for mines and smoke cartridges (U.S. Environmental Protection Agency 2009a). As an example, 10^{-5} is equivalent to 0.0001 and 10^{-15} is equivalent to 0.00000000000001. To generate 1 lb. of hazardous air pollutants would require the expenditure of 10,000 to 10,000,000,000,000 lb. of munitions, respectively.

3.2.3.2.1.1 Training

Human health would not be impacted by training emissions of hazardous air pollutants in the Study Area under the No Action Alternative because (1) hazardous air pollutant emissions from training activities would be released to the environment in a remote area (the ocean) with few existing sources of air pollutants, (2) hazardous air pollutant emissions of training activities would be distributed over the entire Study Area and rapidly dispersed over a large ocean area where few individuals would be exposed to them, and (3) hazardous air pollutant emissions from training activities would be diluted through mixing in the atmosphere to a much lower ambient concentration. Residual hazardous air pollutant impacts when training is not being conducted would not be detectable. Therefore, hazardous air pollutant emissions from training for the Proposed Action will not be quantitatively estimated in this EIS/OEIS.

3.2.3.2.1.2 Testing

Human health would not be impacted by testing emissions of hazardous air pollutants in the Study Area under the No Action Alternative because (1) hazardous air pollutant emissions from testing activities would be released to the environment in a remote area (the ocean) with few existing sources of air pollutants, (2) hazardous air pollutant emissions of testing activities would be distributed over the entire Study Area and rapidly dispersed over a large ocean area where few individuals would be exposed to them, and (3) hazardous air pollutant emissions from testing activities would be diluted through mixing in the atmosphere to a much lower ambient concentration. Residual hazardous air pollutant impacts when testing is not being conducted would not be detectable. Therefore, hazardous air pollutant emissions from testing for the Proposed Action will not be quantitatively estimated in this EIS/OEIS.

3.2.3.2.2 Alternative 1

3.2.3.2.2.1 Training

Trace amounts of hazardous air pollutants would be emitted from sources participating in Alternative 1 training activities, including aircraft, vessels, targets, and munitions. Hazardous air pollutant emissions would increase under Alternative 1 relative to emissions under the No Action Alternative. As noted for the No Action Alternative in Section 3.2.3.2.1, hazardous air pollutant emissions are not quantitatively estimated, but the increase in hazardous air pollutant emissions under Alternative 1 would be roughly proportional to the increase in emissions of criteria air pollutants. Therefore, the amounts that would be emitted as a result of Alternative 1 activities would be somewhat greater than those emitted under the No Action Alternative, but would remain very small compared to the emissions of criteria air pollutants. The potential health impacts of training-related hazardous air pollutant emissions under Alternative 1 would be the same as those discussed under the No Action Alternative.

3.2.3.2.2.2 Testing

Trace amounts of hazardous air pollutants would be emitted from sources participating in Alternative 1 testing activities, including aircraft, vessels, targets, and munitions. Hazardous air pollutant emissions would increase under Alternative 1 relative to emissions under the No Action Alternative. As noted for the No Action Alternative in Section 3.2.3.2.1, hazardous air pollutant emissions are not quantitatively estimated, but the increase in hazardous air pollutant emissions under Alternative 1 would be roughly proportional to the increase in emissions of criteria air pollutants. Therefore, the amounts that would be emitted as a result of Alternative 1 testing activities would be somewhat greater than those emitted under the No Action Alternative, but would remain very small compared to the emissions of criteria air pollutants. The potential health impacts of testing-related hazardous air pollutant emissions under Alternative 1 would be the same as those discussed under the No Action Alternative.

3.2.3.2.3 Alternative 2

3.2.3.2.3.1 Training

The amounts and distribution of training-related hazardous air pollutants emitted under Alternative 2 would be similar to those described under Alternative 1. The potential health impacts of training-related hazardous air pollutants emitted under Alternative 2 would be the same as those discussed under the No Action Alternative.

3.2.3.2.3.2 Testing

The amounts and distribution of testing-related hazardous air pollutants emitted under Alternative 2 would be similar to those described under Alternative 1. The potential health impacts of testing-related hazardous air pollutants emitted under Alternative 2 would be the same as those discussed under the No Action Alternative.

3.2.4 Summary of Potential Impacts (Combined Impacts of All Stressors) on Air Quality

3.2.4.1 No Action Alternative

As discussed in Sections 3.2.3.1 and 3.2.3.2, emissions associated with Study Area training and testing primarily occur offshore, with 30 percent of emissions occurring 12 nm or more from shore. Fixed-wing aircraft emissions typically occur above the 3,000 ft. (914 m) mixing layer. Even though these stressors can co-occur in time and space, atmospheric dispersion would assure that the impacts would be short term. Changes in criteria and hazardous air pollutant emissions are not expected to be detectable, so air quality is expected to fully recover before a subsequent activity. For these reasons, impacts on air quality from combinations of these resource stressors are expected to be similar to the impacts on air quality for any stressor taken individually, with no additive, synergistic, or antagonistic interactions.

3.2.4.2 Alternative 1

As discussed in Sections 3.2.3.1 and 3.2.3.2, emissions associated with Study Area training and testing under Alternative 1 primarily occur offshore, with 37 percent of emissions occurring at least 12 nm offshore. Fixed-wing aircraft emissions typically occur above the 3,000 ft. (914 m) mixing layer. Even though these stressors can co-occur in time and space, atmospheric dispersion would assure that the impacts would be short term. Air quality is expected to fully recover before a subsequent activity. For these reasons, the impacts on air quality from combinations of these resource stressors are expected to be similar to the impacts on air quality for any stressor taken individually, with no additive, synergistic, or antagonistic interactions. Emissions of most criteria pollutants and hazardous air pollutants are expected to increase under Alternative 1.

3.2.4.3 Alternative 2

As discussed in Sections 3.2.3.1 and 3.2.3.2, emissions associated with Study Area training and testing under Alternative 2 primarily would occur at least 12 nm offshore. Fixed-wing aircraft emissions typically occur above the 3,000 ft. (914 m) mixing layer. Even though these stressors can co-occur in time and space, atmospheric dispersion would assure that the impacts would be short term. Air quality is expected to fully recover before a subsequent activity. For these reasons, impacts on air quality from combinations of these resource stressors are expected to be similar to the impacts on air quality for any stressor taken individually, with no additive, synergistic, or antagonistic interactions. Emissions of most criteria pollutants and hazardous air pollutants are expected to increase under Alternative 2.

REFERENCES

Agency for Toxic Substances and Disease Registry. (2003). Public health assessment: Naval Air Station Fallon. (EPA Facility ID: NV9170022173). Fallon, Churchill County, NV. Prepared by Federal Facilities Assessment Branch, Division of Health Assessment and Consultation, Agency for Toxic Substance and Disease Registry.

California Air Resources Board. (2007). Calculating emission inventories for vehicles in California. User's Guide. (EMFAC2007 version 2.30).

California Air Resources Board. (2010). 2009 Air quality almanac. Retrieved from http://www.arb.ca.gov/aqd/almanac/almanac09/pdf as accessed on 2010. December 2.

Intergovernmental Panel on Climate Change. (1995). IPCC Second Assessment: Climate Change 1995.

John J. McMullen Associates. (2001). Surface Ship Emission Factors Data.

Markle, S. P. & Brown, A. J. (1995). Naval Diesel Engine Duty Cycle Development International Congress and Exposition. (pp. 15). Detroit.

Ritchie, G. D., Bekkedal, M. Y. V., Bobb, L. A. J. & Still, C. K. R. (2001). Biological and health effects of JP-8 exposure. (TOXDET 01-01). Wright-Patterson Air Force Base: Naval Health Research Center Detachment (Toxicology).

San Diego County Water Authority. (n.d.). Rainfall data. Retrieved from http://www.sdcwa.org/manage/sources-rainfall.phtml as accessed on 2010. December 2.

Spargo, B. J., Hullar, T. L., Fales, S. L., Hemond, H. F., Koutrakis, P., Schlesinger, W. H., Watson, J. G. (1999). Environmental Effects of RF Chaff. A Select Panel Report to the Undersecretary of Defense for Environmental Security. Naval Research Laboratory.

U.S. Air Force. (1997). Environmental Effects of Self-Protection Chaff and Flares. (pp. 241).

U.S. Department of the Navy. (2008). Southern California Range Complex Environmental Impact Statement/Overseas Environmental Impact Statement. U.S. Navy Pacific Fleet. Prepared by Naval Facilities Engineering Command Southwest.

U.S. Environmental Protection Agency. (1972). Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution throughout the Contiguous United States. (pp. 26-35). Research Triangle Park, North Carolina.

U.S. Environmental Protection Agency. (1992). Procedures for Emission Inventory Preparation. (Vol. IV: Mobile Sources, pp. 240).

U.S. Environmental Protection Agency. (1995). AP-42, Fifth edition, Compilation of air pollutant emission factors. (Vol. I: Stationary Point and Area Sources).

U.S. Environmental Protection Agency. (2002). Exhaust and crankcase emission factors for nonroad engine modeling - compression-ignition. (NR-009b).

U.S. Environmental Protection Agency. (2008). AP 42, Fifth Edition, Volume I. Chapter 15: Ordnance Detonation. Section 15.7 Mines and Smoke Pots.

U.S. Environmental Protection Agency. (2009a). AP 42, Fifth Edition, Volume I Chapter 15: Ordnance Detonation Retrieved from http://www.epa.gov/ttn/chief/ap42/ch15/index.html

U.S. Environmental Protection Agency. (2009b). Endangerment and cause or contribute findings for greenhouse gases under Section 202(a) of the Clean Air Act.

U.S. Environmental Protection Agency. (2009c). Inventory of U.S. greenhouse gas emissions and sinks: 1990-2007.

U.S. Environmental Protection Agency. (2009d). Technical support document for endangerment and cause or contribute findings for greenhouse gases under Section 202(a) of the Clean Air Act.

U.S. Environmental Protection Agency. (2010a). Final action to ensure authority to issue permits under the prevention of significant deterioration program to sources of greenhouse gas emissions: Finding of substantial inadequacy and SIP Call.

U.S. Environmental Protection Agency. (2010b). Pollutants in the Ambient Air. Retrieved from http://www.epa.gov/ozonedesignations/1997standards/regions/region4desig.htm, 2011, July 21.

U.S. Environmental Protection Agency. (2011a). Currently Designated Nonattainment Areas for All Criteria Pollutants. Retrieved from http://www.epa.gov/air/oaqps/greenbk/ancl3.html, 2011, July 7.

U.S. Environmental Protection Agency. (2011b). National Ambient Air Quality Standards (NAAQS). Retrieved from http://www.epa.gov/air/criteria.html, 2011, September 11.

United Nations Framework Convention on Climate Change. (2004). Guidelines for the preparation of national communications by parties included in annex I to the convention, Part I: UNFCCC reporting guidelines on annual inventories (following incorporation of the provisions of decision 13/CP.9). (FCCC/SBSTA/2004/8).

Western Regional Climate Center. Hawaii climate. Retrieved from http://www.wrcc.dri.edu/narratives/HAWAII.htm as accessed on 2010. December 2.

3.3 Marine Habitats

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

This Page Intentionally Left Blank

3.3 MARINE HABITATS

MARINE HABITATS SYNOPSIS

The United States Department of the Navy considered all potential stressors, and the following have been analyzed for marine habitats as a substrate for biological communities:

- Acoustic (underwater explosives)
- Physical disturbance and strike (vessels and in-water devices, military expended materials, and seafloor devices)

Preferred Alternative

- Acoustics: Most of the high-explosive military expended materials would detonate at or near the water surface. Only bottom-laid explosives could affect bottom substrate and, therefore, marine habitats. Habitat utilized for underwater detonations would primarily be soft-bottom sediment. The surface area of bottom substrate affected would be a fraction of the total training area available in the Study Area.
- Physical Disturbance and Strike: Ocean approaches would not be expected to affect marine habitats because of the nature of high-energy surf and shifting sands. Seafloor devices would be located in areas that would be primarily soft-bottom habitat. Most seafloor devices would be placed in areas that would result in minor bottom substrate impacts. Once on the seafloor, military expended material would be buried by sediment, corroded from exposure to the marine environment, or colonized by benthic organisms. The surface area of bottom substrate affected would be a fraction of the total training area available in the Study Area.
- Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of explosives on or near the bottom, military expended materials, and seafloor devices during training and testing activities may have an adverse effect on Essential Fish Habitat by reducing the quality and quantity of non-living substrates that constitute Essential Fish Habitat and Habitat Areas of Particular Concern. Essential Fish Habitat conclusions for associated marine vegetation and sedentary invertebrates are summarized in corresponding resource sections (e.g., marine vegetation, invertebrates). Impacts to the water column as Essential Fish Habitat are summarized in corresponding resource sections (e.g., invertebrates, fish) because they are impacts on the organisms themselves.

3.3.1 INTRODUCTION

This section analyzes potential impacts on marine nonliving (abiotic) substrates found in the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area). The Study Area covers a range of marine habitats, each supporting communities of organisms that vary by season and location. The intent of this chapter is to cover abiotic habitat features that were not addressed in the individual biological resource chapters (i.e., disturbance of bottom substrate). The water column and bottom substrate provide the necessary habitats for living resources that form biotic habitats (i.e., aquatic beds and attached invertebrates), which are discussed in other sections.

Table 3.3-1 lists the types of habitats that will be discussed in this section in relation to the open-ocean areas, Large Marine Ecosystems, and bays and estuaries in which they occur. Habitat types are derived from the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979). Habitat types and subtypes presented in Table 3.3-1 represent the optimum grouping of habitats, based on similar stressor responses to locations within the aquatic environment (i.e., depth, illumination, waves, currents) and remote detection signatures for mapping. The Essential Fish Habitat Assessment for the HSTT Study Area is a supporting technical document, with concurrence from the National Marine Fisheries Service (NMFS) (U.S. Department of the Navy 2013).

Description and distribution information for the water column itself are not provided here because it is unaffected by the physical and acoustic impacts of naval training and testing activities. The direct impacts of the Proposed Action are on living marine resources in the water column and on abiotic habitats forming the bottom. The distribution of water column features is described in Section 3.0.3.2 (Bathymetry). Impacts on federally managed species via the water column (e.g., noise, contaminants), are summarized in corresponding resource sections (e.g., marine vegetation, invertebrates, fish).

Table 3.3-1: Habitat Types within the Large Marine Ecosystems and Open Ocean of the Hawaii-Southern California Training and Testing Study Area

Habitat Type	Subtype	Open Ocean	Large Marine Ecosystems	Bays, Estuaries, and Rivers
Soft Shores[2]	Beach	-	California Current, Insular Pacific-Hawaiian	-
	Tidal Delta/Flat	-	California Current, Insular Pacific-Hawaiian	California Current, Insular Pacific-Hawaiian
Hard Shores[2]	Rocky Intertidal	-	California Current, Insular Pacific-Hawaiian	-
	Biotic/Reef	Refer to "Marine Invertebrates" (Section 3.8)		
Vegetated Shores[1]	Salt/Brackish Marsh, Mangrove	Refer to "Marine Vegetation" (Section 3.7)		
Aquatic Beds[1]	Sargassum, Seagrass, Macroalgae			
Soft Bottom[2]	Channel, Flat, Shoal	California Current, Insular Pacific-Hawaiian	California Current, Insular Pacific-Hawaiian	California Current, Insular Pacific-Hawaiian
Hard Bottoms[2]	Rocky Bottom	California Current, Insular Pacific-Hawaiian	California Current, Insular Pacific-Hawaiian	-
	Biotic/Reef	Refer to "Marine Invertebrates" (Section 3.8)		
Artificial Structures[2]	Artificial reefs, ship wrecks, oil/gas platforms	-	California Current, Insular Pacific-Hawaiian	California Current, Insular Pacific-Hawaiian

[1] See Section 3.7 (Marine Vegetation) for living habitat component assessment.
[2] See Section 3.8 (Marine Invertebrates) for living habitat component assessment.

The rationale for evaluating the impact of stressors on marine substrates differs from the rationale applied to other biological resources. Unlike organisms, habitats are valued mainly for their function, which is largely based on their structural components and ability to support a variety of marine organisms. Accordingly, the assessment focuses on the ability of substrates to function as habitats. An impact on abiotic marine habitat is anticipated where training, testing, or associated transit activities could convert one substrate type into another (i.e., bedrock or consolidate limestone to unconsolidated soft bottom, or soft bottom to parachute canvas). Whereas the impacts on the biotic growth (i.e., vegetation and algae) are covered in their respective resource sections, the impacts on bottom substrate itself are considered here.

3.3.2 AFFECTED ENVIRONMENT

The majority of the Study Area lies within out-of-state and open-ocean areas. Relatively little of the Study Area includes intertidal and shallow subtidal areas in state waters, where numerous habitats are exclusively present (i.e., salt/brackish marsh, mangrove, seagrass beds, kelp forests, rocky reefs). Intertidal abiotic habitats (i.e., beaches, tidal deltas, mudflats, rocky shores) are addressed only where intersections with naval training and testing activities are reasonably likely to occur. The distribution of abiotic marine habitats among the biogeographic units and systems (i.e., estuaries, coastal ocean) is described in their respective sections, and is generalized to system and biogeographic region in Table 3.3-1.

Abiotic marine habitats vary according to geographic location, underlying geology, hydrodynamics, atmospheric conditions, and suspended particles. Flows and sediments from creeks and rivers create channels, tidal deltas, intertidal and subtidal flats, and shoals of unconsolidated material along the shorelines and estuaries. In the Hawaiian Islands, sediments are also derived from volcanic rock or can be biogenous. The influence of land-based nutrients and sediment increases with proximity to nearshore and inland waters. These nearshore areas are considered the most biologically productive waters in the Study Area as a whole (Feierabend and Zelanzy 1987; Nybakken 1993; National Oceanic and Atmospheric Administration 2010). In the pelagic ocean, gyres, eddies, and oceanic currents create dynamic microhabitats that influence the distribution of organisms. A patchwork of diverse habitats exists on the open ocean floor, where there is no sunlight, low nutrient levels, and minimal sediment movement (Levinton 2009). Major bottom features in offshore biogeographic units include shelves, banks, breaks, slopes, canyons, plains, and seamounts (Table 3.3-1). Geologic features such as these affect the hydrodynamics of the ocean water column (i.e., currents, gyres, upwellings) as well as the biological resources present.

Estuarine and ocean environments worldwide are under increasing pressure from human development and expansion, accompanied by increased ship traffic, pervasive pollution, invasive species, destructive fishing practices, vertical shoreline stabilization, offshore energy infrastructure, and global climate change (Crain et al. 2009; Lotze et al. 2006; Pandolfi et al. 2003). The stressors associated with these activities are distributed in concentrated areas across a variety of habitat types and ecosystems (Halpern et al. 2008). Areas where heavy concentrations of human activity co-occur with naval training and testing activities have the greatest potential for cumulative stress on the marine ecosystem (see Chapter 4, Cumulative Impacts). Refer to individual biological resource sections in Chapter 3, for specific stressors and impacts.

3.3.2.1 Vegetated Shores

Vegetated shorelines are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens that grow above the water line (Cowardin et al. 1979). This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. All water regimes are included except subtidal and irregularly exposed. Vegetated shorelines in the Study Area are formed by salt marsh or mangrove plant species. Salt marsh and mangrove plants are living marine resources and biotic habitat where they dominate the intertidal zone, and are therefore not covered in this chapter. Refer to Section 3.7 (Marine Vegetation) for information on salt marsh and mangrove plant species.

3.3.2.2 Soft Shores

3.3.2.2.1 Description

Soft shores include all wetland habitats having three characteristics: (1) unconsolidated substrates with less than 75 percent areal coverage of stones, boulders, or bedrock; (2) less than 30 percent areal coverage of vegetation other than pioneering plants; and (3) any of the following water regimes: irregularly exposed, regularly flooded, irregularly flooded, seasonally flooded, temporarily flooded, intermittently flooded, saturated, or artificially flooded (Cowardin et al. 1979). Soft shores include beaches, tidal flats and deltas, and stream beds of the tidal riverine and estuarine systems.

Intermittent or intertidal channels of the riverine system and intertidal channels of the estuarine system are classified as streambed. Intertidal flats, also known as tidal flats or mudflats, consist of loose mud, silt, and fine sand with organic-mineral mixtures that are regularly exposed and flooded by the tides (Karleskint et al. 2006). Muddy fine sediment is deposited in sheltered inlets and estuaries where wave energy is low (Holland and Elmore 2008). Mudflats are typically unvegetated, but may be covered with mats of green algae and benthic diatoms (single-celled algae), or sparsely vegetated with low-growing aquatic species. The muddy intertidal habitat occurs most often as part of a patchwork of intertidal habitats that may include rocky shores, tidal creeks, sandy beaches, salt marshes, and mangroves.

Beaches form through the interaction of waves and tides, as particles are sorted by size and deposited along the shoreline (Karleskint et al. 2006). Wide flat beaches with fine-grained sands occur where wave energy is limited. Narrow steep beaches of coarser sand form where energy and tidal ranges are higher (Speybroeck et al. 2008). Three zones characterize beach habitats: (1) dry areas above the mean high water, (2) wrack line (line of organic debris left on the beach by the action of tides) at the mean high water mark, and (3) a high-energy intertidal zone. Refer to biological resources chapters for more information on species use of tidal deltas, intertidal flats, or beaches.

3.3.2.2.2 Distribution

Tidal flats occur on a variety of scales in virtually all estuaries and bays in the California Current and Insular Pacific-Hawaiian large marine ecosystems. About 82 percent of Southern California's coastline is sandy beach habitat (Figure 3.3-1; Allen and Pondella 2006). The Southern California portion of the Study Area has extensive beaches, although few stretches are undisturbed by human activity (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, and National Marine Sanctuary Program 2008). In the Hawaiian portion of the Study Area, beaches are common along the lagoon reaches of atoll islets and along the coasts of all of the main Hawaiian Islands. Significant sandy beach habitat occurs primarily on the western and southern sides of the islands (Maragos 2000).

3.3.2.3 Hard Shores

3.3.2.3.1 Description

Rocky Shores include aquatic environments characterized by bedrock, stones, or boulders that, singly or in combination, cover 75 percent or more of the substrate and where vegetation covers less than 30 percent (Cowardin et al. 1979). Water regimes are restricted to irregularly exposed, regularly flooded,

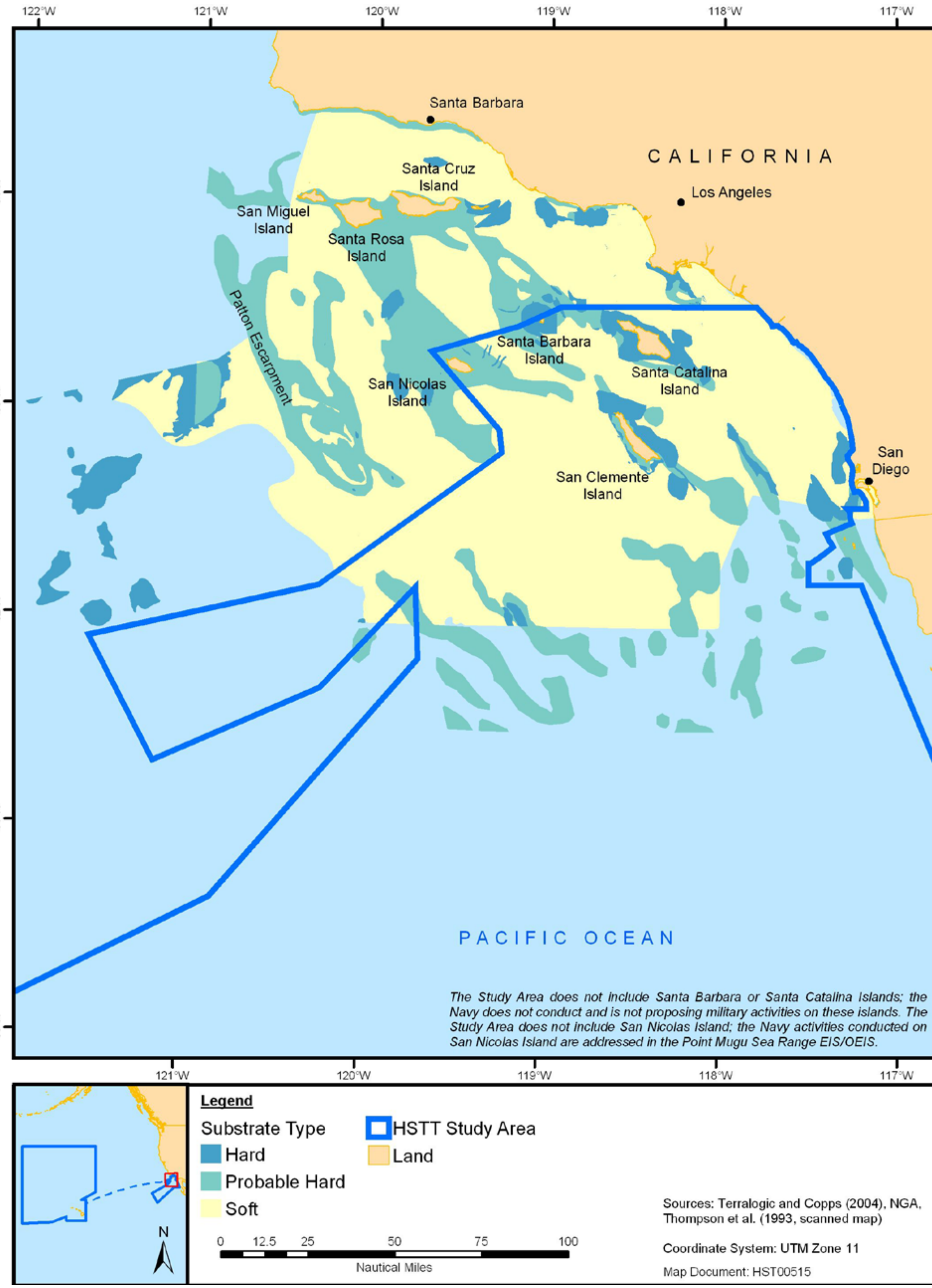


Figure 3.3-1: Bottom Substrate Composition of the Southern California Range Complex

irregularly flooded, seasonally flooded, temporarily flooded, and intermittently flooded. Rocky intertidal shores are areas of bedrock that alternate between periods of submergence and exposure to air, depending on whether the tide is high or low. Extensive rocky shorelines can be interspersed with sandy areas, estuaries, or river mouths.

Environmental gradients between hard shorelines and subtidal habitats are determined by: (1) wave action, (2) depth and frequency of tidal inundation, and (3) stability of substrate. Where wave energy is extreme, only rock outcrops may persist. In lower energy areas, a mixture of rock sizes will form the intertidal zone. Boulders scattered in the intertidal and subtidal areas provide substrate for attached macroalgae and sessile invertebrates. Refer to biological resources chapters for more information on species inhabiting hard shorelines.

3.3.2.3.2 Distribution

In the Study Area within the California Current large marine ecosystem, the most abundant hard intertidal habitat is within the Channel Island National Marine Sanctuary and the surrounding islands outside of the sanctuary (Figure 3.3-1). The Channel Island National Marine Sanctuary contains approximately 95 miles (mi.) (152.9 kilometers [km]) of hard intertidal habitat (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, and National Marine Sanctuary Program 2008). In the Insular Pacific-Hawaiian large marine ecosystem, hard intertidal habitat occurs throughout the Hawaiian Islands wherever physical conditions prevent sand from accumulating (Maragos 2000).

3.3.2.4 Aquatic Beds

Aquatic beds include wetlands and permanently submerged habitats dominated by plants and algae that grows principally on or below the surface of the water for most of the growing season in most years (Cowardin et al. 1979). Water regimes include subtidal, irregularly exposed, regularly flooded, permanently flooded, intermittently exposed, semi-permanently flooded, and seasonally flooded. Seagrasses, attached macroalgae (i.e., kelp), and floating macroalgae (i.e., Sargassum) are living marine resources and biotic habitats where they dominate the intertidal or shallow subtidal zone, and are therefore not covered in this chapter. Refer to Section 3.7 (Marine Vegetation) for information on seagrass and macroalgae species.

3.3.2.5 Soft Bottoms

3.3.2.5.1 Description

Soft bottoms include all wetland and deepwater habitats with at least 25 percent cover of particles smaller than stones (10 to 24 inches [in.] [25 to 60 centimeters {cm}]), and a vegetative coverage less than 30 percent (Cowardin et al. 1979). Water regimes are restricted to subtidal, permanently flooded, intermittently exposed, and semi-permanently flooded. Soft bottom forms the substrate of channels, shoals, subtidal flats, and other features of the bottom. Sandy channels emerge where strong currents connect estuarine and ocean water columns. Shoals or capes form where sand is deposited along converging currents. Subtidal flats occur between the soft shores and the channels or shoals.

The continental shelf extends seaward of the shoals and inlet channels, and includes an abundance of coarse-grained, soft-bottom habitats. Finer-grained sediments collect off the shelf break, continental slope, and abyssal plain. These areas are inhabited by soft-sediment communities of mobile invertebrates fueled by benthic algae production, chemosynthetic microorganisms, and detritus drifting through the water column. Refer to biological resources chapters for more information on species use of soft-bottom habitats.

3.3.2.5.2 Distribution

Soft-bottom habitat is the dominant habitat in both the California and Hawaii portions of the Study Area. In the California portion, soft-bottom habitat accounts for about 70-90 percent of bottom habitat (Allen et al. 2006). Sandy sediments are common in nearshore and shelf break portions of the Study Area while silt, clay, and mud sediments are common between the shelf break and nearshore sand sediments.

Bays and harbors in the Insular Pacific-Hawaiian large marine ecosystem are dominated by fluvial sediment (sediments deposited by rivers and streams) and sediments composed of carbonate grains derived from organisms, such as corals and mollusks. The offshore habitats of the Hawaiian Islands have similar substrate compositions at depths of 984 to 5,249 feet (ft.) (300.02 to 1,600.3 meters [m]), and are dominated by silty sands and clay. At shallow depths, there is an increasing occurrence of rocky outcrops and coral rubble (Miller 1994). Over 50 percent of the nearshore areas of the Northwestern Hawaiian Islands are considered soft bottom (Friedlander et al. 2009). The abyssal regions, which cover approximately 80 percent of the Hawaii portion of the Study Area, consist of fine-grained marine clays (Stephens et al. 1997).

The HSTT Transit Corridor follows the most direct route from Hawaii to San Diego. The HSTT Transit Corridor occurs primarily over the abyssal plain, which is an underwater plain that consists of soft bottom habitat, primarily silts and clays.

3.3.2.6 Hard Bottoms

3.3.2.6.1 Description

Hard-bottom habitat includes both biogenic reefs and rocky bottoms covered by a thin veneer of living sedentary invertebrates, hard reef and exoskeletal remains of invertebrates, and algae. Biogenic reefs include ridge-like or mound-like structures formed by the colonization and growth of sedentary invertebrates (Cowardin et al. 1979). Water regimes are restricted to subtidal, irregularly exposed, regularly flooded, and irregularly flooded. Corals form reefs that are living marine resources and biotic habitats. Coral reefs tend to dominate intertidal shores or subtidal bottoms, and are not covered in this section. “Rock Bottom” includes all wetlands and deepwater habitats with substrates having a surface of stones, boulders, or bedrock (75 percent or greater coverage) and vegetative coverage of less than 30 percent (Cowardin et al. 1979). Water regimes are restricted to subtidal, permanently flooded, intermittently exposed, and semi-permanently flooded. Cobble (a substrate smaller than stones) is included in the definition of hard bottom used by Pacific Fishery Management Council.

Subtidal rocky bottom occurs as extensions of intertidal rocky shores and as isolated offshore outcrops. The shapes and textures of the larger rock assemblages and the fine details of cracks and crevices are determined by the type of rock, the wave energy, and other local variables (Davis 2009). Maintenance of rocky reefs requires wave energy sufficient to sweep sediment away (Lalli 1993) or offshore areas lacking a significant sediment supply; therefore, rocky reefs are rare on broad coastal plains near sediment-laden rivers and are more common on high-energy shores and beneath strong bottom currents, where sediments cannot accumulate. The shapes of the rocks determine, in part, the type of community that develops on a rocky bottom (Witman and Dayton 2001). Below a depth of about 20 m (65.6 ft.) on rocky reefs, light is insufficient to support much plant life (Dawes 1998). Rocky reefs in this zone are encrusted with invertebrates, including sponges, sea cucumbers, soft corals, and sea whips, which provide food and shelter for many smaller invertebrates. Refer to living resource sections for more information on species inhabiting rock bottoms.

3.3.2.6.2 Distribution

Less than 2 percent of the coastal seafloor in Southern California is composed of hard-bottom habitat (California Department of Fish and Game 2009). Shallow hard-bottom communities are relatively uncommon and patchy in the California Current large marine ecosystem. The distribution of hard-bottom habitat in the Study Area has not been mapped extensively (Figure 3.3-1; Whitmire and Clarke 2007). Hard bottoms are most common offshore of California near rocky headlands, along steep shelf areas, and near the shelf break and submarine canyons (Allen et al. 2006). The U.S. Department of the Navy (Navy) is using side-scan Sound Navigation and Ranging (sonar) to identify the distribution of marine habitats in the offshore areas of Silver Strand Training Complex (SSTC) (as shown in Figure 3.3-2).

Volcanic rock and consolidated limestone hard bottom habitats are abundant in the Insular Pacific-Hawaiian large marine ecosystem. Figures 3.3-3, 3.3-4, 3.3-5, and 3.3-6 show offshore hard-bottom habitats in the main Hawaiian Islands. Hard-bottom habitat at middle-depths (100 to 330 ft. [30.5 to 100.6 m]) within the Insular Pacific-Hawaiian large marine ecosystem is extremely abundant but not colonized. The subtidal regions of Kaneohe Bay provide extensive solid rock formed from limestone and sand dunes, as well as dead coral, coral rubble, or live coral habitat.

Although the primary habitat of the HSTT Transit Corridor is soft-bottom, small portions of hard-bottom habitat may lie within that portion of the Study Area. Hard-bottom habitat includes ridges, submarine canyons, seamounts, and other areas of seafloor that area exposed because of ocean currents.

3.3.2.7 Artificial Structures

3.3.2.7.1 Description

Artificial habitats are manmade structures that provide habitat for marine organisms. Artificial habitats occur in the marine environment either by design and intended as habitat (e.g., artificial reefs), by design and intended for a function other than habitat (e.g., oil and gas platforms, fish-aggregating devices, floating objects moored at specific locations in the ocean to attract fishes that live in the open ocean), or unintentionally (e.g., shipwrecks). Artificial structures function as hard bottom by providing structural attachment points for algae and sessile invertebrates, which in turn support a community of animals that feed, seek shelter, and reproduce there (National Oceanic and Atmospheric Administration 2007).

Artificial habitats in the Study Area include artificial reefs, shipwrecks, oil and gas platforms, man-made shoreline structures (i.e., piers, wharfs, docks, pilings), and fish-aggregating devices (Macfadyen, Huntington, & Cappell 2009; Seaman 2007) (Figure 3.3-3 through Figure 3.3-6). Artificial reefs are designed and deployed to supplement the ecological services provided by coral or rocky reefs. Artificial reefs range from simple concrete blocks to highly engineered structures. Vessels that sink to the seafloor, including Navy shipwrecks within the Study Area, are colonized by the common encrusting marine organisms that attach to hard bases. Over time, the wrecks can become functioning reefs.

3.3.2.7.2 Distribution

As part of a Minerals Management Service (Minerals Management Service 1990) study, a database was compiled that documents 4,676 shipwrecks off the coast of California, with 876 wrecks in Southern California. The *Automated Wreck and Obstruction Information System* database (Automated Wreck and Obstruction Information System Database 2010) lists 292 wrecks just in San Diego, Orange, Los Angeles, and Ventura Counties. Shipwrecks located near the Island of Hawaii are concentrated along its northwestern coast and within Hilo Bay. The numerous known wrecks in the waters surrounding Oahu

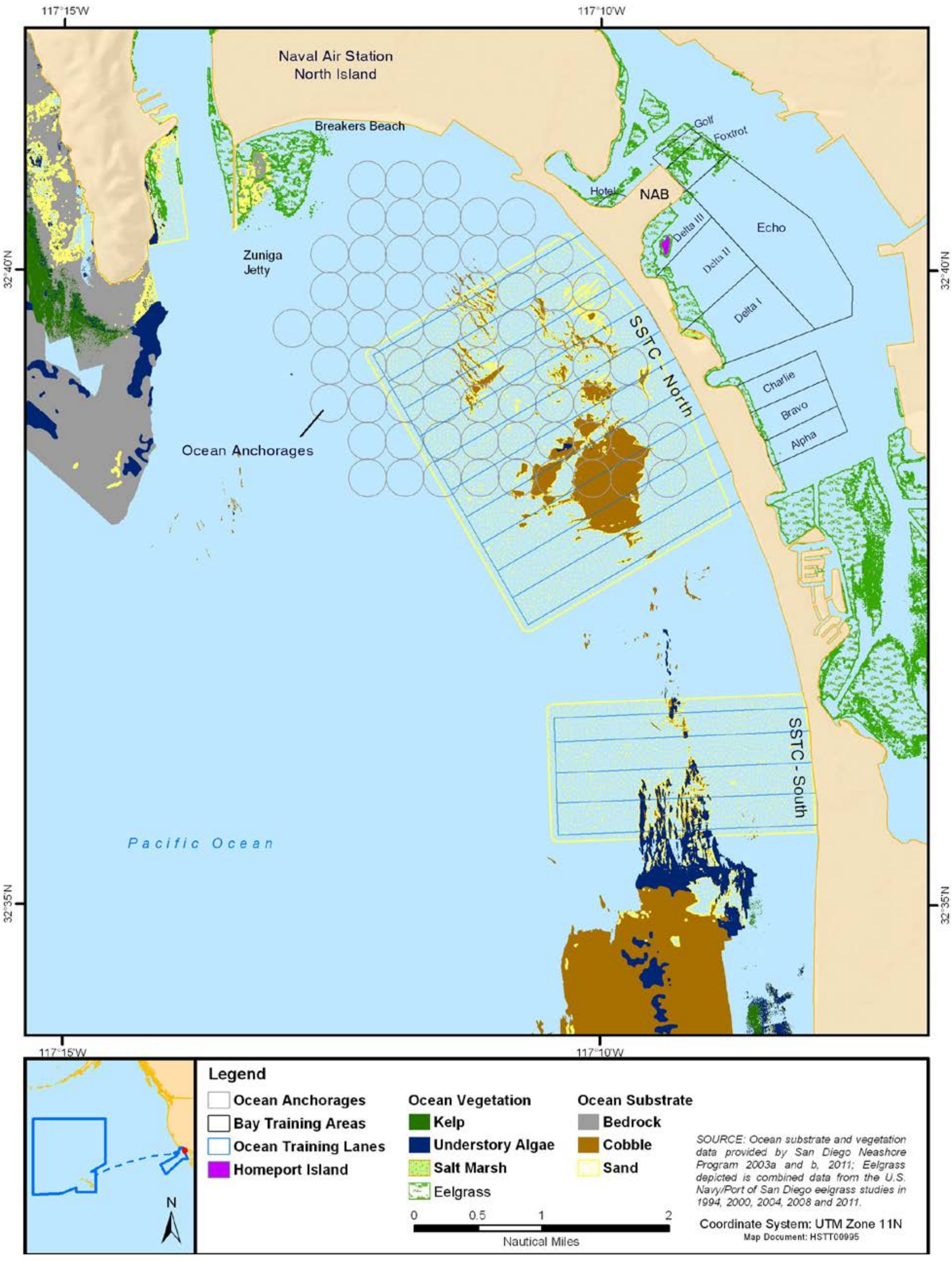


Figure 3.3-2: Bottom Substrate Composition of Silver Strand Training Complex

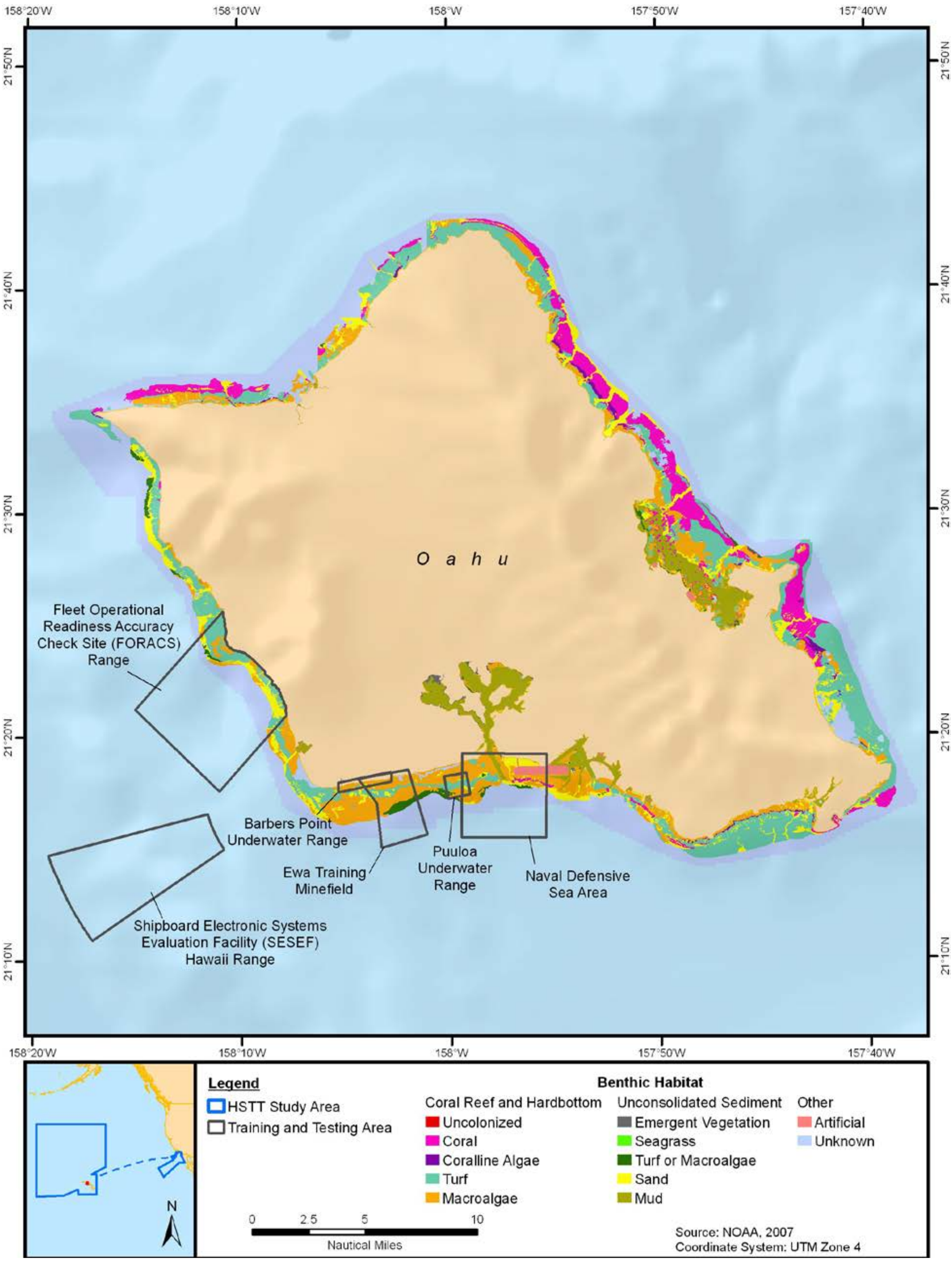


Figure 3.3-3: Offshore Habitats of Island of Oahu

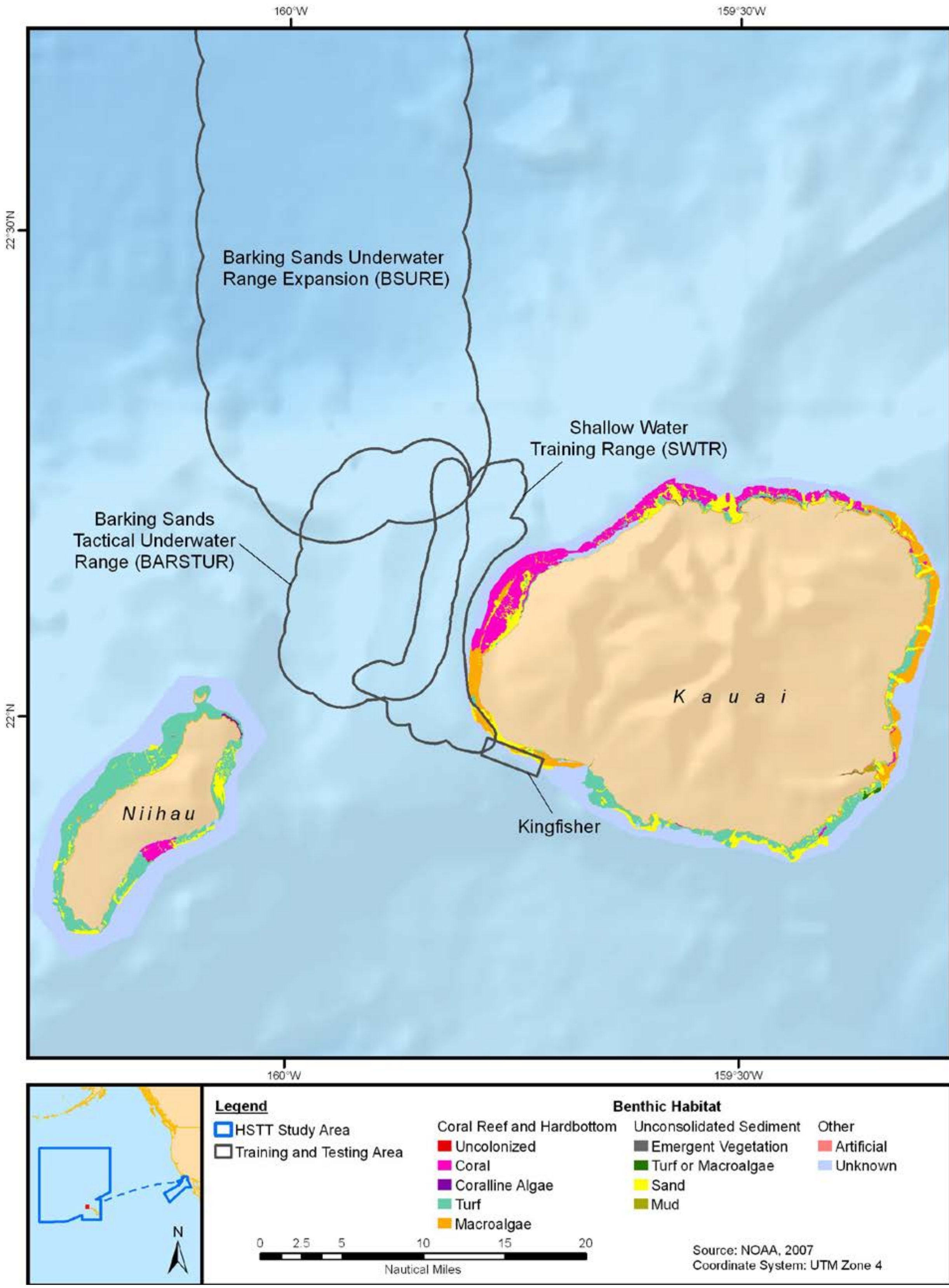


Figure 3.3-4: Offshore Habitats of Islands of Kauai and Niihau

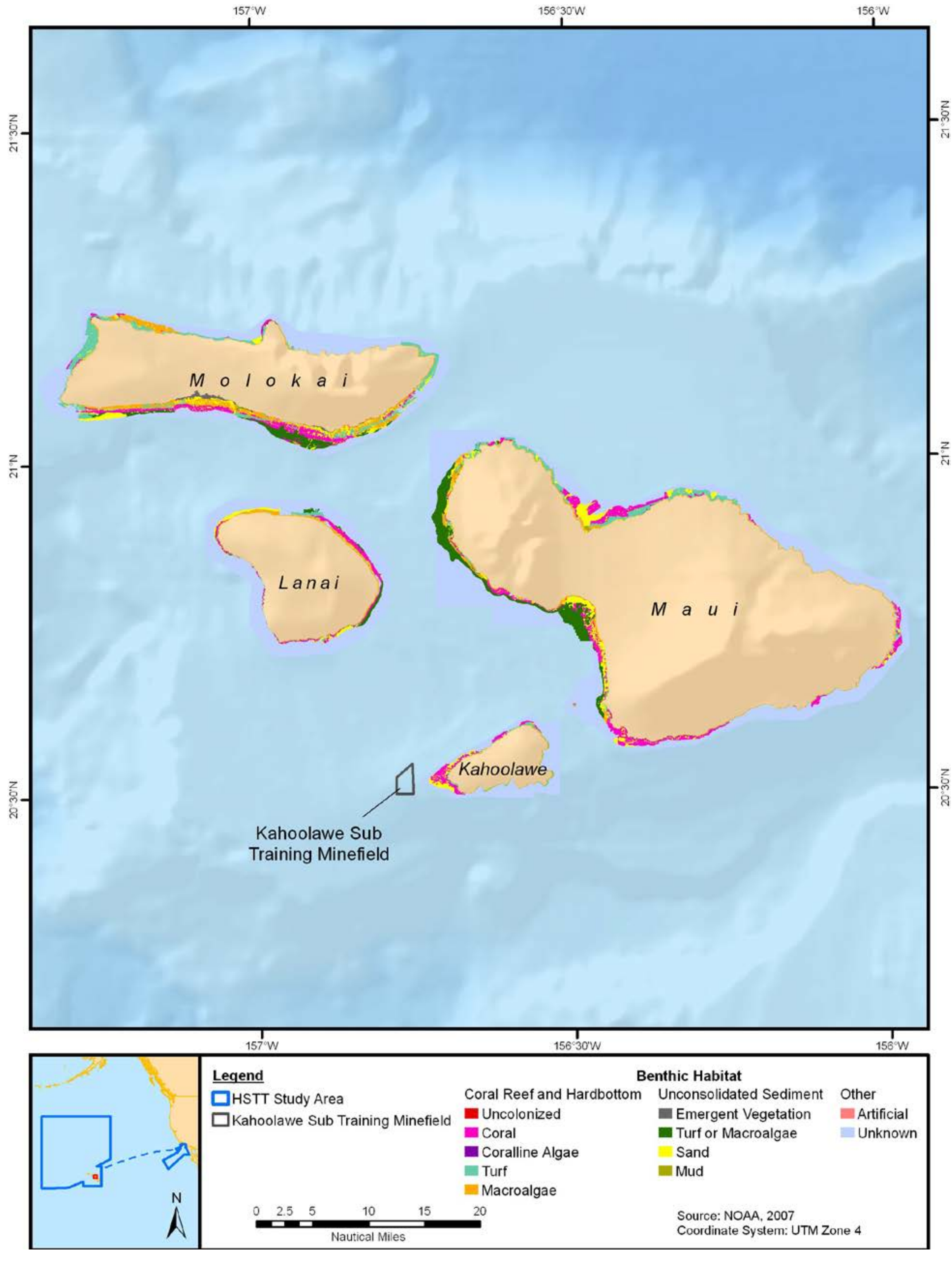


Figure 3.3-5: Offshore Habitats of Islands of Maui, Molokai, and Lanai

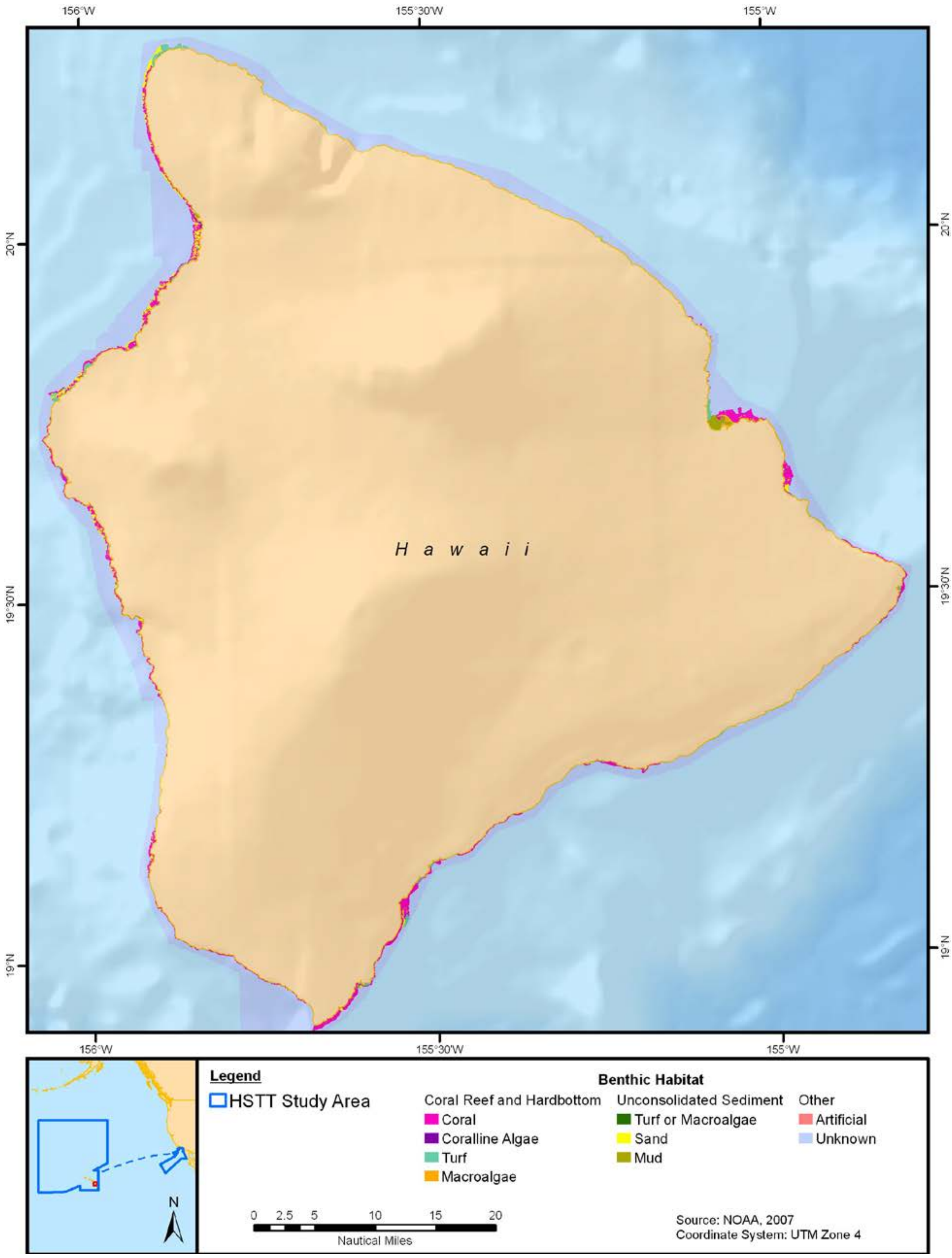


Figure 3.3-6: Offshore Habitats of Island of Hawaii

include the largely intact Sea Tiger, a World War II-era Japanese midget submarine; *Mahi*, a Navy minesweeper/cable layer scuttled off the Waianae Coast; and the YO-257, a Navy yard oiler built in the 1940s that was intentionally sunk off Waikiki in 1989 to create an artificial reef. Major shipwrecks in Pearl Harbor include the *USS Arizona*, the *USS Utah*, and the *USS Bowfin,* which are listed in the National Register of Historic Places. A cultural resources survey reported 127 known wrecks in the Northwestern Hawaiian Islands, including ships and aircraft (Office of National Marine Sanctuaries 2009). At least 14 ships have run aground in the Northwestern Hawaiian Islands since 1957 (Friedlander et al. 2009).

Most artificial reefs in marine waters have been placed and monitored by individual state programs; national and state databases of artificial reefs are not available (National Oceanic and Atmospheric Administration 2007). A 2001 report identified more than 100 artificial reefs in Southern California (California Department of Fish and Game 2001b), including some at Pendleton, Carlsbad, Bolsa Chica, and Mission Bay (California Department of Fish and Game 2001a, b). In addition to deploying reefs to enhance fish habitat, California has constructed some artificial reefs specifically to replace or enhance degraded rocky reef and kelp habitat. Artificial reefs installed at Mission Beach, Topanga, and San Mateo Point successfully support mature kelp forests (California Department of Fish and Game 2009). Off Southern California, 23 oil and gas platforms are operating in federal waters of the outer continental shelf at depths from 130 ft. (40 m) to more than 655 ft. (200 m). Operations are expected to continue through 2025 (Love et al. 2006; Minerals Management Service 2007). Four platforms offshore of Orange County are located within the Study Area.

In the Insular Pacific-Hawaiian Large Marine Ecosystem, the State of Hawaii manages five artificial reefs, four around Oahu and one on the southern side of Maui (Hawaii Division of Aquatic Resources 2006). In addition, the State monitors and maintains 55 surface fish aggregating devices (University of Hawaii 2010). No record of fish aggregating devices in the California Current Large Marine Ecosystem was located using standard search techniques.

3.3.3 Environmental Consequences

This section evaluates how and to what degree training and testing activities described in Chapter 2 (Description of Proposed Action and Alternatives) could impact marine habitats in the Study Area. Tables 2.8-1 through 2.8-5 present the baseline and proposed training and testing activity locations for each alternative (including number of events and ordnance expended). Each marine habitat stressor is introduced, analyzed by alternative, and analyzed for training activities and testing activities. Stressors vary in intensity, frequency, duration, and location within the Study Area. The following stressors are applicable to marine habitats in the Study Area and are analyzed because they have the potential to alter the quality or quantity of marine habitats for associated living resources:

- Acoustic (explosives)
- Physical disturbance and strikes (vessels and in-water devices, military expended materials, and seafloor devices).

Sonar sources do not change the substrate type of the bottom, and energy stressors do not change the substrate type by their surface orientation and nature. Entanglement and ingestion stressors are included as an aspect of military expended materials. In the remainder of this section, marine habitats will be referred to as marine substrates to reflect the subset of marine habitats being evaluated.

3.3.3.1 Acoustic Stressors (Explosives)

This section analyzes the potential impacts of underwater explosions on or near the bottom resulting from training and testing activities within the Study Area. Underwater detonations are primarily used during various mine warfare training activities. The impacts of underwater explosions vary with the bottom substrate type.

3.3.3.1.1 No Action Alternative

3.3.3.1.1.1 Training Activities

Mine neutralization training using divers and remotely operated vehicles, airborne mine neutralization system AN/ASQ-235 training, and Marine Mammal Systems training would involve explosions on or near the seafloor, which could affect marine habitats. Table 3.3-2 lists training and testing activities that include seafloor explosions, along with the location of the activity and the associated explosives charges. Primarily soft-bottom habitat would be utilized for underwater detonations. Cobble, rocky reef, and other hard bottom habitat may be scattered throughout the area, but those areas would be avoided during training to the maximum extent practicable (for additional mitigation measures, refer to Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring, Section 5.3.3.2.1, Marine Habitats and Cultural Resources).

Under the No Action Alternative, an estimated 595 underwater explosions would occur on or near the seafloor within the Study Area, as identified in Table 3.3-3. Underwater explosions near the seafloor would primarily occur in the nearshore (within 3 nautical miles [nm] of land) portions of the Study Area, with an estimated 68 high-explosive charges in the Hawaii Range Complex (HRC), 93 high-explosive charges in the Southern California (SOCAL) Range Complex, and 434 high-explosive charges in SSTC. Underwater explosives placed on or near the seafloor would range from 1 to 60 pounds (lb.) (0.4 to 27 kilograms [kg]), net explosive weight.

The determination of effect for training activities on the seafloor is based on the largest net-weight charge for each training activity: 15 lb. (6.8 kg), 29 lb. (13 kg), and 60 lb. (27 kg) (net explosive weight) explosions. Explosions produce high energies that would be partially absorbed and partially reflected by the seafloor. Hard bottoms would mostly reflect the energy (Berglind et al. 2009), whereas a crater would be formed in soft bottom (Gorodilov & Sukhotin 1996). The area and depth of the crater would vary according to depth, bottom composition, and size of the explosive charge. The relationship between crater size and depth of water is non-linear, with relatively small crater sizes in the shallowest water, followed by a spike in size at some intermediate depth, and a decline to an average flat-line at greater depth (Gorodilov & Sukhotin, 1996; O'Keeffe & Young, 1984).

In general, training and testing activities that include seafloor detonations occur in water depths ranging from 6 ft. (1.8 m) to about 100 ft. (30 m). Based on Gorodilov & Sukhotin (1996), the depth (h) and radius (R) of a crater from an underwater explosion over soft bottom is calculated using the charge radius (r_0)[1] multiplied by a number determined by solving for h or R along a non-linear relationship between [depth of water/r_0] and [h or R/r_0]. For example, a 60 lb. (27 kg) explosive charge (r_0 = 0.16 m) on a sandy bottom would produce a maximum crater size of approximately 31 ft. (10 m) in diameter and 2.6 ft. (0.8 m) deep. The area of the crater on a sandy bottom would be 760 square feet (ft.^{2}; 71 square

[1] Pounds per cubic inch of TNT (1.64 g/cm^3) x number of pounds, then solving for radius in the geometry of a spherical volume

meters [m^2]. The displaced sand doubles the radius of the crater (O'Keeffe and Young, 1984), yielding a crater diameter of 62 ft. (19 m) and an area of 3,060 $ft.^2$ (284 m^2) of impacted substrate. The area of impacted substrate for each 15 lb. (6.8 kg) and 29 lb. (13 kg) underwater explosion on the seafloor would be approximately 1,210 $ft.^2$ (112 m^2) and 1,880 $ft.^2$ (174 m^2), respectively. The radii of craters are expected to vary little among unconsolidated sediment types. On sediment types with non-adhesive particles (everything except clay), the impacts should be temporary; craters in clay may persist for years (O'Keeffe and Young, 1984). The production of craters in soft bottom could uncover subsurface hard bottom, altering marine substrate types.

Table 3.3-2: Training and Testing Activities That Include Seafloor Explosions

Activity	Explosive Charge (lb, NEW [1])	Underwater Detonations by Alternative (number)			Range Complex	
		No Action	1	2	SOCAL	Hawaii
Training						
Mine Neutralization (Explosive Ordnance Disposal)	1 to 60[2]	561	796	796	SOCAL – TAR 2, TAR 3, TAR 21, SWAT 1&2, SOAR, SWTR, SSTC Boat Lanes 1–14	Puuloa Underwater Range, Barbers Point Underwater Range, NISMF, Lima Landing, Ewa Training Minefield.
Mine Neutralization (Remotely Operated Vehicle)	3.3, 3.57, and 10 to 15	26	28	28	SOCAL: Kingfisher, Tanner-Cortez Bank, Imperial Beach Minefield, CPAAA SSTC[3]-All SSTC Boat Lanes 1–14, Breakers Beach, Delta I, II, and Delta North, Echo	-
Marine Mammal Systems	13 or 29	8	8	8	SSTC[3] Boat Lanes 1–14, Breakers Beach	Hawaii OPAREA, Kingfisher, SWM, Sonar Training Area.
Testing						
Airborne Mine Neutralization System	3.5	20	48	53	SOCAL OPAREA	
Mine Countermeasures Mission Package	3.5	0	96	128	Pyramid Cove	Hawaii OPAREA
Mine Countermeasures Neutralization	3.5	0	24	28	SOCAL OPAREA	

[1] NEW is the trinitrotoluene (TNT) equivalent of energetic material, [2] Maximum explosive charge for training activities in SSTC is 29 lb. net explosive weight, [3] Underwater detonations associated with mine neutralization (remotely operated vehicle) in SSTC occur only in the boat lanes.

Notes: NEW = net explosive weight, SOCAL = Southern California, SCI = San Clemente Island, SOAR = Southern California Anti-submarine Warfare Range, SWTR = Shallow Water Training Range, SWAT = Special Warfare Training Area, CPAAA = Camp Pendleton Amphibious Assault Area, SSTC = Silver Strand Training Complex, NISMF = Naval Inactive Ship Maintenance Facility, OPAREA = Operating Area, SWM = Shallow Water Minefield, TAR = Training Area and Range

Hard substrates reflect more energy from bottom detonations than do soft bottoms (Keevin and Hempen 1997). The amount of consolidated substrate (i.e., bedrock) converted to unconsolidated sediment by surface explosions varies according to material types and degree of consolidation (i.e., rubble, bedrock). Because of a lack of accurate and specific information on hard bottom types, the impacted area is assumed to be equal to the area of soft bottom impacted. Potential exists for fracturing and damage to hard-bottom habitat if underwater detonations occur over that type of habitat.

Detonations on the seafloor would result in approximately 1,277,730 ft.^{2} (118,748 m^2) of disturbed sediment per year in the Study Area (Table 3.3-3). Training activities at SSTC represent the highest intensity of bottom explosions (about 63 percent under the No Action Alternative). The SSTC Boat Lanes would be the smallest training area for underwater detonations in the Study Area. Assuming a disturbed area of approximately 801,000 ft.^{2} (74,400 m^2) at SSTC, this area would account for approximately 0.3 percent of the available oceanside training area (14 Boat Lanes x 500 yards [yd.] x 4,000 yd. x 9 ft.^{2}/square yard (yd.^{2}) = 252,000,000 ft.^{2} [23,400,000 m^2]). SSTC Boat Lanes are the smallest training area, so underwater detonations in HRC and SOCAL Range Complex would affect a smaller portion of the training area because training would occur in several training areas that are larger than SSTC. Therefore, underwater detonations in SOCAL Range Complex and HRC would have lesser impacts on bottom substrates than underwater detonations at SSTC.

Training events that include bottom-laid underwater explosions are infrequent and the percentage of training area affected is small, so the bottom substrates of disturbed areas would be expected to recover their previous structure. Therefore, underwater explosions under the No Action Alternative would affect marine habitat structure in the Study Area, but most impacts would be local and short-term.

Table 3.3-3: Bottom Detonations for Training Activities under the No Action Alternative

Training Area	Net Explosive Weight (lb.)[1]	Impact Footprint (m^2)	Number of Charges	Total Impact Area (m^2)
Hawaii Range Complex	60	284	68	19,312
Southern California Range Complex	15	112	8	896
	60	284	85	24,140
		Total (SOCAL)	93	25,036
Silver Strand Training Complex	15	112	18	2,016
	29	174	416	72,384
		Total (SSTC)	434	74,400
Total	-	-	**595**	**118,748**

Notes: lb. = pound(s), m^2 = square meters, SOCAL = Southern California Range Complex, SSTC = Silver Strand Training Complex

[1] Analysis assumes the largest charge, in terms of net explosive weight, for each training activity. Table 3.3-2 lists the ranges of charges used for each training activity.

3.3.3.1.1.2 Testing Activities

Under the No Action Alternative, only the airborne mine neutralization system tests include underwater explosions on or near the seafloor (seafloor detonations). Under the No Action Alternative, an estimated 20 underwater detonations occur within the Study Area (Table 3.3-2). Seafloor detonations primarily occur within 3 nm of land, and all 20 underwater detonations occur in the SOCAL Range Complex.

The determination of effect for testing activities with seafloor detonations is based on the largest net-weight charge for each activity. This activity employs a class E4 explosive (2.5–5.0 lb., net explosive weight). The impact area for a 5-lb. net explosive weight charge was calculated using the equation employed for calculating a 20-lb. charge impact (i.e., crater radius = 30 x charge radius). Realistically, not all charges are detonated on the bottom, and mitigation measures help prevent hard-bottom impacts (Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring). The number of bottom explosions modeled (10) is assumed to be half of the total number of charges (20). Because of a lack of accurate and specific information on hard-bottom types, the impacted area is assumed to be equal to the area of soft bottom impacted. Hard-bottom habitat could be fractured or otherwise damaged if underwater detonations occur over that type of habitat.

Under the No Action Alternative, all seafloor detonations for testing activities occur in the SOCAL Operating Area portion of the Study Area. Seafloor detonations for testing activities under the No Action Alternative disturb approximately 5,813 $ft.^2$ (540 m^2) of sediment per year. The area disturbed is a negligible portion of the SOCAL Operating Area.

Testing events that include seafloor detonations are infrequent and the percentage of training area affected is small, so the bottom substrates of disturbed areas are expected to recover their previous structure. Therefore, underwater explosions for testing activities under the No Action Alternative affect marine habitat structure in the Study Area, but most impacts are local and short term.

3.3.3.1.2 Alternative 1

3.3.3.1.2.1 Training Activities

Under Alternative 1, the number of underwater detonations would increase from 595 to 832 per year (40-percent increase). The number of detonations in the SOCAL Range Complex would increase by 230 percent, with smaller increases in HRC and SSTC (21 percent and 1 percent, respectively).

Underwater explosions associated with training activities under Alternative 1 would disturb approximately 1,991,160 $ft.^2$ (185,052 m^2) per year of substrate in the Study Area (Table 3.3-4). Under Alternative 1, the total area of substrate affected by underwater detonations on the seafloor would increase by 56 percent compared to the No Action Alternative. The affected area in SOCAL Range Complex would increase by 240 percent, with smaller increases for HRC (21-percent increase) and SSTC (1.8-percent increase). Underwater detonations on or near the seafloor in the SOCAL Range Complex would affect the largest amount of bottom substrate under Alternative 1.

Table 3.3-4: Bottom Detonations for Training Activities under Alternative 1

Training Area	Net Explosive Weight (lb.)	Impact Footprint (m^2)	Number of Charges	Total Impact Area (m^2)
Hawaii Range Complex	60	284	82	23,288
Southern California Range Complex	15	112	8	896
	60	284	300	85,200
		Total (SOCAL)	308	86,096
Silver Strand Training Complex	15	112	20	2,240
	29	174	422	73,428
		Total (SSTC)	442	75,668
Total	-	-	**832**	**185,052**

Notes: lb. = pound(s), m^2 = square meters, SOCAL = Southern California Range Complex, SSTC = Silver Strand Training Complex

As stated in the No Action Alternative, SSTC would represent the largest proportion of affected area compared to the total available training area. Under Alternative 1, approximately 0.3 percent of the available training area in the SSTC Boat Lanes would be affected annually by underwater detonations. Effects of underwater detonations in HRC and SOCAL Range Complex would be less than those at SSTC because of the substantial increase in available training area. Training events that include bottom-laid underwater explosions would be infrequent and the percentage of training area affected would be small, so the disturbed areas of bottom substrates would be expected to return to their previous structure. Therefore, underwater explosions under Alternative 1 would be limited to local and short-term impacts on marine habitat structure in the Study Area.

3.3.3.1.2.2 Testing Activities

Relevant testing activities under Alternative 1 include airborne mine neutralization systems testing, mine countermeasure mission package testing, and mine countermeasures/neutralization testing (Table 3.3-2). Under Alternative 1, the total number of underwater detonations would increase from 20 to 168 per year (an 840-percent increase). The number of detonations in the SOCAL Range Complex would increase by 600 percent, and this activity would be initiated in HRC (no such activities occur in HRC under the No Action Alternative).

Underwater explosions associated with testing activities under Alternative 1 would disturb approximately 48,808 $ft.^2$ (4,536 m^2) per year of substrate in the Study Area (Table 3.3-5). Under Alternative 1, the total area of substrate affected by underwater detonations on the seafloor would increase by 840 percent compared to the No Action Alternative. Underwater detonations on or near the seafloor in the SOCAL Range Complex would affect the largest amount of bottom substrate under Alternative 1.

Table 3.3-5: Bottom Detonations for Testing Activities under Alternative 1

Training Area	Net Explosive Weight (lb.)	Impact Footprint (m^2)	Seafloor Detonations (#)	Total Impact Area (m^2)
Hawaii Range Complex	5	54	24	1,296
Southern California Range Complex	5	54	60	3,240
Total			**168**	**4,536**

Notes: # = number, lb. = pound(s), m^2 = square meters,

Under Alternative 1, the areas of bottom habitat in SOCAL and HRC Operating Areas affected annually by underwater detonations for testing activities would be a negligible portion of available bottom habitat. Training events that include seafloor detonations would be infrequent and the percentage of training area affected would be small, so the disturbed areas of bottom substrates would be expected to return to their previous structure. Therefore, underwater explosions under Alternative 1 would be limited to local and short-term impacts on marine habitat structure in the Study Area.

3.3.3.1.3 Alternative 2

3.3.3.1.3.1 Training Activities

Under Alternative 2, the same number of training activities and underwater detonations would occur as under Alternative 1. Therefore, underwater detonations under Alternative 2 would have the same impacts on marine habitats as under Alternative 1.

3.3.3.1.3.2 Testing Activities

Relevant testing activities under Alternative 2 include airborne mine neutralization systems testing, mine countermeasure mission package testing, and mine countermeasures/neutralization testing (Table 3.3-2). Under Alternative 2, the total number of underwater detonations would increase from 20 to 209 per year, a 1,045-percent increase. The number of detonations in the SOCAL Range Complex would increase by 725 percent, and this activity would be initiated in HRC (no such activities occur in HRC under the No Action Alternative).

Underwater explosions during testing activities under Alternative 2 would disturb approximately 61,009 ft.^{2} (5,670 m^2) per year of substrate in the Study Area (Table 3.3-6). Under Alternative 2, the total area of substrate affected by underwater detonations on the seafloor would increase by 1,050 percent compared to the No Action Alternative. Underwater detonations on or near the seafloor in the SOCAL Range Complex would affect the largest amount of bottom substrate under Alternative 2.

Table 3.3-6: Bottom Detonations for Testing Activities under Alternative 2

Training Area	Net Explosive Weight (lb.)	Impact Footprint (m^2)	Number of Charges	Total Impact Area (m^2)
Hawaii Range Complex	5	54	32	1,728
Southern California Range Complex	5	54	73	3,942
Total			**105**	**5,670**

Notes: lb. = pound(s), m^2 = square meters,

Under Alternative 2, the areas of bottom habitat in SOCAL and HRC Operating Areas affected annually by underwater detonations for testing activities would be a negligible portion of available bottom habitat. Training events that include seafloor detonations would be infrequent and the percentage of training area affected would be small, so the disturbed areas of bottom substrates would be expected to return to their previous structure. Therefore, underwater explosions under Alternative 2 would be limited to local and short-term impacts on marine habitat structure in the Study Area.

3.3.3.1.3.3 Substressor Impact on Marine Substrate as Essential Fish Habitat

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of explosives on or near the bottom during training and testing activities may have an adverse effect on Essential Fish Habitat by reducing the quality and quantity of non-living substrates that constitute Essential Fish Habitat and Habitat Areas of Particular Concern. The HSTT Essential Fish Habitat Assessment report states that explosive impacts to hard bottom substrate are determined to be permanent and minimal throughout the Study Area. The impacts on soft bottom are determined to be short term and minimal. Mitigation measures should avoid impacts to surveyed hard bottom, as defined in the Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring). Impacts on water column as Essential Fish Habitat are summarized in corresponding resource sections (e.g., invertebrates, fish) because they are impacts on the organisms themselves.

3.3.3.2 Physical Disturbance and Strike Stressors

This section analyzes the potential impacts of various types of physical disturbance and strike stressors resulting from Navy training and testing activities within the Study Area. Bottom substrates could be disturbed by military expended materials and seafloor devices used for Navy training and testing.

Impacts of physical disturbances and strikes resulting from Navy training and testing activities on biogenic soft bottom (e.g., seagrass, macroalgae) and hard bottom (e.g., corals, sponges, tunicates, oysters, mussels, kelp) substrates are discussed in Marine Vegetation and Marine Invertebrates, Sections 3.7 and 3.8, respectively. Potential impacts on the underlying substrates (soft, hard, or artificial) are analyzed in this section.

3.3.3.2.1 Impacts from Vessel and In-Water Devices

Vessels performing training and testing exercises in the Study Area are primarily large ocean-going ships and submarines operating in waters deeper than 328 ft. (100 m), transiting through the operating areas. Vessels used for training and testing activities range in size from small boats (less than 40 ft. [12 m]) to nuclear aircraft carriers (greater than 980 ft. [300 m]). Table 3.0-19 lists representative types of vessels, including amphibious warfare vessels, used during training and testing activities.

Towed mine warfare and unmanned devices are much smaller than other Navy vessels, but would also disturb the water column near the device. Some operations involve vessels towing in-water devices used in mine warfare activities. When towed by a vessel, in-water devices are evaluated as extensions of the vessel because they can strike marine habitats in similar ways. The towed devices attached to a vessel by cables are smaller than most vessels, and are not towed at high speeds. Some vessels, such as amphibious vehicles, would intentionally contact the seafloor in the surf zone.

Vessels, in-water devices, and towed in-water devices could impact any of the habitat types discussed in this section, including soft and hard shores, soft and hard bottoms, and artificial substrates. In addition, a vessel or device could disturb the water column enough to stir up bottom sediments, temporarily and locally increasing the turbidity. The shore environment is typically very dynamic because of its constant exposure to wave action and cycles of erosion and deposition. As a result, disturbed areas would be reworked by waves and tides shortly after the disturbance. In deeper waters where the tide or wave action has little influence, sediments suspended into the water column would quickly settle to the seafloor or would be carried along the bottom by currents before settling again. In either case, these disturbances would not alter the overall nature of the sediments to a degree that would impair their function as habitat.

3.3.3.2.1.1 No Action Alternative

Training Activities

Training activities with amphibious landings under the No Action Alternative are identified in Table 3.0-24. Under the No Action Alternative, these training activities would occur 590 times per year. Under the No Action Alternative, the majority of amphibious landings during these training activities would occur in the SOCAL Range Complex (558 training activities [95 percent]), with 18 training activities (3 percent) and 14 training activities (2 percent) occurring in SSTC and HRC, respectively. The numbers of vessels used during training activities is highly variable, with the number based upon requirements, deployment schedules, annual budgets, and other unpredictable factors.

Amphibious vessels would land in HRC (Pacific Missile Range Facility [Figure 2.1-3], Marine Corps Base Hawaii [Figure 2.1-4], Marine Corps Training Area Bellows [Figure 2.1-4], and Kawaihae Pier), SOCAL Range Complex (Eel Cove [Figure 2.1-8], Wilson Cove [Figure 2.1-8], West Cove [Figure 2.1-8], Horse Beach Cove [Figure 2.1-8], Northwest Harbor [Figure 2.1-8], and Camp Pendleton Amphibious Assault Area [Figure 2.1-9]), and SSTC (Boat and Beach Lanes [Figure 2.1-10] and San Diego Bay training areas [Figure 2.1-10]). Surface ships, propelled either by water jet pump or by propeller, and small craft would be used in the Study Area. Boats in the Study Area may approach the shore or beach below the mean high tide line to transport personnel or equipment to and from shore. This beaching activity could affect marine habitats because the boat contacts and disturbs the sediment where it lands. Because of their greater size and power, large power-driven vessels would have more potential impact on bottom substrate in the Study Area. These vessels would include MK V Special Operations Craft, Mechanized and Utility Landing Craft, Air Cushioned Landing Craft, and other vessels transporting large numbers of people or equipment.

Amphibious vessels would approach the shore and could beach, which would disturb sediments and increase turbidity. The impact of large, power-driven vessels on the substrate in the surf zone would be minor because of the dispersed nature of the amphibious landings and the dynamic nature of sediments in areas of high-energy surf. Amphibious landings of large vessels in San Diego Bay would be restricted to the designated training lane within the Bravo training area.

Under the No Action Alternative, vessel movements could affect bottom sediments during amphibious landings. Ocean approaches would not be expected to affect marine habitats because of the nature of high-energy surf and shifting sands. The movement of sediment by wave energy would fill in disturbed soft-bottom habitat similar to sediment recovery from a severe storm. Impacts on substrate would be limited to suspended sediments that are carried away by ocean currents. Ocean currents, however, would carry sediments from other locations into the Study Area. Therefore, vessel movements in the Study Area would not be expected to affect marine habitats.

Testing Activities

Under the No Action Alternative, testing activities in the Study Area would not include activities, such as amphibious landings, where vessels would contact bottom substrates. Therefore, vessels and in-water devices for testing activities would have no effect on marine habitats under the No Action Alternative.

3.3.3.2.2 Alternative 1

Training Activities

Training activities with amphibious landings under Alternative 1 are identified in Table 3.0-24. Amphibious warfare training activities with amphibious landings would occur 776 times per year under Alternative 1 (32-percent-increase). Under Alternative 1, the majority of amphibious landings during these training activities would occur in the SOCAL Range Complex (559 training activities [72 percent]), with 18 training activities (2 percent) and 199 training activities (26 percent) occurring in SSTC and HRC, respectively.

Alternative 1 proposes to introduce new vessels (not replacement class vessel for existing vessels). The Littoral Combat Ship and the Joint High Speed Vessel are fast vessels that may operate in nearshore waters, but would not be expected to contact bottom substrates. The Navy would introduce unmanned undersea and surface systems under Alternative 1.

Under Alternative 1, vessel movements during amphibious landings and during the operation of unmanned undersea and surface vessels may disturb bottom sediments. Ocean approaches would not affect marine habitats because of the nature of high-energy surf and shifting sands. Since the numbers of amphibious landings are similar to those under the No Action Alternative and the number of unmanned undersea and surface vessel operations would be limited, effects on bottom substrate would be as described under the No Action Alternative. Therefore, vessel movements in the Study Area would not be expected to affect marine habitats.

Testing Activities

There are no testing activities with amphibious landings under Alternative 1.

Amphibious vessels used during testing activities would be the same or similar to amphibious vessels used during training activities. Vessel movements could affect bottom sediments during amphibious landings. Ocean approaches would not be expected to affect marine habitats because of the nature of high-energy surf and shifting sands. The movement of sediment by wave energy would fill in disturbed soft-bottom habitat similar to sediment recovery from a severe storm. Impacts on substrate would be limited to suspended sediments that are carried away by ocean currents. Therefore, vessel movements in the Study Area would not be expected to affect marine habitats.

3.3.3.2.3 Alternative 2

Training Activities

The number of training activities under Alternative 2 would be the same as under Alternative 1. Vessels used under Alternative 2 would consist of the same proposed vessels and unmanned systems as described under Alternative 1. Therefore, the effects of vessel movements under Alternative 2 would be as described for Alternative 1.

Testing Activities

There are no testing activities with amphibious landings under Alternative 2.

Under Alternative 2, vessel movements may disturb bottom sediments during amphibious landings. Ocean approaches would not affect marine habitats because of the nature of high-energy surf and shifting sands. Since the numbers of amphibious landings are similar to those under Alternative 1, effects on bottom substrate would be as described under Alternative 1. Therefore, vessel movements in the Study Area would not be expected to affect marine habitats.

3.3.3.2.4 Impacts from Military Expended Materials

Many different types of military expended materials remain on the ocean floor following Navy training and testing activities, described in Chapter 2, that occur throughout the Study Area. The potential for physical disturbance of marine substrates by military expended materials from Navy training and testing activities exists throughout the Study Area, although the types of military expended materials vary by activity (see Table 3.0-39 through Table 3.0-62 in Chapter 3) and region with some areas of greater concentration. Section 2.3.6 describes military expended materials, which include non-explosive practice munitions (projectiles, bombs, and missiles) that are used in Navy training and testing activities. Military expended materials could disturb marine substrates to the extent that they impair the substrate's ability to function as a habitat. These disturbances could result from several sources, including the impact of the expended material contacting the seafloor, the covering of the substrate by the expended material, or the alteration of the substrate from one type to another.

The potential of military expended materials to impact marine substrates as they contact the seafloor depends on several factors, including the size, type, mass, and speed of the material; water depth; the amount of material expended; the frequency of training or testing; and the type of substrate. Most of the kinetic energy of an expended item is dissipated within the first few yards of the object entering the water, causing it to slow considerably by the time it reaches the substrate. Because the damage caused by a strike is proportional to the force of the strike, slower speeds may result in lesser impacts. Because of the depth of the water in which most training and testing events take place, a direct strike on either hard bottom or artificial structures (e.g., artificial reefs and shipwrecks) with sufficient force to damage the substrate is unlikely. Any damage would be limited to a small portion of the structural habitat. The value of these substrates as habitat, however, does not depend on the shape of the structure. An alteration in shape or structure caused by military expended materials would not necessarily reduce the habitat value of either hard bottom or artificial structures. In softer substrates (e.g., sand, mud, silt, clay, and composites), the impact of the expended material on the seafloor, if large enough and striking with sufficient momentum, may create a depression and redistribute local sediments as they are temporarily re-suspended in the water column. During Navy training and testing, countermeasures such as flares and chaff are introduced into marine habitats. These types of military expended materials are not expected to impact marine habitats as strike stressors because of their size and low velocity when deployed, compared to projectiles, bombs, and missiles.

Other potential effects of military expended materials on marine substrates would be to cover them or to alter the type of substrate and, therefore, its function as habitat. The majority of military expended materials that settle on hard bottoms or artificial substrates, while covering the seafloor, would still provide the same habitat as the substrate it covers by providing a hard surface on which organisms can attach. An exception would be expended materials, such as parachutes used to deploy sonobuoys, lightweight torpedoes, expendable mobile anti-submarine warfare training targets, and other devices from aircraft, that would not provide a hard or permanent surface for colonization. In these cases, the hard bottom or artificial substrate covered by the expended material would not be damaged, but its function as a habitat for colonizing or encrusting organisms would be impaired.

Most military expended materials that settle on soft-bottom habitats, while not damaging the substrate, would eliminate the habitat by covering the substrate with a hard surface. This event would alter the substrate from a soft surface to a hard structure and, therefore, would prevent the substrate from supporting a soft bottom community. Expended materials that settle in the shallower, more dynamic environments of the continental shelf would likely be eventually covered over by sediments because of currents and other coastal processes or encrusted by organisms. In the deeper waters of the continental slope and beyond, where currents do not play as large of a role, larger expended materials (i.e., bombs, missiles) may remain exposed on the surface of the substrate with minimal change for extended periods. Softer expended materials, such as parachutes, would not damage sediments. Parachutes, however, could impair the function of the substrate as habitat because they could be a temporary barrier to interactions between the water column and the sediment.

One unique type of military expended material, because of its size, is a ship hulk. Sinking exercises use a target (ship hull or stationary artificial target) against which explosive and non-explosive ordnance are fired. These exercises eventually sink the target. The exercise lasts 4 to 8 hours over 1 to 2 days, and may use multiple targets. Sinking exercises would only occur in waters more than 9,800 ft. (2,987 m) deep. The potential impacts of sinking exercises depend on the amounts of ordnance and types of weapons used, which are situational and training-need dependent (U.S. Department of the Navy 2006). The potential military expended materials from sinking exercises include the ship hull and shell fragments. The expended materials that settle to the seafloor would not affect the stability of the seafloor or disturb natural ocean processes (U.S. Department of the Navy 2006). The impact of a ship hull settling on marine substrates would depend on the size of the ship hull and the type of substrate it settles upon. Areas of hard bottom may fragment or break as the ship settles to the seafloor. While the ship would cover a portion of the seafloor, it would support the same type of communities as the hard substrate it covered, and likely would provide more complexity and relief, which are important habitat features for hard-bottom communities. Areas of unconsolidated sediments would experience a temporarily large increase in turbidity as sediment is suspended in the water column. The settling of the ship to the seafloor would also likely displace sediment and create a large depression in the substrate. The soft substrates covered by the ship would no longer support a soft-bottom community, having been replaced by a hard structure more suitable for attaching and encrusting organisms.

The analysis to determine the potential level of disturbance of military expended materials on marine substrates assumes that the impact of the expended material on the seafloor is twice the size of its footprint. This assumption would more accurately reflect the potential disturbance to soft-bottom habitats, but could overestimate disturbance of hard-bottom habitats. For this analysis, high-explosive munitions were treated in the same manner as non-explosive practice munitions in terms of impacts on the seafloor, to be conservative, even though high-explosive ordnance would normally explode in the upper water column, and only fragments of the ordnance would settle on the seafloor.

3.3.3.2.4.1 No Action Alternative

The numbers of military expended materials used for training and testing activities under each of the Alternatives are listed in Tables 3.3-7 through 3.3-9. The physical impact area is estimated as twice the footprint of each type of military expended material.

Training Activities

Military expended materials from training activities could impact the marine substrates in training areas. Each range complex within the HSTT Study Area is evaluated below to determine what the level of impact could be under the No Action Alternative. A total of 1,552,654 military items would be expended annually in the Study Area during training activities, which would result in a total impact area of approximately 6,303,690 $ft.^2$ (585,632 m^2). The majority of the impact area would be ship hulks expended during sinking exercises. With an impact area of 632,035 $ft.^2$ (58,718 m^2) for each vessel and up to eight sinking exercises per year, ship hulks would account for about 80 percent (5,056,336 $ft.^2$ [469,749 m^2]) of the annual impact area for training activities under the No Action Alternative.

An estimated 242,649 military items would be expended annually during training activities within HRC (Table 3.3-7). Assuming that the impact area is twice the footprint of the expended item, the total impact area would be approximately 4,435,180 $ft.^2$ (412,042 m^2). The total impact area of military expended materials from training activities would cover approximately 0.12 square nautical miles (nm^2), which would be a fraction of the total sea surface area of HRC (approximately 120,000 nm^2). An estimated 1,310,005 military items would be used each year during training activities within the SOCAL Range Complex (Table 3.3-7), which could impact an area of approximately 1,868,520 $ft.^2$ (173,591 m^2) of the seafloor, assuming the area of impact is twice the footprint of the expended item. The total impact area would cover approximately 0.05 nm^2, which would be a fraction of the total sea surface area of the SOCAL Range Complex (approximately 120,000 nm^2).

Table 3.3-7: Number and Impact Footprint of Military Expended Materials by Range Complex – No Action Alternative

Military Expended Material	Size (m^2)	Impact Footprint (m^2)	Hawaii Range Complex				Southern California Range Complex[1]			
			Training Activities		Testing Activities		Training Activities		Testing Activities	
			Number	Impact (m^2)	Number	Impact (m^2)	Number	Impact (m^2)	Number	Impact (m^2)
Bombs (HE)	0.7544	1.5088	110	166	0	0	652	984	0	0
Bombs (NEPM)	0.7544	1.5088	477	720	0	0	640	966	0	0
Small caliber[1]	0.0028	0.0056	68,300	382	0	0	913,000	5,113	0	0
Medium caliber (HE)	0.0052	0.0104	3,100	32	0	0	15,000	156	2,500	26
Medium caliber (NEPM)	0.0052	0.0104	97,600	1,015	0	0	281,000	2,922	6,500	68
Large caliber (HE)	0.0938	0.1876	11,200	2,101	0	0	16,400	3,077	0	0
Large caliber (NEPM)	0.0938	0.1876	7,500	1,407	0	0	16,900	3,170	0	0
Missiles (HE)	3.4715	6.9430	160	1,111	4	28	142	986	29	201
Missiles (NEPM)	2.8801	5.7602	60	346	4	23	26	150	74	426
Rockets (HE)	0.0742	0.1484	0	0	0	0	0	0	0	0
Rockets (NEPM)	0.0742	0.1484	0	0	0	0	0	0	15	2
Chaff (cartridges)	0.0001	0.0002	200	0.04	0	0	20,750	4	0	0
Flares	0.1133	0.2266	1,750	397	0	0	8,300	1,881	0	0
Airborne targets	4.3838	8.7676	24	210	0	0	45	395	0	0
Surface targets	0.5344	1.0688	200	214	8	9	400	428	109	116
Sub-surface targets	0.1134	0.2268	370	84	32	7	670	152	24	5
Mine shapes	2.3960	4.7920	336	1,610	0	0	216	1,035	0	0
Ship hulk (SINKEX)	29,370	58,740	6	352,440	0	0	2	117,480	0	0
Torpedoes (HE)	3.0861	6.1721	6	37	8	49	2	12	8	49
Neutralizers (HE)	0.1513	0.3026	0	0	0	0	0	0	40	12
Neutralizers (NEPM)	0.1513	0.3026	0	0	0	0	360	109	100	30
Sonobuoys (HE)	0.1134	0.2268	0	0	314	71	0	0	2,652	601
Sonobuoys	0.1134	0.2268	25,000	5,670	1,817	412	17,250	3,912	5,322	1,207
Parachutes	0.8400	1.6800	26,250	44,100	1,859	3,123	18,250	30,660	5,371	9,023
Total			**242,649**	**412,042**	**4,046**	**3,722**	**1,310,005**	**173,591**	**22,744**	**11,769**

[1]Only military expended materials in SSTC are small arms blanks used during small boat attack training activities, which are included as SOCAL military expended materials.

Notes: m^2 = square meter, HE = high explosive, NEPM = non-explosive practice munition, SOCAL = Southern California, SINKEX = Sinking Exercise

Table 3.3-8: Number and Impact Footprint of Military Expended Materials by Range Complex – Alternative 1

Military Expended Material	Size (m^2)	Impact Footprint (m^2)	Hawaii Range Complex				Southern California Range Complex[1]			
			Training Activities		Testing Activities		Training Activities		Testing Activities	
			Number	Impact (m^2)	Number	Impact (m^2)	Number	Impact (m^2)	Number	Impact (m^2)
Bombs (HE)	0.7544	1.5088	74	112	0	0	166	250	0	0
Bombs (NEPM)	0.7544	1.5088	399	602	0	0	1,120	1,690	0	0
Small caliber[1]	0.0028	0.0056	422,000	2,363	6,600	37	2,559,800	14,335	13,600	76
Medium caliber (HE)	0.0052	0.0104	6,640	69	1,400	15	13,920	145	16,400	171
Medium caliber (NEPM)	0.0052	0.0104	195,360	2,032	23,000	239	435,160	4,526	58,000	603
Large caliber (HE)	0.0938	0.1876	1,894	355	2,690	505	4,244	796	3,470	651
Large caliber (NEPM)	0.0938	0.1876	1,464	275	7,500	1,407	5,596	1,050	6,620	1,242
Missiles (HE)	3.4715	6.9430	146	1,014	54	375	330	2,291	64	444
Missiles (NEPM)	2.8801	5.7602	64	369	68	392	30	173	138	795
Rockets (HE)	0.0742	0.1484	760	113	0	0	3,800	564	284	42
Rockets (NEPM)	0.0742	0.1484	0	0	0	0	0	0	696	103
Chaff (cartridges)	0.0001	0.0002	2,600	1	300	0.06	20,750	4	204	0.04
Flares	0.1133	0.2266	1,750	397	0	0	8,300	1,881	100	23
Airborne targets	4.3838	8.7676	26	228	41	359	45	395	13	114
Surface targets	0.5344	1.0688	450	481	40	43	1,150	1,229	178	190
Sub-surface targets	0.1134	0.2268	405	92	165	37	550	125	225	51
Mine shapes	2.3960	4.7920	384	1,840	0	0	216	1,035	0	0
Ship hulk (SINKEX)	29,370	58,740	6	352,440	0	0	2	117,480	0	0
Torpedoes (HE)	3.0861	6.1721	6	37	26	160	2	12	8	49
Neutralizers (HE)	0.1513	0.3026	0	0	0	0	0	0	40	12
Neutralizers (NEPM)	0.1513	0.3026	0	0	48	15	360	109	348	105
Sonobuoys (HE)	0.1134	0.2268	480	109	408	93	120	27	2,760	626
Sonobuoys	0.1134	0.2268	24,500	5,557	4,032	914	26,800	6,078	8,047	1,825
Parachutes	0.8400	1.6800	26,000	43,680	4,217	7,085	28,000	47,040	8,361	14,046
Total			**685,408**	**412,163**	**50,589**	**11,676.06**	**3,110,461**	**201,235**	**119,556**	**21,168.04**

[1]Only military expended materials in SSTC are small arms blanks used during small boat attack training activities, which are included as SOCAL military expended materials.

Notes: m^2 = square meter, HE = high explosive, NEPM = non-explosive practice munition, SINKEX = Sinking Exercise

Table 3.3-9: Number and Impact Footprint of Military Expended Materials by Range Complex – Alternative 2

Military Expended Material	Size (m^2)	Impact Footprint (m^2)	Hawaii Range Complex				Southern California Range Complex[1]			
			Training Activities		Testing Activities		Training Activities		Testing Activities	
			Number	Impact (m^2)	Number	Impact (m^2)	Number	Impact (m^2)	Number	Impact (m^2)
Bombs (HE)	0.7544	1.5088	74	112	0	0	166	250	0	0
Bombs (NEPM)	0.7544	1.5088	399	602	0	0	1,120	1,690	0	0
Small caliber[1]	0.0028	0.0056	422,000	2,363	8,250	46	2,559,800	14,335	15,550	87
Medium caliber (HE)	0.0052	0.0104	6,640	69	1,750	18	13,920	145	18,250	190
Medium caliber (NEPM)	0.0052	0.0104	195,360	2,032	23,000	239	435,160	4,526	62,000	645
Large caliber (HE)	0.0938	0.1876	1,894	355	3,680	690	4,244	796	4,460	837
Large caliber (NEPM)	0.0938	0.1876	1,464	275	3,640	683	5,596	1,050	2,060	386
Missiles (HE)	3.4715	6.9430	146	1,014	56	389	330	2,291	70	486
Missiles (NEPM)	2.8801	5.7602	64	369	70	403	30	173	148	853
Rockets (HE)	0.0742	0.1484	760	113	0	0	3,800	564	297	44
Rockets (NEPM)	0.0742	0.1484	0	0	0	0	0	0	781	116
Chaff (cartridges)	0.0001	0.0002	2,600	1	300	0.06	20,750	4	254	0.05
Flares	0.1133	0.2266	1,750	397	0	0	8,300	1,881	110	25
Airborne targets	4.3838	8.7676	26	228	52	456	45	395	24	210
Surface targets	0.5344	1.0688	450	481	43	46	1,150	1,229	197	211
Sub-surface targets	0.1134	0.2268	405	92	177	40	550	125	243	55
Mine shapes	2.396	4.792	384	1,840	0	0	216	1,035	0	0
Ship hulk (SINKEX)	29,370	58,740	6	352,440	0	0	2	117,480	0	0
Torpedoes (HE)	3.0861	6.1721	6	37	29	179	2	12	8	49
Neutralizers (HE)	0.1513	0.3026	0	0	0	0	0	0	44	13
Neutralizers (NEPM)	0.1513	0.3026	0	0	64	19	360	109	394	119
Sonobuoys (HE)	0.1134	0.2268	480	109	500	113	120	27	2,892	656
Sonobuoys	0.1134	0.2268	24,500	5,557	4,343	985	26,800	6,078	8,896	2,018
Parachutes	0.8400	1.6800	26,000	43,680	4,542	7,631	28,000	47,040	9,234	15,513
Total			**685,408**	**412,163**	**50,496**	**11,937.06**	**3,110,461**	**201,235**	**125,912**	**22,513.05**

[1] Only military expended materials in SSTC are small arms blanks used during small boat attack training activities, which are included as SOCAL military expended materials.

Notes: m^2 = square meter; HE = high explosive; NEPM = non-explosive practice munition; SINKEX = Sinking Exercise

Under the No Action Alternative, the majority of military expended materials would be used in open ocean areas, where the substrate is clays and silts. High-explosive military expended material would typically fragment into small pieces. Ordnance that fails to function as designed and inert munitions would result in larger pieces of military expended material settling to the seafloor. Once on the seafloor, military expended material would be buried by sediments or corroded from exposure to the marine environment.

During sinking exercises, large amounts of military expended material and a vessel hulk would be expended. Sinking exercises in the Study Area, however, would occur over 50 nm from shore, where the substrate would be primarily clays and silts. Clay and silt deep-water habitats would primarily consist of abyssal plains. Impacts of military materials expended over deep-water would be negligible because the Navy would typically avoid hard-bottom sub-surface features (e.g., sea mounts). Vessel hulks used during sinking exercises would alter the bottom substrate, converting soft bottom habitat into an artificial, hard-bottom structure. The amount of area affected by vessel hulks would be a fraction of the available training area, and the vessel hulk would be an anchoring point in the open ocean where the predominant habitat is soft bottom.

Military expended material in the coastal portions of the Study Area (i.e., those within 3 nm of the coast) would be limited to small-caliber projectiles, flares, and target fragments. These materials would be small, and would typically be covered by sediment or colonized by benthic organisms. The small size of military expended materials would not change the habitat structure. Therefore, military expended material from training activities in the Study Area would not affect marine habitats.

Testing Activities

Military expended materials used for testing activities may impact marine substrates in testing areas. The numbers and sizes of military expended materials in the Study Area were evaluated to determine their level of impact under the No Action Alternative. Annually, 26,790 items would be expended during testing activities, impacting approximately 166,750 $ft.^2$ (15,491 m^2) of the Study Area. The majority of the physical impact footprint would be from parachutes (about 78 percent). Parachutes would not create craters, but could cover bottom substrates as they settle on the seafloor.

An estimated 4,046 military items would be expended annually during testing activities within HRC (Table 3.3-7). Assuming that the impact area is twice the footprint of the expended material, a total area of approximately 40,068 $ft.^2$ (3,722 m^2) may be impacted in HRC. The total impact area of military expended materials from testing activities would cover approximately 0.001 nm^2, which would be a fraction of the total sea surface area of HRC.

An estimated 22,744 military items would be expended each year during testing activities within the SOCAL Range Complex (Table 3.3-7), which may impact a total area of approximately 126,680 $ft.^2$ (11,769 m^2) of the seafloor, assuming the area of impact is twice the footprint of the expended material. The total impact area of military expended materials from testing activities would cover approximately 0.003 nm^2, which would be a fraction of the total sea surface area of the SOCAL Range Complex.

3.3.3.2.4.2 Alternative 1

Table 3.3-8 lists the numbers of military items expended in training and testing activities under Alternative 1.

Training Activities

A total of 3,795,869 military items would be expended annually in the Study Area during training activities, which would result in a total impact area of approximately 6,602,550 $ft.^2$ (613,397 m^2). Although the number of military expended materials would increase by 140 percent compared to the No Action Alternative, the total area of bottom substrate affected would only increase by 5 percent.

An estimated 685,408 military items would be expended annually during training activities within the HRC (Table 3.3-8). Assuming that the impact area is twice the footprint of the expended material, a total area of approximately 4,436,480 $ft.^2$ (412,163 m^2) would be impacted. The increase in military expended materials under Alternative 1 would result in less than a 1-percent increase in the total area of substrate affected by training activities in HRC.

An estimated 3,110,461 military items would be expended each year during training activities within the SOCAL Range Complex (Table 3.3-8), which could impact a total area of approximately 2,166,070 $ft.^2$ (201,235 m^2) of the seafloor, assuming the area of impact was twice the footprint of the expended material. Compared to the No Action Alternative, the total area of substrate affected by training activities in the SOCAL Range Complex would increase by 16 percent.

In addition, military items would be expended in the Transit Corridor between HRC and SOCAL. Under Alternative 1, an estimated 91,365 items would be expended, with a total impact area of approximately 12,930 $ft.^2$ (1,201 m^2). This amount of material would be dispersed over thousands of square miles.

The majority of military training items would be expended in the open ocean, where substrates would primarily be clays and silts with few benthic invertebrates. Military expended material in the coastal portions of the Study Area (i.e., those within 3 nm of the coast) would be limited to small-caliber projectiles, flares, and target fragments. While the number of events would increase, the types of military expended materials under Alternative 1 would be the same as under the No Action Alternative. Therefore, military material expended by training activities in the Study Area would have a slightly greater impact on marine habitats than the No Action Alternative.

Testing Activities

A total of 170,145 military expended materials would be expended annually in the Study Area during testing activities, which would impact a total area of approximately 353,540 $ft.^2$ (32,845 m^2). The number of military expended materials would increase substantially compared to the No Action Alternative, and the total area of bottom substrate affected would increase by 110 percent.

An estimated 50,589 military items would be expended annually during testing activities within the HRC (Table 3.3-8). Assuming that the impact area is twice the footprint of the expended material, a total area of approximately 125,670 $ft.^2$ (11,675 m^2) would be impacted. The total area impacted by military expended materials would increase by approximately 210 percent.

An estimated 119,556 military items would be expended each year during testing activities within the SOCAL Range Complex (Table 3.3-8), which could impact approximately 227,870 $ft.^2$ (21,170 m^2) of the seafloor, assuming the impact area is twice the footprint of the expended material. The impact area would increase 80 percent compared to the impact area under the No Action Alternative (from 126,680 $ft.^2$ [11,769 m^2] to 227,870 $ft.^2$ [21,170 m^2]).

3.3.3.2.4.3 Alternative 2

The numbers of military items that would be expended for training and testing activities under Alternative 2 are listed in Table 3.3-9.

Training Activities

Under Alternative 2, the number of military expended materials would be the same as under Alternative 1. Therefore, the impact of military expended materials would be the same as under Alternative 1.

Testing Activities

A total of 176,408 military expended materials would be used annually in the Study Area during testing activities, which would impact an area of approximately 370,830 $ft.^2$ (34,451 m^2). The number of military expended materials would increase substantially compared to the No Action Alternative, and the total area of bottom substrate affected would increase by 120 percent.

An estimated 50,496 military expended materials would be used annually during testing activities within the HRC (Table 3.3-9). Assuming that the impact area is twice the footprint of the expended material, a total area of approximately 128,500 $ft.^2$ (11,938 m^2) would be impacted. The total impact area from military expended materials would increase 220 percent compared to the No Action Alternative.

An estimated 125,912 military expended materials would be used each year during testing activities within the SOCAL Range Complex (Table 3.3-9), which could impact a total area of approximately 242,320 $ft.^2$ (22,512 m^2) of the seafloor, assuming the area of impact is twice the footprint of the expended material. The total impact area of military expended materials would increase 90 percent compared to the impact area under the No Action Alternative.

3.3.3.2.4.4 Substressor Impact on Marine Substrate as Essential Fish Habitat

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of military expended materials during training and testing activities may have an adverse effect on Essential Fish Habitat by reducing the quality and quantity of non-living substrates that constitute Essential Fish Habitat and Habitat Areas of Particular Concern. The HFTT Essential Fish Habitat Assessment report states that military expended material impacts to both soft and hard bottom substrates would be minimal with a duration period of long term to permanent within the HSTT Study Area.

3.3.3.2.5 Impacts from Seafloor Devices

Seafloor devices are items used during training or testing activities that are deployed onto the seafloor. These items include moored mine shapes, anchors, bottom placed instruments, and robotic vehicles referred to as "crawlers." Seafloor devices are either stationary or move very slowly along the bottom. Seafloor devices also are used in the Mobile Diving and Salvage Unit and Elevated Causeway training activities because these training activities require installation and removal of pilings on the seafloor.

Moored mines deployed by fixed-wing aircraft enter the water and impact the bottom, becoming partially buried in sediments. Upon impact, the mine casing separates and the semi-buoyant mine floats up through the water column until it reaches the end of the mooring line. Bottom mines are typically positioned manually and are allowed to free sink to the bottom to rest. Mine shapes are normally deployed over soft sediments and are recovered within 7 to 30 days following the completion of the training or testing event.

Precision anchoring training exercises release anchors in precise locations. The intent of these training exercises is to practice anchoring the vessel within 100 yd. (91 m) of the planned anchorage location. These training activities typically occur within predetermined shallow water anchorage locations near ports with seafloors consisting of unconsolidated sediments. The level of impact on the soft sediments would depend on the size of the anchor used, which would vary according to vessel type.

3.3.3.2.5.1 No Action Alternative

Training Activities

Training activities that include seafloor devices are identified in Table 3.0-68. The numbers and locations (by range complex) of training activities with seafloor devices under the No Action Alternative are summarized in Table 3.0-70.

Mobile Diving and Salvage Unit Training Area

The Mobile Diving and Salvage Unit Training Area was established after the completion of the previous HRC Environmental Impact Statement/Overseas Environmental Impact Statement in 2009. The Navy's Mobile Diving and Salvage Unit One and armed forces from other countries would practice ship and barge salvage, towing, battle damage repair, deep-ocean recovery, harbor clearance, removal of objects from navigable waters, and underwater ship repair capabilities. The training would consist of various underwater projects to develop mission-critical skills, such as hot tapping, welding, cutting, patching, plugging, drilling, tapping, and grinding. Training includes submerging and recovering a 100 ft. by 50 ft. (30 m by 15 m) vessel. The vessel is already in place, and would remain at the Mobile Diving and Salvage Unit Training Area for an extended period. Sediment would be disturbed during raising and lowering of the vessel from its position on the seafloor. The vessel would be lowered into the same position on the seafloor after each training activity. This would result in recurring disturbance of the bottom substrate, but disturbance of the seafloor would be limited to the area directly below the vessel. Therefore, due to the limited area affected by training (500 $ft.^2$ [46 m^2]), the Mobile Diving and Salvage Unit Training Area would not be expected to affect marine habitats.

Elevated Causeway Training Activities

Under the No Action Alternative, elevated causeway training activities would occur four times per year at SSTC (Boat Lanes 1-10 and Bravo training lane). Elevated causeway activities would involve installing and removing a temporary pier or causeway over a two-week period using floating barges and a pile driver to drive 24-in. (61-cm) diameter metal pilings into bottom substrates. Most of the causeway would remain floating offshore, with pilings driven into the sediment. An elevated causeway would most likely consist of 58 pier piles (29 per side), 29 pier head piles, and 16 pier head fender piles, for a total of 103 piles. The estimated affected area for each training activity would be approximately 320 $ft.^2$ (30 m^2), with approximately 1,300 $ft.^2$ (121 m^2) affected by all four training activities. The driving and removal of piles to support the elevated causeway system would disturb sediment and increase turbidity at the site of the pile driving. Pile-driving would occur mostly in soft-bottom habitat. Training activities in the oceanside Boat Lanes would affect less than 0.001 percent of the training area, and would occur in areas of high-energy surf, which is adapted to frequent disturbance. Therefore, based on the small percentage of training area affected during training activities, elevated causeway pilings would not be expected to affect marine sediments.

Testing Activities

Testing activities that include seafloor devices are identified in Table 3.0-69. The numbers and locations (by range complex) of testing activities with seafloor devices under the No Action Alternative are summarized in Table 3.0-70.

Under the No Action Alternative, testing activities for mine countermeasures would use Mine Neutralization Training Areas as described above for training activities. In addition, testing activities could occur outside of established training minefields. The sizes and shapes of mines used for testing activities would be similar to those used for training activities. Based on the small area affected by mine shapes (approximately 8 to 15 $ft.^2$) (0.7 to 1.4 m^2), mine shapes used during testing activities would not be expected to affect marine habitats.

Fixed intelligence, surveillance, and reconnaissance sensor systems testing activities would place fixed sensor arrays on the seafloor for submarine detection and tracking experiments and demonstrations. The sensors are connected by cables to processing centers on land. Cables are typically laid on the seafloor, but may be buried in areas where bottom disturbance is likely, such as areas typically used for trawling, fishing, or anchoring. In these areas, cables would be buried and armored to prevent damage to the cables and attached sensors. Cables for fixed intelligence, surveillance, and reconnaissance sensor systems would not be expected to affect marine habitats because the small diameter of cables and burial in frequently disturbed areas.

3.3.3.2.6 Alternative 1

Training Activities

Training activities that include seafloor devices are identified in Table 3.0-68. The numbers and locations (by range complex) of training activities with seafloor devices under Alternative 1 are summarized in Table 3.0-70. Under Alternative 1, no additional seafloor devices would be used or implemented and the number of training activities with seafloor devices would decrease compared to the No Action Alternative. Therefore, seafloor devices under Alternative 1 would have the same effects on marine habitats as under the No Action Alternative.

Testing Activities

Testing activities that include seafloor devices are identified in Table 3.0-69. The numbers and locations (by range complex) of testing activities with seafloor devices under Alternative 1 are summarized in Table 3.0-70. Under Alternative 1, seafloor devices used during testing activities for mine countermeasures would consist of mine shapes and cables for fixed intelligence, surveillance, and reconnaissance sensor systems. The types of mine shapes would be the same as under the No Action Alternative. The number of testing activities using fixed intelligence, surveillance, and reconnaissance sensor systems would increase, but testing activities would use the existing seafloor sensors. Sensor maintenance may be required, but would only affect disturbed areas. Therefore, seafloor devices would not be expected to affect marine habitats.

3.3.3.2.7 Alternative 2

Training Activities

Training activities that include seafloor devices are identified in Table 3.0-68. The numbers and locations (by range complex) of training activities with seafloor devices under Alternative 2 are summarized in Table 3.0-70. Under Alternative 2, no additional seafloor devices would be used or implemented, and the number of training activities with seafloor devices would decrease compared to the No Action Alternative. Therefore, seafloor devices under Alternative 2 would have the same effects on marine habitats as under the No Action Alternative.

Testing Activities

Testing activities that include seafloor devices are identified in Table 3.0-69. The numbers and locations (by range complex) of testing activities with seafloor devices under Alternative 2 are summarized in Table 3.0-70. Under Alternative 2, seafloor devices used during testing activities would consist of mine shapes and cables for fixed intelligence, surveillance, and reconnaissance sensor systems. Seafloor devices used under Alternative 2 would be the same as under the No Action Alternative and Alternative 1, and, therefore, would have similar effects. Seafloor devices under Alternative 2 would not be expected to affect marine habitats.

3.3.3.2.7.1 Substressor Impact on Marine Substrate as Essential Fish Habitat

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of seafloor devices during training and testing activities may have an adverse effect on soft bottom substrates that constitute Essential Fish Habitat (U.S. Department of the Navy 2013). These potential impacts to soft bottom substrates would be minimal in size and temporary (recovery in days to weeks) to short term (recovery in weeks up to three years) in duration (U.S. Department of the Navy 2013). Hard bottom substrates and artificial structures should not be adversely affected by the use of seafloor devices.

3.3.3.2.8 Summary of Physical Disturbance and Strike Stressors

Physical disturbance and strike stressors that could affect bottom substrates include vessel and in-water strikes, seafloor devices, and military expended materials. Amphibious landings in marine habitats of concern would be located to limit the potentially affected area. Ocean approaches would not be expected to affect marine habitats because of the nature of high-energy surf and shifting sands. Seafloor devices would be located in areas that would be primarily soft-bottom habitat. Most seafloor devices would be placed in areas that would result in minor bottom substrate impacts.

3.3.4 Summary of Potential Impacts (Combined Impacts of All Stressors) on Marine Habitats

Most of the high-explosive military expended materials would detonate at or near the water surface. Underwater explosions that could affect bottom substrate, and therefore marine habitats, would be underwater detonations on the seafloor. Habitat utilized for underwater detonations would primarily be soft-bottom sediment. The substrate and water column affected by detonations on the seafloor would be expected to be recolonized.

Physical stressors that could affect bottom substrates include vessel and in-water strikes, seafloor devices, and military expended materials. Amphibious landings in marine habitats of concern would be located to limit the potentially affected area. Beach approaches from the ocean would not be expected to affect marine habitats because the biotic community has adapted to frequent disturbances because of the nature of sand movement in surf zones. Seafloor devices would be located primarily in soft-bottom habitat. Most seafloor devices would only disturb local bottom substrate. Once on the seafloor, military expended material would be colonized by benthic organisms because military expended materials would provide anchor points in the shifting, soft-bottom substrate.

3.3.4.1 No Action Alternative

The combined impact area of acoustic stressors, physical disturbances, and strike stressors proposed for training and testing events in the No Action Alternative would not significantly impact the ability of soft shores, soft bottoms, hard shores, hard bottoms, or artificial substrates to function as habitat. The total area impacted by underwater explosions and military expended is summarized in Table 3.3-10.

Table 3.3-10: Combined Impact from Acoustic Stressors (Underwater Explosions) and Physical Disturbances (Military Expended Materials) on Marine Substrates for the No Action Alternative

Training Area	Impact Footprint (m^2)		
	Underwater Explosions	Military Expended Materials	Total
Hawaii Range Complex	19,312	415,764	435,076
Southern California Range Complex	25,036	185,300	210,336
Silver Strand Training Complex	74,400	59	74,459
Transit Lane	0	0	0
Total	118,748	601,123	719,871

3.3.4.2 Alternative 1

The combined effects of acoustic stressors, physical disturbances, and strike stressors proposed for training and testing events in Alternative 1 would not significantly impact the ability of soft shores, soft bottoms, hard shores, hard bottoms, or artificial substrates to function as habitat. The total area impacted by underwater explosions and military expended is summarized in Table 3.3-11.

Table 3.3-11: Combined Impact from Acoustic Stressors (Underwater Explosions) and Physical Disturbances (Military Expended Materials) on Marine Substrates for Alternative 1

Training Area	Impact Footprint (m^2)		
	Underwater Explosions	Military Expended Materials	Total
Hawaii Range Complex	23,288	423,838	447,126
Southern California Range Complex	86,096	222,404	308,500
Silver Strand Training Complex	75,668	59	75,727
Transit Lane	0	1,201	1,201
Total	185,052	647,502	832,554

3.3.4.3 Alternative 2

The combined effects of acoustic stressors, physical disturbances, and strike stressors proposed for training and testing events in Alternative 2 would not significantly impact the ability of soft shores, soft bottoms, hard shores, hard bottoms, or artificial substrates to function as habitat. The total area impacted by underwater explosions and military expended is summarized in Table 3.3-12.

Table 3.3-12: Combined Impact from Acoustic Stressors (Underwater Explosions) and Physical Disturbances (Military Expended Materials) on Marine Substrates for Alternative 2

Training Area	Impact Footprint (m^2)		
	Underwater Explosions	Military Expended Materials	Total
Hawaii Range Complex	23,288	424,101	447,389
Southern California Range Complex	86,096	223,747	309,843
Silver Strand Training Complex	75,668	59	75,727
Transit Lane	0	1,201	1,201
Total	185,052	649,108	834,160

3.3.4.4 Essential Fish Habitat Determinations

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of explosives on or near the bottom, vessel movement, military expended materials, and seafloor devices may have an adverse effect on Essential Fish Habitat by reducing the quality and quantity of non-living substrates that constitute Essential Fish Habitat and Habitat Areas of Particular Concern. The HSTT Essential Fish Habitat Assessment report states that individual stressor impacts to non-living substrates were all either no effect or minimal and ranged in duration from temporary to permanent, depending on the habitat impacted (U.S. Department of the Navy 2013).

REFERENCES

Allen, L. G. and Pondella, D. J. (2006). Surf zone, coastal pelagic zone, and harbors. In L. G. Allen, D. J. Pondella, II and M. H. Horn (Eds.), *The Ecology of Marine Fishes: California and Adjacent Waters* (pp. 149-166). Berkeley, CA: University of California Press.

Allen, L. G., Yoklavich, M. M., Cailliet, G. M. and Horn, M. H. (2006). Bays and estuaries. In L. G. Allen, D. J. Pondella, II and M. H. Horn (Eds.), *The Ecology of Marine Fishes: California and Adjacent Waters* (pp. 119-148). Berkeley, CA: University of California Press.

Automated Wreck and Obstruction Information System Database. (2010). Shipwreck Database. Retrieved from http://shipwrecks.slc.ca.gov/ShipwrecksDatabase/Shipwrecks_Database.asp, January 5, 2011.

Berglind, R., Menning, D., Tryman, R., Helte, A., Leffler, P., & Karlsson, R.-M. (2009). *Environmental effects of underwater explosions: a literature study*: Totalforsvarets Forskningsinstitut, FOI.

California Department of Fish and Game. (2001a). Artificial reef coordinates in Southern California (Appendix 1). In *A Guide to the Artificial Reefs of Southern California*. Modified version of A Guide to the Artificial Reefs of Southern California (1989), by Robin D. Lewis and Kimberly K. McGee and the Nearshore Sportfish Habitat Enhancement Program ed. Retrieved from http://www.dfg.ca.gov/marine/artificialreefs/appendix1.pdf, 05 June 2010.

California Department of Fish and Game. (2001b). *A Guide to the Artificial Reefs of Southern California*. Modified version of *A Guide to the Artificial Reefs of Southern California* (1989), by Robin D. Lewis and Kimberly K. McGee and the Nearshore Sportfish Habitat Enhancement Program ed. [Web Page]. Retrieved from http://www.dfg.ca.gov/marine/artificialreefs/index.asp, 05 June 2010.

California Department of Fish and Game. (2009). *Regional Profile of the MLPA South Coast Study Region (Point Conception to the California-Mexico Border)*. (pp. 193). Sacramento, CA: California Marine Life Protection Act Initiative, California Natural Resources Agency.

Cowardin, L. M., Carter, V., Golet, F. C., & LaRoe, E. T. (1979). *Classification of wetlands and deepwater habitats of the United States*.

Crain, C. M., Halpern, B. S., Beck, M. W., & Kappel, C. V. (2009). Understanding and managing human threats to the coastal marine environment. *The Year in Ecology and Conservation Biology: New York Academy of Science, 1162*, 39-62.

Davis, A. R. (2009). The role of mineral, living and artificial substrata in the development of subtidal assemblages. In. In M. Wahl (Ed.), *Marine Hard Bottom Communities: Patterns, Dynamics, Diversity and Change* (Vol. 206, pp. 19-37). Berlin: Springer-Verlag.

Dawes, C. J. (1998). *Marine Botany* (2nd ed.). New York, NY: John Wiley & Sons, Inc.

Feierabend, S. J., & Zelazny, J. M. (1987). *Status report on our nation's wetlands*. Washington, D.C.: National Wildlife Federation.

Friedlander, A., Keller, K., Wedding, L., Clarke, A. and Monaco, M. (Eds.). (2009). *A Marine Biogeographic Assessment of the Northwestern Hawaiian Islands*. (NOAA Technical Memorandum NOS NCCOS 84, pp. 363). Silver Spring, MD. Prepared by NCCOS's Biogeography Branch in cooperation with the Office of National Marine Sanctuaries Papahānaumokuākea Marine National Monument.

Gorodilov, L. V., & Sukhotin, A. P. (1996). Experimental investigation of craters generated by explosions of underwater surface charges on sand. *Combustion, Explosion, and Shock Waves, 32*(3), 344-346.

Halpern, B. S., Walbridge, S., Selkoe, K. A., Kappel, C. V., Micheli, F., D'Agrosa, C. (2008). A global map of human impact on marine ecosystems. Science, 319(5865), 948-952. doi: 10.1126/science.1149345.

Hawaii Division of Aquatic Resources. (2006). *Hawaii's Five Artificial Reefs & Corresponding Commercial Fish Catch Areas - Map* [Electronic Map]. (Area covered: Hawaii Islands).

Holland, K. T. and Elmore, P. A. (2008). A review of heterogeneous sediments in coastal environments. *Earth-Science Reviews, 89*(3-4), 116-134. doi: 10.1016/j.earscirev.2008.03.003

Karleskint, G., Turner, R. and Small, J. W., Jr. (2006). *Introduction to Marine Biology* (2nd ed., pp. 460). Belmont, California: Thomson Brooks/Cole.

Keevin, T. M., & Hempen, G. L. (1997). *The environmental effects of underwater explosions with methods to mitigate impacts*. St. Louis, MO.

Lalli, C. M. (1993). *Biological Oceanography: An Introduction*. New York: Pergamon Press.

Levinton, J. (2009). The Tidelands: Rocky shores, soft-substratum shores, marshes, mangroves, and estuaries. In Marine Biology: Function, Biodiversity, Ecology (3rd ed., pp. 355-412). New York, NY: Oxford University Press.

Lotze, H. K., Lenihan, H. S., Bourque, B. J., Bradbury, R. H., Cooke, R. G., Kay, M. C. (2006). Depletion, degradation, and recovery potential of estuaries and coastal seas. Science, 312(5781), 1806-1809. doi: 10.1126/science.1128035.

Love, M. S., Schroeder, D. M., Lenarz, W., MacCall, A., Bull, A. S. and Thorsteinson, L. (2006). Potential use of offshore marine structures in rebuilding and overfished rockfish species, bocaccio (Sebastes paucispinis). Fishery Bulletin, 104(3), 383-390.

Macfadyen, G., Huntington, T. & Cappell, R. (2009). Abandoned, Lost or Otherwise Discarded Fishing Gear. (UNEP Regional Seas Report and Studies 185, or FAO Fisheries and Aquaculture Technical Paper 523, pp. 115). Rome, Italy: United Nations Environment Programme Food, Food and Agriculture Organization of the United Nations. Available from http://www.fao.org/docrep/011/i0620e/i0620e00.HTM.

Maragos, J. E. (2000). Hawaiian Islands (U.S.A.). In C. R. C. Sheppard (Ed.), Seas at the Millennium: An Environmental Evaluation (Vol. II: Regional Chapters: The Indian Ocean to the Pacific, pp. 791-812). New York, NY: Elsevier Science Ltd.

Miller, J. (1994). Review of the physical oceanographic conditions within the designated sanctuary. Pages 9-18 in K. Des Rochers, ed. 1994. A site characterization study for the Hawaiian Island Humpback Whale National Marine Sacntuary. Prepared by the University of Hawaii Sea Grant Program. Honolulu, Hawaii. National Oceanographic and Atmospheric Administration.

Minerals Management Service. (1990). California, Oregon, and Washington Archaeological Resource Study. (Vol. III: Prehistory, pp. 141). Prepared by P. Snethkamp, G. Wessen, A. York, J. Cleland, S. Hoyt and R. Gearhart. Prepared for Minerals Management Service.

Minerals Management Service. (2007). Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf: Final Environmental Impact Statement. (OCS EIS/EA MMS 2007-046) US Department of the Interior and Minerals Management Service.

National Oceanic and Atmospheric Administration. (2007). National Artificial Reef Plan (as Amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs. (pp. 51) U.S. Department of Commerce and National Oceanic and Atmospheric Administration.

National Oceanic and Atmospheric Administration. (2010). Barrier islands: Formation and evolution. In, Beach Nourishment: A Guide for Local Government Officials.

Nybakken, J. W. (1993). Marine Biology, an Ecological Approach (3rd ed.). New York, NY: Harper Collins College Publishers.

O'Keeffe, D.J. and G.A. Young (1984). Handbook on the Environmental Effects of Underwater Explosions. Naval Surface Weapons Center. NSWC TR 83-240. 13 September.

Office of National Marine Sanctuaries. (2009). Papahānaumokuākea Marine National Monument Condition Report 2009. (pp. 54). Silver Spring, MD: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries.

Pandolfi, J. M., Bradbury, R. H., Sala, E., Hughes, T. P., Bjorndal, K. A., Cooke, R. G. (2003). Global trajectories of the long-term decline of coral reef ecosystems. Science, 301(5635), 955-958.

Seaman, W. (2007). Artificial habitats and the restoration of degraded marine ecosystems and fisheries. Hydrobiologia, 580(1), 143-155. doi: 10.1007/s10750-006-0457-9.

Speybroeck, J., Bonte, D., Courtens, W., Gheskiere, T., Grootaert, P., Maelfait, J. P., et al. (2008). The Belgian sandy beach ecosystem: a review. Marine Ecology-an Evolutionary Perspective, 29(Supplement 1), 171-185.

Stephens, M.P., D.C. Kadko, C.R. Smith, and M. Latasa. (1997). Chlorophyll-a and pheopigments as tracers of labile organic carbon at the central equatorial Pacific seafloor. Geochimica et Cosmochimica Acta 61(21): 4605-4619.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Sanctuary Program. (2008). Channel Islands National Marine Sanctuary Final Management Plan/Final Environmental Impact Statement. Silver Spring, MD.

U.S. Department of the Navy. (2006). *Programmatic Overseas Environmental Assessment (OEA) for Sinking Exercises (SINKEXs) in the Western North Atlantic Ocean* (pp. 64). Newport, RI: U.S. Department of the Navy, Commander Fleet Forces Command. Prepared by N. Naval Undersea Warfare Center Division.

University of Hawaii. (2010). History of the Hawaii State FADs Program. [Web Page]. Retrieved from http://www.hawaii.edu/HIMB/FADS/FADHistory.html

Whitmire, C. E. and Clarke, M. E. (2007). State of deep coral ecosystems of the U.S. Pacific coast: California to Washington. In S. E. Lumsden, T. F. Hourigan, A. W. Bruckner and G. Dorr (Eds.), The State of Deep Coral Ecosystems of the United States. (NOAA Technical Memorandum CRCP-3, pp. 109-154). Silver Spring, MD: U.S. Departement of Commerce and National Oceanic and Atmospheric Administration.

Witman, J. D. & Dayton, P. K. (2001). Rocky subtidal communities. In M. D. Bertness, S. D. Gaines and M. E. Hay (Eds.), Marine Community Ecology (pp. 339-366). Sunderland, Massachusetts: Sinauer Associates, Inc.

3.4 Marine Mammals

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

This Page Intentionally Left Blank

3.4 Marine Mammals

MARINE MAMMALS SYNOPSIS

The United States (U.S.) Department of the Navy (Navy) considered all potential stressors, and the following have been analyzed for marine mammals:

- Acoustic (sonar and other active acoustic sources, explosives, pile driving, swimmer defense airguns, weapons firing, launch, and impact noise, vessel noise, and aircraft noise)
- Energy (electromagnetic devices)
- Physical disturbance and strike (vessels, in-water devices, military expended materials, and seafloor devices)
- Entanglement (fiber optic cables and guidance wires, and parachutes)
- Ingestion (munitions and military expended materials other than munitions)
- Secondary (explosives and byproducts, metals, chemicals, and transmission of disease and parasites)

Preferred Alternative (Alternative 2)

- Acoustics: Pursuant to the Marine Mammal Protection Act (MMPA), the use of sonar and other active acoustic sources and explosives may result in Level A harassment or Level B harassment of certain marine mammals; pile driving is not expected to result in mortality or Level A harassment but may result in Level B harassment of certain marine mammals; the use of swimmer defense airguns is not expected to result in mortality or Level A harassment but may result in Level B harassment of California sea lion; weapons firing, launch, and impact noise, vessel noise, and aircraft noise are not expected to result in mortality, Level A harassment, or Level B harassment of any marine mammals. Pursuant to the Endangered Species Act (ESA), the use of sonar and other active sources and explosives may affect and is likely to adversely affect certain ESA-listed marine mammals. Pile driving; swimmer defense airguns; weapons firing, launch, and impact noise; vessel noise; and aircraft noise may affect but are not likely to adversely affect certain ESA-listed marine mammals. Acoustic sources would have no effect on marine mammal critical habitats.
- Energy: Pursuant to the MMPA, the use of electromagnetic devices is not expected to result in mortality, Level A harassment, or Level B harassment of any marine mammals. Pursuant to the ESA, the use of electromagnetic devices may affect but is not likely to adversely affect certain ESA-listed marine mammals and would have no effect on marine mammal critical habitats.
- Physical Disturbance and Strike: Pursuant to the MMPA, the use of vessels may result in mortality or Level A harassment of certain marine mammal species but is not expected to result in Level B harassment of any marine mammal. The use of in-water devices, military expended materials, and seafloor devices is not expected to result in mortality, Level A harassment, or Level B harassment of any marine mammal. Pursuant to the ESA, vessel use may affect and is likely to adversely affect certain ESA-listed species. The use of in-water devices and military expended materials may affect but is not likely to adversely affect certain marine mammal species. The use of seafloor devices would have no effect on any ESA-listed marine mammal. The use of vessels, in-water devices, military expended materials, and seafloor devices would have no effect on marine mammal critical habitats.

MARINE MAMMALS SYNOPSIS (continued)

Preferred Alternative (Alternative 2)

- Entanglement: Pursuant to the MMPA, the use of fiber optic cables, guidance wires, and parachutes is not expected to result in mortality, Level A harassment, or Level B harassment of any marine mammal. Pursuant to the ESA, the use of fiber optic cables, guidance wires, and parachutes may affect but is not likely to adversely affect certain ESA-listed marine mammals and would have no effect on marine mammal critical habitats.
- Ingestion: Pursuant to the MMPA, the potential for ingestion of military expended materials is not expected to result in mortality, Level A harassment, or Level B harassment of any marine mammal. Pursuant to the ESA, the potential for ingestion of military expended materials may affect but is not likely to adversely affect certain ESA-listed species.
- Secondary Stressors: Pursuant to the MMPA, secondary stressors are not expected to result in mortality, Level A harassment, or Level B harassment of any marine mammal. Pursuant to the ESA, secondary stressors may affect but are not likely to adversely affect certain ESA-listed marine mammals and would have no effect on marine mammal critical habitats.

The use of sonar and active acoustic sources are not expected to result in mortality, although the potential for beaked whale mortality coincident with use of sonar and other active acoustic sources is considered. The Navy has requested two annual beaked whale mortality takes under the MMPA as part of all training activities combined to account for any unforeseen potential impacts.

3.4.1 INTRODUCTION

This section provides the analysis of potential impacts on marine mammals that are found in the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area). Throughout this section references are made to various regions of the Pacific Ocean delineated by the National Oceanic and Atmospheric Administration/National Marine Fisheries Service (NMFS) Science Centers. The Eastern North Pacific is the area in the Pacific Ocean that is east of 140 degrees (°) west (W) longitude and north of the equator. Similarly the Central North Pacific is the area north of the equator and between the International Date Line (180° W longitude) and 140° W longitude. The Eastern Tropical Pacific is the area roughly extending from the United States (U.S.)-Mexico Border west to Hawaii and south to Peru.

Marine mammals are a diverse group of approximately 130 species. Most live predominantly in the marine habitat, although some species spend time in terrestrial habitats (e.g., seals) or in some cases, in freshwater environments, such as certain freshwater dolphins (Jefferson 2009a, Rice 1998). The exact number of formally recognized marine mammal species changes periodically with new scientific understanding or findings (Rice 1998). Even the higher-level classification of marine mammals is controversial because the understanding of their origins and relationships continues to evolve (for a list of current species, see the formal list *Marine Mammal Species and Subspecies* maintained by the Society for Marine Mammalogy [Perrin et al. 2009]). This HSTT analysis uses the list of species as provided by the NMFS *2012 Pacific Stock Assessment Report* (Carretta et al. 2013).

All marine mammals in the United States are protected under the Marine Mammal Protection Act (MMPA), and some species receive additional protection under the Endangered Species Act (ESA). The MMPA defines a marine mammal "stock" as "a group of marine mammals of the same species or smaller taxon in a common spatial arrangement that interbreed when mature." For MMPA management purposes, a stock is considered an isolated population or group of individuals within a whole species that is found in the same area. However, generally due to a lack of sufficient information, NMFS recognized management stocks may include groups of multiple species, such as with *Mesoplodon* beaked whales[1] and the two *Kogia* species occurring in the Southern California (SOCAL) portion of the Study Area (Carretta et al. 2010). There are 43 marine mammal species known to exist in the Study Area including 7 mysticetes (baleen whales), 29 odontocetes (dolphins and toothed whales), 6 pinnipeds (seals and sea lions), and the Southern sea otter. Among these species there are 72 stocks managed by NMFS or the U.S. Fish and Wildlife Service in the U.S. Exclusive Economic Zone. These species and stocks are presented in Table 3.4-1 and relevant information on their status, distribution, abundance, and ecology is presented in Section 3.4.2 (Affected Environment). As noted above, in some cases species are grouped into a single stock due to limited species-specific information, while in other cases a single species includes multiple stocks recognized for management purposes (e.g., spinner dolphin in Hawaii).

For summaries of the general biology and ecology of marine mammals beyond the scope of this Environmental Impact Statement (EIS), see Rice (1998), Reynolds and Rommel (1999), Twiss and Reeves (1999), Hoelzel (2002), Berta et al. (2006), Jefferson et al. (2008), and Perrin et al. (2008). Additional species profiles and information on the biology, life history, species distribution and conservation of marine mammals can also be found through the following organizations:

- NMFS Office of Protected Resources (includes species distribution maps)
- Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations (known as OBIS-SEAMAP) species profiles
- National Oceanic and Atmospheric Administration Cetacean Density and Distribution Mapping Working Group
- International Whaling Commission
- International Union for Conservation of Nature, Cetacean Specialist Group
- The Marine Mammal Commission
- Society for Marine Mammalogy

[1] In SOCAL, the *Mesoplodon* species *M. carlhubbsi, M. ginkgodens, M. perrini, M. peruvianus, M. stejnegeri and M. densirostris* have been grouped by NMFS into a single management unit (*Mesoplodon* spp.) in the 2010 Pacific Stock Assessment report (Carretta et al. 2010)

Table 3.4-1: Marine Mammals with Possible or Confirmed Presence within the Study Area

Common Name	Scientific Name[2]	Study Area[3]	Stock[4]	Stock Abundance[5] (CV)	Study Area Abundance[6] (CV)	Occurrence in Study Area	ESA/MMPA Status
Order Cetacea							
Suborder Mysticeti (baleen whales)							
Family Balaenopteridae (rorquals)							
Humpback whale	*Megaptera novaeangliae*	SOCAL	California, Oregon, & Washington	2,043 (0.10)	36 (0.51)	Seasonal; more sightings around the northern Channel Islands	Endangered/ Depleted
		HRC	Central North Pacific	10,103 (n/a)	4,491 (NA)	Seasonal; throughout known breeding grounds during winter and spring (most common November through April)	Endangered/ Depleted
Blue whale	*Balaenoptera musculus*	SOCAL	Eastern North Pacific	2,497 (0.24)	842 (0.20)	Seasonal; Arrive Apr-May; more common late summer to fall in SOCAL	Endangered/ Depleted
		HRC	Central North Pacific	No data	No data	Seasonal; infrequent winter migrant; few sightings mainly fall and winter; considered rare	Endangered/ Depleted
Fin whale	*Balaenoptera physalus*	SOCAL	California, Oregon, & Washington	3,044 (0.18)	359 (0.40)	Year-round presence	Endangered/ Depleted
		HRC	Hawaiian	174 (0.72)	174 (0.72)	Seasonal; mainly fall and winter although considered rare in HRC	Endangered/ Depleted

[2] Taxonomy follows Perrin et al. (2009).
[3] SOCAL includes the eastern portion of the Transit Corridor and HRC includes the western portion of the Transit Corridor.
[4] Stock abundance estimates from Carretta et al. (2011) and Allen and Angliss (2010) except where noted.
[5] The stated coefficient of variation (CV) is an indicator of uncertainty in the abundance estimate and describes the amount of variation with respect to the population mean. It is expressed as a fraction or sometimes a percentage and can range upward from zero, indicating no uncertainty, to high values. For example, a CV of 0.85 would indicate high uncertainty in the population estimate. When the CV exceeds 1.0, the estimate is very uncertain. The uncertainty associated with movements of animals into or out of an area (due to factors such as availability of prey or changing oceanographic conditions) is much larger than is indicated by the CVs that are given.
[6] SOCAL Study Area abundance includes waters south of Point Conception (at 34.5°N) and reflects estimates from ship surveys conducted in the summer and fall between 1991 and 2005 (Barlow and Forney 2007). HRC Study Area abundance estimates include waters within the Hawaii Exclusive Economic Zone as estimated from a ship survey conducted in 2002 (Barlow 2006). Note that in many cases the Hawaiian stock estimates are the same as the Hawaii Exclusive Economic Zone estimates.
Extralimital means the species is not expected in the area.
Notes: SOCAL = Southern California; HRC = Hawaii Range Complex; ESA = Endangered Species Act; MMPA = Marine Mammal Protection Act

Table 3.4-1: Marine Mammals with Possible or Confirmed Presence within the Study Area (continued)

Common Name	Scientific Name	Study Area	Stock	Stock Abundance (CV)	Study Area Abundance (CV)	Occurrence in Study Area	ESA/MMPA Status
Family Balaenopteridae (rorquals) (continued)							
Sei whale	*Balaenoptera borealis*	SOCAL	Eastern North Pacific	126 (0.53)	7 (1.07)	Rare; Infrequently summer occurrence off California.	Endangered/ Depleted
		HRC	Hawaiian	77 (1.06)	77 (1.06)	Rare; limited sightings of seasonal migrants that feed at higher latitudes	Endangered/ Depleted
Bryde's whale	*Balaenoptera brydei/ edeni*	SOCAL	Eastern Tropical Pacific	13,000 (0.20)	7 (1.07)	Rare; Infrequent summer occurrence off California.	-
		HRC	Hawaiian	469 (0.45)	469 (0.45)	Uncommon; distributed throughout the Hawaii Exclusive Economic Zone	-
Minke whale	*Balaenoptera acutorostrata*	SOCAL	California, Oregon, & Washington	478 (1.36)	226 (1.02)	Less common in summer; small numbers around northern Channel Islands	"unknown"[7]
		HRC	Hawaiian	No data	No data	Regular but seasonal occurrence (November – March)	-
Family Eschrichtildae (gray whale)							
Gray whale	*Eschrichtius robustus*	SOCAL	Eastern North Pacific	19,126 (0.07)	Population migrates through SOCAL	Transient during seasonal migrations	-
			Western North Pacific	155	Individuals migrate through SOCAL	Transient during seasonal migrations	Endangered/ Depleted
		HRC	No known occurrence				

[7] Status of stock given as "unknown" in the *2010 Pacific Stock Assessment Report* although not endangered, depleted, or strategic from Carretta et al. (2011).

Table 3.4-1: Marine Mammals with Possible or Confirmed Presence within the Study Area (continued)

Common Name	Scientific Name	Study Area	Stock	Stock Abundance (CV)	Study Area Abundance (CV)	Occurrence in Study Area	ESA/MMPA Status
Suborder Odontoceti (toothed whales)							
Family Physeteridae (sperm whale)							
Sperm whale	*Physeter macrocephalus*	SOCAL	California, Oregon, & Washington	971 (0.31)	607 (0.57)	Common year-round; More likely in waters > 1,000 m depth, most often > 2,000 m	Endangered/ Depleted
		HRC	Hawaiian	6,919 (0.81)	6,919 (0.81)	Widely distributed year-round; More likely in waters > 1,000 m depth, most often > 2,000 m	Endangered/ Depleted
Family Kogiidae (pygmy and dwarf sperm whale)							
Pygmy sperm whale	*Kogia breviceps*	SOCAL	California, Oregon, & Washington	579 (1.02)	No data	Seaward of 500-1000 m depth; limited sightings over entire Southern California Bight (SCB)	-
		HRC	Hawaiian	7,138 (1.12)	7,138 (1.12)	Stranding numbers suggest this species is more common than infrequent sightings during survey (Barlow 2006) indicated	-
Dwarf sperm whale	*Kogia sima*	SOCAL	California, Oregon, & Washington	No data	No data	Seaward of 500-1000 m depth; no confirmed sightings over entire SCB (all *Kogia* spp. or *Kogia breviceps*)	-
		HRC	Hawaiian	17,519 (0.74)	17,519 (0.74)	Stranding numbers suggest this species is more common than infrequent sightings during survey (Barlow 2006) indicated	-
Family Delphinidae (dolphins)							
Killer whale	*Orcinus orca*	SOCAL	Eastern North Pacific Offshore	240 (0.49)	30 (0.73)	Uncommon; occurrence varies on an interannual basis but more likely in winter	-
			Eastern North Pacific Transient	451 (0.49)	No data	Uncommon; occurs infrequently; more likely in winter	-
		HRC	Hawaiian	349 (0.98)	349 (0.98)	Uncommon; infrequent sightings	-

Table 3.4-1: Marine Mammals with Possible or Confirmed Presence within the Study Area (continued)

Common Name	Scientific Name	Study Area	Stock	Stock Abundance (CV)	Study Area Abundance (CV)	Occurrence in Study Area	ESA/MMPA Status
Family Delphinidae (dolphins) (continued)							
False killer whale	*Pseudorca crassidens*	SOCAL	Eastern Tropical Pacific	No data	No data	Uncommon; warm water species; although stranding records from the Channel Islands	-
		HRC	Main Hawaiian Islands Insular[8]	151 (0.20)	151 (0.20)	Regular	Endangered/ Depleted
			Hawaii Pelagic[8]	1,503 (0.66)	1,503 (0.66)	Regular	-
			Northwestern Hawaiian Islands[8]	552 (1.09)	552 (1.09)	Regular	
Pygmy killer whale	*Feresa attenuata*	SOCAL	Tropical	No data	Extralimital	Extralimital within the south-west boundary of the SOCAL Range Complex	-
		HRC	Hawaiian	956 (0.83)	956 (0.83)	Year-round resident	-
Short-finned pilot whale	*Globicephala macrorhynchus*	SOCAL	California, Oregon, & Washington	760 (0.64)	118 (1.04)	Uncommon; more common before 1982	-
		HRC	Hawaiian	8,870 (0.38)	8,870 (0.38)	Commonly observed around main Hawaiian Islands and Northwestern Hawaiian Islands	-
Melon-headed whale	*Peponocephala electra*	SOCAL	No known occurrence				
		HRC	Hawaiian	2,950 (1.17)	2,950 (1.17)	Regular	-
Long-beaked common dolphin	*Delphinus capensis*	SOCAL[9]	California	107,016 (0.42)	111,738 (0.44)	Common; more inshore distribution (within 50 nm of coast)	-
		HRC	No known occurrence				

[8] The 2012 Pacific Stock Assessment Report (Carretta et al. 2013) provides a new abundance estimate for the Hawaii Insular Stock and Bradford et al. (2012) provides new abundance estimates for the other two stocks of false killer whale in Hawaiian waters.
[9] Abundance estimates from Carretta et al. (2011).

Table 3.4-1: Marine Mammals with Possible or Confirmed Presence within the Study Area (continued)

Common Name	Scientific Name	Study Area	Stock	Stock Abundance (CV)	Study Area Abundance (CV)	Occurrence in Study Area	ESA/MMPA Status
Short-beaked common dolphin	*Delphinus delphis*	SOCAL	California, Oregon, & Washington	411,211 (0.21)	165,400 (0.19)	Common; one of the most abundant SOCAL dolphins; higher summer densities	-
		HRC	No known occurrence				
Bottlenose dolphin coastal	*Tursiops truncatus*	SOCAL	California Coastal	323 (0.13)	323 (0.13)	Limited, small population within 1 km of shore	-
Family Delphinidae (dolphins) (continued)							
Bottlenose dolphin offshore	*Tursiops truncatus*	SOCAL	California, Oregon, & Washington Offshore	1,006 (0.48)	1,831 (0.47)	Common	-
Bottlenose dolphin Hawaiian Islands Stock Complex	*Tursiops truncatus*	HRC	Hawaiian Pelagic	3,178 (0.59)	3,215 (0.59) for entire Hawaiian Islands Stock Complex	Common in deep offshore waters	-
			Kauai and Niihau	147 (0.11)		Common in shallow nearshore waters (1000 m depth or less)	-
			Oahu	594 (0.54)		Common in shallow nearshore waters (1000 m depth or less)	-
			4-Island Region	153 (0.24)		Common in shallow nearshore waters (1000 m depth or less)	-
		HRC	Hawaii Island	No data		Common in shallow nearshore waters (1000 m depth or less)	-
Pantropical spotted dolphin	*Stenella attenuata*	SOCAL	Eastern Tropical Pacific	No data	No data	Rare; associated with warm tropical surface waters	Depleted
		HRC	Hawaiian	8,978 (0.48)	8,978 (0.48)	Common; primary occurrence between 330 and 13,122 ft. depth	-

Table 3.4-1: Marine Mammals with Possible or Confirmed Presence within the Study Area (continued)

Common Name	Scientific Name	Study Area	Stock	Stock Abundance (CV)	Study Area Abundance (CV)	Occurrence in Study Area	ESA/MMPA Status
Family Delphinidae (dolphins) (continued)							
Striped dolphin	*Stenella coeruleoalba*	SOCAL	California, Oregon, & Washington	10,908 (0.34)	12,529 (0.28)	Occasional visitor; warm water oceanic species	-
		HRC	Hawaiian	13,143 (0.46)	13,143 (0.46)	Occurs regularly year-round but infrequent sighting during survey (Barlow 2006)	-
Spinner dolphin	*Stenella longirostris*	SOCAL	No known occurrence				
Spinner dolphin Hawaiian Island Stock Complex	*Stenella longirostris*	HRC	Hawaii Pelagic	No data	No data	Common year-round in offshore waters	-
			Hawaii Island	790 (0.17)		Common year-round; rest in nearshore waters during the day and move offshore to feed at night	-
			Oahu and 4-Islands	335 (0.09)		Common year-round; rest in nearshore waters during the day and move offshore to feed at night	-
			Kauai and Niihau	601 (0.20)		Common year-round; rest in nearshore waters during the day and move offshore to feed at night	-
			Kure and Midway	No data		Common year-round; rest in nearshore waters during the day and move offshore to feed at night	-
			Pearl and Hermes	No Data		Common year-round; rest in nearshore waters during the day and move offshore to feed at night	
Rough-toothed dolphin	*Steno bredanensis*	SOCAL	Tropical and warm temperate	No data	No data	Rare; more tropical offshore species	-
		HRC	Hawaiian	8,709 (0.45)	8,709 (0.45)	Common throughout the main Hawaiian Islands and Hawaii Exclusive Economic Zone	-

Table 3.4-1: Marine Mammals with Possible or Confirmed Presence within the Study Area (continued)

Common Name	Scientific Name	Study Area	Stock	Stock Abundance (CV)	Study Area Abundance (CV)	Occurrence in Study Area	ESA/MMPA Status
Family Delphinidae (dolphins) (continued)							
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	SOCAL	California, Oregon, & Washington	26,930 (0.28)	2,196 (0.71)	Common; year round cool water species; more abundant Nov-Apr	-
		HRC	No known occurrence				
Northern right whale dolphin	*Lissodelphis borealis*	SOCAL	California, Oregon, & Washington	8,334 (0.40)	1,172 (0.52)	Common; cool water species; more abundant Nov-Apr	-
		HRC	No known occurrence				
Fraser's dolphin	*Lagenodelphis hosei*	SOCAL	No known occurrence				
		HRC	Hawaiian	10,226 (1.16)	10,226 (1.16)	Tropical species only recently documented within Hawaii Exclusive Economic Zone (2002 survey)	-
Risso's dolphins	*Grampus griseus*	SOCAL	California, Oregon, & Washington	6,272 (0.30)	3,418 (0.31)	Common; present in summer, but higher densities Nov-Apr	-
		HRC	Hawaiian	2,372 (0.97)	2,372 (0.97)	Have been considered rare but multiple sightings in Hawaii Exclusive Economic Zone during various surveys conducted between 2002 and 2012	-
Family Phocoenidae (porpoises)							
Dall's porpoise	*Phocoenoides dalli*	SOCAL	California, Oregon, & Washington	42,000 (0.33)	727 (0.99)	Common in cold water periods; more abundant Nov-Apr	-
		HRC	No known occurrence				
Family Ziphiidae (beaked whales)							
Cuvier's beaked whale	*Ziphius cavirostris*	SOCAL	California, Oregon, & Washington	2,143 (0.65)	911 (0.68)	Possible year-round occurrence but difficult to detect due to diving behavior	-
		HRC	Hawaiian	15,242 (1.43)	15,242 (1.43)	Year-round occurrence but difficult to detect due to diving behavior	-

Table 3.4-1: Marine Mammals with Possible or Confirmed Presence within the Study Area (continued)

Common Name	Scientific Name	Study Area	Stock	Stock Abundance (CV)	Study Area Abundance (CV)	Occurrence in Study Area	ESA/MMPA Status
Family Ziphiidae (beaked whales) (continued)							
Baird's beaked whale	*Berardius bairdii*	SOCAL	California, Oregon, & Washington	907 (0.49)	127 (1.14)	Primarily along continental slope from late spring to early fall	-
		HRC	No known occurrence				
Blainville's beaked whale	*Mesoplodon densirostris*	SOCAL	California, Oregon, & Washington	603 (1.16)	132 (0.96; for Mesoplodon *spp*)	Distributed throughout deep waters and continental slope regions; difficult to detect given diving behavior	-
		HRC	Hawaiian	2,872 (1.25)	2,872 (1.25)	Year-round occurrence but difficult to detect due to diving behavior	-
Longman's beaked whale	*Indopacetus pacificus*	SOCAL	No known occurrence				
		HRC	Hawaiian	1,007 (1.26)	1,007 (1.26)	Considered rare; however, multiple sightings during 2010 survey[10]	-
Mesoplodont beaked whales (SOCAL estimates also include Blaineville's beaked whale listed separately above)	*Mesoplodon spp.*	SOCAL	California, Oregon, & Washington	1,024 (0.77)	132 (0.96)	Distributed throughout deep waters and continental slope regions; difficult to detect given diving behavior Limited sightings; generally seaward of 500-1000 m depth	-
		HRC	No known occurrence of five *Mesoplodon* species (*M. carlhubbsi, M. ginkgodens, M. perrini, M. peruvianus, M. stejnegeri)*[11]				
Suborder Pinnipedia[12]							
Family Otariidae (fur seals and sea lions)							
California sea lion	*Zalophus californianus*	SOCAL	U.S. Stock	296,750	No data	Most common pinniped, Channel Islands breeding sites in summer	-
		HRC	No known occurrence				

[10] Hawaiian Islands Cetacean and Ecosystem Assessment Survey (HICEAS) 2010 survey of the Hawaii Exclusive Economic Zone; NMFS SWFSC; Personal communication Jay Barlow (2011).

[11] Baumann-Pickering et al. (2012) hypothesize that an unknown likely beaked whale signal detected at Cross Seamount in Hawaii is likely produced by a ginkgo-toothed beaked whale, although there has been no visual confirmation.

[12] There are no data regarding the coefficient of variation (CV) for any pinniped density estimate given that abundance is determined differently than that for cetaceans.

Table 3.4-1: Marine Mammals with Possible or Confirmed Presence within the Study Area (continued)

Common Name	Scientific Name	Study Area	Stock	Stock Abundance (CV)	Study Area Abundance (CV)	Occurrence in Study Area	ESA/MMPA Status
Family Otariidae (fur seals and sea lions) (continued)							
Northern fur seal	*Callorhinus ursinus*	SOCAL	San Miguel Island	9,968	Stock is outside of SOCAL	Common; small population breeds on San Miguel Is. May-Oct	-
		HRC	-	-		Extralimital	-
Family Phocidae (true seals)							
Guadalupe fur seal	*Arctocephalus townsendi*	SOCAL	Mexico	7,408	No data	Rare; Occasional visitor to northern Channel Islands; mainly breeds on Guadalupe Is., Mexico, May-Jul	Threatened/ Depleted
		HRC	No known occurrence				
Hawaiian monk seal	*Monachus schauinslandi*	SOCAL	No known occurrence				
		HRC	Hawaiian	1,212	1,212	Predominantly occur at Northwestern Hawaiian Islands; approximately 153 in Main Hawaiian Islands	Endangered/ Depleted
Northern elephant seal	*Mirounga angustirostris*	SOCAL	California	124,000	~9,800	Common; Channel Island haul-outs of different age classes; including San Clemente Island Dec-Mar and Apr-Aug; spend 8-10 months at sea	-
		HRC		-	-	Extralimital	
Harbor seal	*Phoca vitulina*	SOCAL	California	34,233	5,271	Common; Channel Island haul-outs including San Clemente Island and La Jolla; bulk of stock found north of Pt. Conception	-
		HRC	No known occurrence				

Table 3.4-1: Marine Mammals with Possible or Confirmed Presence within the Study Area (continued)

Common Name	Scientific Name	Study Area	Stock	Stock Abundance (CV)	Study Area Abundance (CV)	Occurrence in Study Area	ESA/MMPA Status
Order Carnivora							
Family Mustelidae (otters)[13]							
Southern sea otter	*Enhydra lutris nereis*	SOCAL	California Stock	2,762	59	In the Study Area at San Nicolas Island (northern SOCAL) is a translocated colony of approximately 51 independent animals plus 8 pups (Carswell 2013)	Threatened/ Depleted[14]
		HRC	No known occurrence				

[13] There are no data regarding the coefficient of variation (CV) for the sea otter density estimate given that abundance is determined by a different method than for cetaceans.
[14] All otters at San Nicolas Island are considered descendants of otters moved to San Nicolas Island during the U.S. Fish & Wildlife Service's translocation program governed by Public Law 99-625.

3.4.1.1 Species Unlikely to be Present in Study Area

Several species that may be present in the northern Pacific Ocean east of the International Date Line have an extremely low probability of presence in the Study Area. Those species carried forward for analysis are those likely to be found in the Study Area based on the most recent data available, and do not include species that may have once inhabited or transited the area but have not been sighted in recent years (e.g., species which were extirpated from factors such as 19th and 20th century commercial exploitation). These species include the North Pacific right whale (*Eubalaena japonica*), harbor porpoise (*Phocoena phocoena*), and Steller sea lion (*Eumetopias jubatus*) and have been excluded from subsequent analysis for reasons explained below.

3.4.1.1.1 North Pacific Right Whale (*Eubalaena japonica*)

The likelihood of a North Pacific right whale being present in the Study Area is extremely low as this species has only been observed rarely in the Bering Sea and Gulf of Alaska in recent years. The most recent estimated population for the North Pacific right whale is between 28 to 31 individuals and although this estimate may be reflective of a Bering Sea subpopulation, the total eastern North Pacific population is unlikely to be much larger (Wade et al. 2010). A right whale was last observed in the Maui Basin (Hawaiian waters) in April 1996 (Salden and Mickelsen 1999). Rare sightings of individual animals are typical of documented sightings, such as those of a single right whale on three occasions between 25 March and 11 April 1979 in Hawaiian waters (Herman et al. 1980, Rowntree et al. 1980). The only recorded sighting of a right whale in the Southern California (SOCAL) Range Complex area occurred in March 1992 approximately 43 miles (mi.) (70 kilometer [km]) off the southern end of San Clemente Island (Carretta et al. 1994). Sightings off California are rare, and there is no evidence that the western coast of the United States was ever highly frequented habitat for this species (Brownell et al. 2001). Individuals sighted near the Hawaiian Islands are considered “vagrants” as this region is not within the typical geographic range of this species (Reilly et al. 2008). Based on this information, it is highly unlikely for this species to be present in the Study Area; consequently, this species will not be considered further in this analysis.

3.4.1.1.2 Harbor Porpoise (*Phocoena phocoena*)

The likelihood of a harbor porpoise being present in the Study Area is extremely low as this species rarely occurs south of Point Conception (Dohl et al. 1983, Barlow 1988, Carretta et al. 2010), which is approximately 100 mi. (160.9 km) north of the Study Area. In the eastern north Pacific, harbor porpoises occur in nearshore coastal waters (generally within a mile or two of shore) from Point Conception to Alaska (Gaskin 1984, Carretta et al. 2010). Based on genetic differences and discontinuities identified from aerial surveys, four separate stocks are recognized off California: (1) a northern California/southern Oregon stock, (2) a San Francisco-Russian River stock, (3) a Monterey Bay stock, and (4) a Morro Bay stock (Carretta et al. 2010). The southern boundary for the Morro Bay stock is Point Conception; based on aerial surveys conducted between 2002 and 2007, this stock has an estimated abundance of 2,044 animals (coefficient of variation = 0.40) (Carretta et al. 2009). Because harbor porpoises are rare in the Southern California Bight (south of Point Conception), it is highly unlikely for this species to be present in the Study Area; consequently, this species will not be considered further in the remainder of this analysis.

3.4.1.1.3 Steller Sea Lion (*Eumetopias jubatus*)

Steller sea lions range along the north Pacific from northern Japan to California (Loughlin et al. 1984), with centers of abundance and distribution in the Gulf of Alaska and Aleutian Islands, respectively. Steller sea lions are rarely sighted in Southern California waters, there have not been any documented interactions with Southern California fisheries in over a decade, and are not expected to be present in the Study Area. The last documented interaction with California-based fisheries was in northern California, in 1994, with the California/Oregon drift gillnet fishery (National Marine Fisheries Service 2001a). A Steller sea lion (a subadult male) was sighted on one of the Channel Islands was in 1998 (Thorson et al. 1998) and in 2011 one was documented hauled out at the Point Loma Space and Naval Warfare Systems Command facility in San Diego Bay. It is most likely that this animal would be from the Eastern Distinct Population Segment and a proposed delisting of this Distinct Population Segment (from ESA) is being pending (National Oceanic and Atmospheric Administration 2012). Since steller sea lion are rarely present in the Study Area, this species will not be considered further in the remainder of this analysis.

3.4.2 AFFECTED ENVIRONMENT

Four main types of marine mammals are generally recognized: cetaceans (whales, dolphins, and porpoises), pinnipeds (seals, sea lions, and walruses; walruses do not occur in the Study Area), sirenians (manatees, dugongs, and sea cows; none of which occur in the Study Area), and several species of marine carnivores (marine otters and polar bears [polar bears do not occur in the Study Area]) (Rice 1998, Jefferson et al. 2008). For recent summaries of the general biology and ecology of marine mammals, beyond the scope of this section, see Reynolds and Rommel (1999), Twiss and Reeves (1999), Hoelzel (2002), Berta et al. (2006), Jefferson et al. (2008), and Perrin et al. (2008).

Detailed reviews of the different groups of cetaceans can be found in Perrin et al. (2009). The order Cetacea is divided into two suborders. The toothed whales, (suborder Odontoceti; e.g., sperm whale, killer whale, dolphins, porpoises, beaked whales) range in size from slightly longer than 3 feet (ft.) (1 meter [m]) to more than 60 ft. (18 m) and have teeth, which they use to capture and consume individual prey. The baleen whales (suborder Mysticeti; e.g., minke, humpback, gray, fin, and blue whales) are universally large (more than 15 ft. [4.5 m] as adults). They are called baleen whales because, instead of teeth, they have baleen, a fibrous structure actually made of keratin (a type of protein similar to that found in human fingernails) in their mouths which enables them to filter or extract food from water for feeding. They are batch feeders that use baleen instead of teeth to engulf, suck, or skim large numbers of small prey from the water or ocean floor sediments (Heithaus and Dill 2008). The different feeding strategies between mysticetes and odontocetes affect their distribution and occurrence patterns. Cetaceans inhabit virtually every marine environment in the Study Area, from coastal waters to open ocean environments in the middle of the Pacific Ocean. Their distribution is influenced by a number of factors, but primary among these are patterns of major ocean currents, bottom relief, and sea surface temperature, which, in turn, affect prey productivity. The continuous movement of water from the ocean bottom to the surface creates a nutrient-rich, highly productive environment for marine mammal prey (Jefferson et al. 2008). For most cetaceans, prey distribution, abundance, and quality largely determine where they occur at any specific time (Heithaus and Dill 2008). Most of the large cetaceans are migratory, but many small cetaceans do not migrate in the strictest sense. Instead, they undergo seasonal dispersal, or shifts in density.

Pinnipeds in the Study Area are also divided into two groups: phocids (true seals) and otariids (fur seals and sea lions). Phocids lack ear flaps, their fore flippers are short and have hair, and their hind flippers are oriented towards the back of their bodies and cannot be rotated forward. Otariids have external ear flaps, long hairless or partially haired fore flippers, and hind flippers that can be rotated beneath their bodies. Pinnipeds spend a large portion of their time in the Study Area on land at haulout sites used for resting and moulting, and at rookeries used for breeding and nursing young, and return to the water to forage. Three species of pinnipeds (California sea lion, Pacific harbor seal, and northern elephant seal) occur in the SOCAL Range Complex portion of the Study Area as regular inhabitants; the northern fur seal is only occasionally present and Guadalupe fur seal is rare in Southern California. These species have well known seasonal cycles, distributions, and established haulout sites and rookeries which support large colonies of individuals. In contrast, the only pinniped species that regularly occurs in Hawaii is the Hawaiian monk seal and, in the main Hawaiian Islands where they will be encountered during the proposed activities, they are generally solitary and have no established rookeries.

There are two species of sea otter inhabiting the Pacific coastline. Northern sea otter (*Enhydra lutris kenyoni*) are found in Washington and Alaska and are therefore not discussed further. The majority of the southern sea otter (*Enhydra lutris neris*) population in Southern California ranges from approximately 78 mi. (126 km) north of the Study Area at Santa Barbara to as far north as Half Moon Bay, California (Tinker et al. 2006). Between 1987 and 1990, the U.S. Fish and Wildlife Service conducted a translocation program governed by Public Law 99-625, and established a small translocated colony of southern sea otters at San Nicolas Island (U.S. Department of the Interior 2003). San Nicolas Island is managed by the Navy (U.S. Department of the Navy 2002). In the Study Area, southern sea otter are only present as part of that translocated colony in the waters surrounding San Nicolas Island, which is located at the northern edge of the SOCAL portion of the Study Area. Sea otters require shallow waters as habitat for reproducing, resting, and foraging. Tinker et al. (2006) report that the critical foraging habitat depth range for the southern sea otter is 6.5–114.8 ft. (2–35 m). Sea otters rarely come ashore and spend most of their life nearshore in the ocean where they regularly swim, feed, and rest.

3.4.2.1 Group Size

Many species of marine mammals, particularly odontocetes, are highly social animals that spend much of their lives living in groups or schools ranging from several to several thousand individuals. Similarly, aggregations of baleen whales may form during particular breeding or foraging seasons, although they do not persist through time as a social unit. A comprehensive and systematic review of relevant literature and data was conducted for available published and unpublished literature including journals, books, technical reports, cruise reports, and raw data from cruises, theses, and dissertations. The results of this review were compiled into a Technical Report (Watwood and Buonantony 2012) including tables of group size information by species along with relevant citations. The behavior of aggregating into groups is important for the purposes of mitigation and monitoring in that it can increase the probability of marine mammals being detected.

3.4.2.2 Diving

Some species of marine mammals have developed specialized adaptations to allow them to make deep dives lasting over an hour, primarily for the purpose of foraging on deep-water prey such as squid. Other species spend the majority of their lives close to the surface, and make relatively shallow dives. The diving behavior of a particular species or individual has implications for the ability to detect them for mitigation and monitoring. In addition, their relative distribution through the water column is an important consideration when conducting acoustic exposure analyses. Information and data on diving behavior for each species of marine mammal were compiled and summarized in a Technical Report (Watwood and Buonantony 2012) that provides the detailed summary of time at depth.

3.4.2.3 Vocalization and Hearing of Marine Mammals

All marine mammals that have been studied can produce sounds and use sounds to forage; orient; detect and respond to predators; and socially interact with others. Measurements of marine mammal sound production and hearing capabilities provide some basis for assessment of whether exposure to a particular sound source may affect a marine mammal behaviorally or physiologically. Marine mammal hearing abilities are quantified using live animals either via behavioral audiometry or electrophysiology (see Schusterman 1981, Au 1993, Wartzok and Ketten 1999, Nachtigall et al. 2007). Behavioral audiograms, which are plots of animals' exhibited hearing threshold versus frequency, are obtained from captive, trained live animals using standard testing procedures with appropriate controls, and are considered to be a more accurate representation of a subject's hearing abilities. Behavioral audiograms of marine mammals are difficult to obtain because many species are too large, too rare, and too difficult to acquire and maintain for experiments in captivity.

Electrophysiological audiometry measures small electrical voltages produced by neural activity when the auditory system is stimulated by sound. The technique is relatively fast, does not require a conscious response, and is routinely used to assess the hearing of newborn humans. Hearing response in relation to frequency for both methods of evaluating hearing ability is a generalized U-shaped curve or audiogram showing the frequency range of best sensitivity (lowest hearing threshold) and frequencies above and below with higher threshold values.

Consequently, our understanding of a species' hearing ability may be based on the behavioral audiogram of a single individual or small group of animals. In addition, captive animals may be exposed to local ambient sounds and other environmental factors that may impact their hearing abilities and may not accurately reflect the hearing abilities of free-swimming animals (Houser et al.2010b). For animals not available in captive or stranded settings (including large whales and rare species), estimates of hearing capabilities are made based on physiological structures, vocal characteristics, and extrapolations from related species.

Direct measurement of hearing sensitivity exists for approximately 25 of the nearly 130 species of marine mammals. Table 3.4-2 provides a summary of sound production and general hearing capabilities for marine mammal species in the Study Area (note that values in this table are not meant to reflect absolute possible maximum ranges, rather they represent the best known ranges of each functional hearing group). For purposes of the analyses in this document, marine mammals are arranged into the following functional hearing groups based on their generalized hearing sensitivities (note that these categories are not the same as the sonar source categories described in Chapter 2, Description of Proposed Action and Alternatives): high-frequency cetaceans, mid-frequency cetaceans, low-frequency cetaceans (mysticetes), phocid pinnipeds (true seals), otariid pinnipeds (sea lion and fur seals), and mustelidae (sea otter).

Note that frequency ranges for high-, mid-, and low-frequency cetacean hearing differ from the frequency range categories defined using similar terms to describe active sonar systems. For discussion of all marine mammal functional hearing groups and their derivation see Finneran and Jenkins (2012).

3.4.2.3.1 High-Frequency Cetaceans

Marine mammals within the high-frequency cetacean functional hearing group are all odontocetes (toothed whales; suborder: Odontoceti) and includes eight species and subspecies of porpoises (family: Phocoenidae); dwarf and pygmy sperm whales (family: Kogiidae); six species and subspecies of river dolphins; and four species of Cephalorhynchus. The following members of the high-frequency cetacean group are present in the Study Area: Dall's porpoise, dwarf sperm whale, and pygmy sperm whale. Functional hearing in high-frequency cetaceans occurs between approximately 200 hertz (Hz) and 180 kilohertz (kHz) (Southall et al. 2007).

Table 3.4-2: Hearing and Vocalization Ranges for All Marine Mammal Functional Hearing Groups and Species Potentially Occurring within the Study Area

Functional Hearing Group	Species Which May Be Present in the Study Area	Sound Production[1]		General Hearing Ability Frequency Range[1]
		Frequency Range	Source Level (dB re 1 µPa @ 1 m)	
High-Frequency Cetaceans	Dall's Porpoise and Kogia Species (Dwarf Sperm Whale and Pygmy Sperm Whale)	100 Hz to 200 kHz	120 to 205	200 Hz to 180 kHz
Mid-Frequency Cetaceans	Sperm Whale, Beaked Whales (*Berardius*, *Indopacetus*, *Mesoplodon*, and *Ziphius* species), Bottlenose Dolphin, Short-beaked Common Dolphin, Long-beaked Common Dolphin, Fraser's Dolphin, Killer Whale, False Killer Whale, Pygmy Killer Whale, Melon-headed Whale, Northern Right Whale Dolphin, Short-finned Pilot Whale, Risso's Dolphin, Rough-toothed Dolphin, Spinner Dolphin, Pantropical Spotted Dolphin, Striped Dolphin, Pacific White-sided Dolphin	100 Hz to >100kHz	118 to 236	150 Hz to 160 kHz
Low-Frequency Cetaceans	Blue Whale, Bryde's Whale, Gray Whale, Fin Whale, Humpback Whale, Minke Whale, Sei Whale	10 Hz to 20 kHz	129 to 195	7 Hz to 22 kHz
Phocidae	Hawaiian Monk Seal, Northern Elephant Seal, Harbor Seal	100 Hz to 12 kHz	103 to 180	In-water: 75 Hz to 75 kHz In-air: 75 Hz to 30 kHz
Otariidae	California Sea Lion, Northern Fur Seal, Guadalupe Fur Seal	30 Hz to 10 kHz	120 to 196	In-water: 50 Hz to 50 kHz In-air: 50 Hz to 75 kHz
Mustelidae	Southern Sea Otter	Primarily (in-air) from 4 kHz to 8 kHz)	In-air: up to 113	In-water: unknown In-air: 125 Hz to 35 kHz; peak sensitivity at 16 kHz

Notes: [1]Sound production levels and ranges and functional hearing ranges are generalized composites for all members of the functional hearing groups, regardless of their presence in the Study Area.
Sound production data adapted and derived from: Aburto, et al., 1997; Ghoul & Reichmuth, 2012; Hanggi & Schusterman, 1994; Kastelein, et al., 2002a, b; Marten, 2000; McShane, et al., 1995; Møhl, et al., 2003; Philips, et al., 2003; Richardson, et al., 1995; Schusterman, et al., 1970; Villadsgaard, et al., 2007.
Hearing data adapted and derived from: Hemila et al. 2006, Ghoul & Reichmuth 2013, Schusterman 1981, Southall et al. 2007.
These frequency ranges and source levels include social sounds for all groups and echolocation sounds for mid- and high-frequency groups. In-air vocalizations were not included for pinniped groups. Vocalization parameters for Mustelidae were measured from in-air vocalizations (see Ghoul & Reichmuth 2012) referenced to 20 µPa; no underwater data are available for this group. Energy and harmonics are present in their calls above 10 kHz to 60 kHz although the behavioral functionality is unknown.
Notes: dB re 1 µPa at 1 m: decibels (dB) referenced to (re) 1 micro (µ) Pascal (Pa); Hz: Hertz; kHz: kilohertz

Sounds produced by high-frequency cetaceans range from approximately 100 Hz to 200 kHz with source levels of 120 to 205 decibels (dB) referenced to (re) 1 micro (µ) Pascal (Pa) at 1 m (Madsen et al. 2005, Richardson et al. 1995, Verboom and Kastelein 2003, Villadsgaard et al., 2007). Recordings of sounds produced by dwarf and pygmy sperm whales consist almost entirely of the click/pulse type (Marten 2000). Porpoises, unlike most other odontocetes, either do not produce whistles or do not whistle often (Awbrey et al. 1979, Houck and Jefferson 1999, Thomson and Richardson 1995, Verboom and Kastelein

2003, Bassett et al. 2009). High-frequency cetaceans also generate specialized clicks used in biosonar (echolocation) at frequencies above 100 kHz that are used to detect, localize and characterize underwater objects such as prey (Richardson et al. 1995).

An electrophysiological audiometry measurement on a stranded pygmy sperm whale indicated best sensitivity between 90 to 150 kHz (Ridgway and Carder 2001). From a harbor porpoise audiogram using behavioral methods, detection thresholds were estimated from 250 Hz to 180 kHz, with the range of best hearing from 16 to 140 kHz and maximum sensitivity between 100 to 140 kHz (Kastelein et al. 2002a). While no empirical data on hearing ability for Dall's porpoise are available, data on the morphology of the cochlea allows for estimation of the upper hearing threshold at about 170 to 200 kHz Awbrey et al. (1979).

3.4.2.3.2 Mid-Frequency Cetaceans

Marine mammals within the mid-frequency cetacean functional hearing group are all odontocetes, and include the sperm whale (family: Phystereidae); 32 species and subspecies of dolphins (family: Delpinidae), the beluga and narwhal (family: Monodontidae), and 19 species of beaked and bottlenose whales (family: Ziphiidae). The following members of the mid-frequency cetacean group are present or have a reasonable likelihood of being present in the Study Area: sperm whale, killer whale, false killer whale, pygmy killer whale, short-finned pilot whale, melon-headed whale, long-beaked common dolphin, short-beaked common dolphin, common bottlenose dolphin, pantropical spotted dolphin, striped dolphin, spinner dolphin, rough-toothed dolphin, Pacific white-sided dolphin, northern right whale dolphin, Fraser's dolphin, Risso's dolphin, and beaked whales (*Berardius, Indopacetus, Mesoplodon*, and *Ziphius* species). Functional hearing in mid-frequency cetaceans is conservatively estimated to be between approximately 150 Hz and 160 kHz (Southall et al. 2007).

Hearing studies on cetaceans have focused primarily on odontocete species (Szymanski et al. 1999, Kastelein et al. 2002, Nachtigall et al. 2005, Yuen et al. 2005, Houser and Finneran 2006). Hearing sensitivity has been directly measured for a number of mid-frequency cetaceans, including Atlantic white-sided dolphins (*Lagenorhynchus acutus*) (Houser et al. 2010a), common dolphins (*Delphinus* spp.) (Houser et al. 2010a), Atlantic bottlenose dolphins (Johnson 1967), belugas (White et al. 1977, Finneran et al. 2005), Indo-Pacific bottlenose dolphins (Houser et al. 2010a), Black Sea bottlenose dolphins (Popov et al. 2007), striped dolphins (Kastelein et al. 2003), white-beaked dolphins (Nachtigall et al. 2008), Risso's dolphins (Nachtigall et al. 2005), belugas (*Delphinapterus leucas*) (Finneran et al. 2005; White et al. 1977), false killer whales (Yuen et al. 2005), killer whales (Szymanski et al. 1999), Gervais' beaked whales (Finneran and Schlundt 2009), and Blainville's beaked whales (Pacini et al. 2011). All audiograms exhibit the same general U-shape, with a wide nominal hearing range between approximately 150 Hz and 160 kHz.

In general, odontocetes produce sounds across the widest band of frequencies. Their social vocalizations range from a few hundreds of Hz to tens of kHz (Southall et al. 2007) with source levels in the range of 100–170 dB re 1 µPa (see Richardson et al. 1995). As mentioned earlier, they also generate specialized clicks used in echolocation at frequencies above 100 kHz that are used to detect, localize and characterize underwater objects such as prey (Au 1993). Echolocation clicks have source levels that can be as high as 229 dB re 1 µPa peak-to-peak (Au et al. 1974).

3.4.2.3.3 Low-Frequency Cetaceans

Marine mammals within the low-frequency functional hearing group are all mysticetes. This group is comprised of 13 species and subspecies of mysticete whales in six genera: *Eubalaena, Balaena, Caperea,* *Eschrichtius, Megaptera*, and *Balaenoptera*. The following members of the low-frequency cetacean group (mysticetes) are present or have a reasonable likelihood of being present in the Study Area: humpback, blue, fin, sei, Bryde's, minke, and gray whales. Functional hearing in low-frequency cetaceans is conservatively estimated to be between approximately 7 Hz and 22 kHz (Southall et al. 2007).

Because of animal size and availability of live specimens, direct measurements of mysticete whale hearing are unavailable, although there was one effort to measure hearing thresholds in a stranded grey whale (Ridgway and Carder 2001). Because hearing ability has not been directly measured in these species, it is inferred from vocalizations, ear structure, and field observations. Vocalizations are audible somewhere in the frequency range of production, but the exact range cannot be inferred (Southall et al. 2007).

Mysticete cetaceans produce low-frequency sounds that range in the tens of Hz to several kHz that most likely serve social functions such as reproduction, but may serve an orientation function as well (Green et al. 1994). Humpback whales are the notable exception within the mysticetes, with some calls exceeding 10 kHz. These sounds can be generally categorized as low-frequency moans; bursts or pulses; or more complex songs (Edds-Walton 1997, Ketten 1997). Source levels of most mysticete cetacean sounds range from 150–190 dB re 1 µPa (see Richardson et al. 1995).

3.4.2.3.4 Pinnipeds

Pinnipeds are divided into three functional hearing groups, otariids (sea lions and fur seals), phocid seals (true seals), and odobenids (walrus) with different in-air and in-water hearing ranges. The Study Area contains phocids (true seals) and otariids (fur seals). Species present or which have a reasonable likelihood of being present in the Study Area include the Hawaiian monk seal in Hawaiian waters, and in SOCAL, harbor seal, northern elephant seal, California sea lion, northern fur seal, and Guadalupe fur seal. Measurements of hearing sensitivity have been conducted on species representing all of the families of pinnipeds (Phocidae, Otariidae, Odobenidae) (see Schusterman et al. 1972, Moore and Schusterman 1987, Terhune 1988, Thomas et al. 1990b, Turnbull and Terhune 1990, Kastelein et al. 2002, Wolski et al. 2003, Kastelein et al. 2005a, Kastelein et al. 2012a, 2012a).

Pinnipeds produce sounds both in air and water that range in frequency from approximately 100 Hz to several tens of kHz and it is believed that these sounds only serve social functions (Miller 1991) such as mother-pup recognition and reproduction. Source levels for pinniped vocalizations range from approximately 95–190 dB re 1 µPa (see Richardson et al. 1995).

3.4.2.3.5 Phocids

Phocids (true seals) present or which have a reasonable likelihood of being present in the Study Area include the Hawaiian monk seal in Hawaiian waters, and in the SOCAL portion, harbor seal, and northern elephant seal. Hearing in phocids has been tested in the following species: gray seals (Ridgway et al. 1975); harbor seals (Richardson et al. 1995, Terhune and Turnbull 1995, Kastak and Schusterman 1998, Wolski et al. 2003, Southall et al. 2007, Kastelein et al. 2012a); harp seals (Terhune and Ronald 1971, 1972); Hawaiian monk seals (Thomas et al. 1990b); northern elephant seal (Kastak and Schusterman 1998, 1999); and ringed seals (Terhune and Ronald 1975, 1976).

Phocid hearing limits are estimated to be 75 Hz–30 kHz in air and 75 Hz–75 kHz in water (Kastak and Schusterman 1999; Kastelein et al., 2009a, b; Møhl 1968; Reichmuth 2008; Terhune and Ronald 1971; Terhune and Ronald 1972).

3.4.2.3.6 Otariids

Otariids (sea lions and fur seals) present or which have a reasonable likelihood of being present in the SOCAL portion of the Study Area include California sea lion, northern fur seal, and Guadalupe fur seal. Hearing in otariid seals is adapted to low frequency sound and less auditory bandwidth than phocid seals. Hearing in otariid seals has been tested in two species present in the Study Area: California sea lion (Kastak and Schusterman 1998, Moore and Schusterman 1987, Schusterman 1981, Schusterman et al. 1972, Southall et al. 2005) and northern fur seal (Babushina et al. 1991, Moore and Schusterman 1987). Based on these studies, the otariids' general hearing capabilities are 50 Hz–75 kHz in air and 50 Hz–50 kHz in water.

3.4.2.3.7 Mustelidae (Sea Otter)

Sea otter are present in the SOCAL portion of the Study Area inhabiting the nearshore shallow waters around San Nicolas Island (see U.S. Department of the Interior 2012b). There have been no direct studies of hearing in sea otter although behavioral response to playbacks in-air have been undertaken previously (Davis et al. 1988; Ghoul and Reichmuth 2012). Maximum hearing sensitivity for sea otter has been inferred based on the anatomy of the inner ear, which indicates they likely have a maximum hearing sensitivity at 16 kHz (Davis et al. 1988). It is assumed that southern sea otters in the Study Area have hearing limits of 75 Hz–30 kHz in air and 75 Hz–75 kHz in water based on their phylogenetic and anatomical similarities to otariids (Finneran and Jenkins 2012).

3.4.2.4 General Threats

Marine mammal populations can be influenced by various factors and human activities. These factors can affect marine mammal populations directly, by activities such as hunting and whale watching, or indirectly, through reduced prey availability or lowered reproductive success of individuals. Twiss and Reeves (1999) provide a general discussion of marine mammal conservation.

Marine mammals are influenced by natural phenomena, such as storms and other extreme weather patterns. Generally, not much is known about how large storms and other weather patterns affect marine mammals, other than that mass strandings (when two or more marine mammals become beached or stuck in shallow water) sometimes coincide with hurricanes, typhoons, and other tropical storms (Marsh 1989; Rosel and Watts 2008). The global climate is changing and is having impacts on some populations of marine mammals (Salvadeo et al. 2010, Simmonds and Eliott 2009). Climate change can affect marine mammal species directly through habitat loss (especially for species that depend on ice or terrestrial areas) and indirectly via impacts on prey, changing prey distributions and locations, and changes in water temperature. Changes in prey can impact marine mammal foraging success, which in turn affects reproduction success, and survival. Climate change also may influence marine mammals through effects on human behavior, such as increased shipping and oil and gas extraction, resulting from sea ice loss (Alter et al. 2010).

Mass die offs of some marine mammal species have been linked to toxic algal blooms, that is, they consume prey that have consumed toxic plankton, such as die offs of California sea lions and northern fur seals because of poisoning caused by the diatom *Pseudo-nitzschia* spp. (Doucette et al. 2006, Fire et al. 2008, Johnson and Rivers 2009, Torres de la Riva et al. 2009, Harvey et al. 2010, Lefebrve et al. 2010). All marine mammals have parasites that, under normal circumstances, probably do little overall harm, but under certain conditions, they can cause serious health problems or even death (Jepson et al. 2005, Bull et al. 2006, Fauquier et al. 2009). Disease affects some individuals (especially older animals), and occasionally disease epidemics can injure or kill a large percentage of the population (Paniz-

Mondolfi and Sander-Hoffmann 2009; Keck et al. 2010). Recently the first case of morbillivirus in the central Pacific was documented for a stranded juvenile male Longman's beaked whale at Hamoa Beach, Hana, Maui (West et al. 2012). Starting in January 2013, an elevated number of strandings of California sea lion pups were observed in five Southern California counties, including San Diego County which is in the Study Area. These strandings were declared an Unusual Mortality Event by NMFS; this is the sixth Unusual Mortality Event involving California sea lions that has occurred in California since 1991. This Unusual Mortality Event has been confined to California sea lion pups born in the summer of 2012. The stranded pups were found to be emaciated, dehydrated, and underweight for their age. The informally presented (reported in newspapers) hypothesis was that a shift in the sea lion prey may have resulted in these young animals being abandoned by their mothers.

Human impacts on marine mammals have received much attention in recent decades, and include hunting (both commercial and native practices), fisheries interactions (such as gear entanglement or shootings by fishers), bycatch (accidental or incidental catch), indirect effects of fisheries through takes of prey species, ship strikes, noise pollution, chemical pollution, and general habitat deterioration or destruction.

Direct hunting, as in whaling and sealing operations, provided the original impetus for marine mammal management efforts and has driven much of the early research on cetaceans and pinnipeds (Twiss and Reeves 1999). In 1994, the MMPA was amended to formally address bycatch. Estimates of bycatch in the Pacific declined by a total of 96 percent from 1994 to 2006 (Geijer and Read 2013). Cetacean bycatch declined by 85 percent from 342 in 1994 to 53 in 2006, and pinniped bycatch declined from 1,332 to 53 over the same time period. However, fishery bycatch is likely the most impactful problem presently and may account for the deaths of more marine mammals than any other cause (Northridge 2008, Read 2008, Hamer et al. 2010; Geijer and Read 2013). In the Hawaii portion of the Study Area, bycatch has significantly contributed to the decline of the Hawaiian population of false killer whales (Boggs et al. 2010).

Ship strikes are an issue of increasing concern for most marine mammals, particularly baleen whale species. Between 1988 and 2007, 21 blue whale deaths were reported along the California coast and eight of these whales were confirmed to have died as a result of ship strikes (Berman-Kowalewski et al. 2010). In the Hawaiian Islands, there were nine reported ship collisions with humpback whales in 2006 (none involved Navy vessels), as recorded by the NMFS Pacific Islands Region Marine Mammal Response Network Activity Updates (National Marine Fisheries Service 2007a).

Chemical pollution is also of great concern, although for the most part, its effects on marine mammals are just starting to be understood (Aguilar de Soto et al. 2008). In a broad scale investigation, the 5.5-year expedition of the *Odyssey* collected 955 biopsy samples from sperm whales around the world to provide a consistent baseline database of ocean contamination and to measure future effects (Ocean Alliance 2010). Chemical pollutants found in pesticides flow into the marine environment from human use on land and are absorbed into the bodies of marine mammals, accumulating in their blubber, internal organs, or are transferred to the young from its mother's milk (Fair et al. 2010). Important factors that determine the levels of pesticides, heavy metals, and industrial pollutants that accumulate in marine mammals are gender (i.e., adult males have no way to transfer pesticides whereas females may pass pollutants to their calves through milk), habitat, and diet. Living closer to the source of pollutants and feeding on higher-level organisms increase the potential to accumulate toxins (Moon et al. 2010). The buildup of human-made persistent compounds in marine mammals not only increases their likelihood of contracting diseases or developing tumors but also compromises the function of their reproductive systems (Fair et al. 2010). Oil and other chemical spills are a specific type of ocean contamination that can have damaging effects on some marine mammal species (see Matkin et al. 2008).

Habitat deterioration and loss is a major factor for almost all coastal and inshore species of marine mammals, especially those that live in rivers or estuaries, and it may include such factors as depleting a habitat's prey base and the complete loss of habitat (Kemp 1996, Smith et al. 2009, Ayres et al. 2012). In some locations, especially where urban or industrial activities or commercial shipping is intense, anthropogenic noise is also being increasingly considered as a potential habitat level stressor. Noise is of particular concern to marine mammals because many species use sound as a primary sense for navigating, finding prey, avoiding predators, and communicating with other individuals. Noise may cause marine mammals to leave a habitat, impair their ability to communicate, or cause stress (Hildebrand 2009, Tyack et al. 2011, Rolland et al. 2012, Erbe et al. 2012). Noise can cause behavioral disturbances, mask other sounds including their own vocalizations, may result in injury and in some cases, may result in behaviors that ultimately lead to death (National Research Council 2003, 2005, Nowacek et al. 2007, Würsig and Richardson 2008, Southall et al. 2009, Tyack 2009). Anthropogenic noise is generated from a variety of sources including commercial shipping, oil and gas exploration and production activities, commercial and recreational fishing (including fishing finding sonar, fathometers, and acoustic deterrent and harassment devices), recreational boating and whale watching activities, offshore power generation, research (including sound from air guns, sonar, and telemetry), and military training and testing activities. Vessel noise in particular is a large contributor to noise in the ocean and intensively used inland waters. Commercial shipping's contribution to ambient noise in the ocean has increased by as much as 12 dB over the last few decades (McDonald et al. 2008, Hildebrand 2009).

Marine mammals as a whole are subject to the various influences and factors delineated in this section. If additional specific threats to individual species within the Study Area are known, those threats are described below in the descriptive accounts of those species.

3.4.2.5 Humpback Whale (*Megaptera novaeangliae*)

3.4.2.5.1 Status and Management

Humpback whales are listed as depleted under the MMPA and endangered under the ESA. Based on evidence of population recovery in many areas, the species is being considered by NMFS for removal or downlisting from the United States Endangered Species List (National Marine Fisheries Service 2009d). The Hawaiian Islands Humpback Whale National Marine Sanctuary is located within the Hawaii Range Complex (HRC) portion of the Study Area (The Hawaiian Islands Humpback Whale National Marine Sanctuary is also discussed in Chapter 6, Additional Regulatory Considerations).

In the United States North Pacific Ocean, the stock structure of humpback whales is defined based on feeding areas because of the species' fidelity to feeding grounds (Carretta et al. 2010). NMFS has designated three stocks: (1) the Central North Pacific stock, consisting of winter and spring populations of the Hawaiian Islands that migrate to northern British Columbia and Alaska, the Gulf of Alaska, the Bering Sea, and Aleutian Islands; (2) the Western North Pacific stock, consisting of winter and spring populations off Asia that migrate to Russia and the Bering Sea and Aleutian Islands; and (3) the California, Oregon, Washington, and Mexico stock, consisting of winter and spring populations in coastal Central America and coastal Mexico that migrate to coastal California and to British Columbia in summer and fall (Allen and Angliss 2013).

3.4.2.5.2 Geographic Range and Distribution

Humpback whales are distributed worldwide in all major oceans and most seas. They typically are found during the summer in high-latitude feeding grounds and during the winter in the tropics and subtropics around islands, over shallow banks, and along continental coasts, where calving occurs.

Insular Pacific-Hawaiian Large Marine Ecosystem. The Central North Pacific stock of humpback whales occurs throughout known breeding grounds in the Hawaii portion of the Study Area during winter and spring (November through April) (Allen and Angliss 2013). Peak occurrence around the Hawaiian Islands is from late February through early April (Carretta et al. 2010, Mobley et al. 2000), with a peak in acoustic detections in March (Norris et al. 1999). A recent study that also used acoustic recordings near the northwestern Hawaiian Islands indicates that humpback whales were present from early December through early June (Lammers et al. 2011). During the fall-winter period, primary occurrence is expected from the coast to 50 nautical miles (nm) offshore (Mobley et al. 2000, Mobley 2004). The greatest densities of humpback whales (including calves) are in the four-island region consisting of Maui, Molokai, Kahoolawe, and Lanai, as well as Penguin Bank (Mobley et al. 2000, Maldini et al. 2005) and around Kauai (Mobley 2005). During the spring-summer period, secondary occurrence is expected offshore out to 50 nm. Occurrence farther offshore, or inshore (e.g., Pearl Harbor), is rare.

Survey results suggest that humpbacks may also be wintering in the northwestern Hawaiian Island region and not just using it as a migratory corridor A recent study that also used acoustic recordings near the northwestern Hawaiian Islands indicates that humpback whales were present from early December through early June (Lammers et al. 2011). It is not yet known if this represents a previously undocumented breeding stock or if the whales occurring at the northwestern Hawaiian Islands are part of the same population that winters near the Main Hawaiian Islands.

In breeding grounds, females with calves occur in significantly shallower waters than other groups of whales, and breeding adults use deeper more offshore waters (Smultea 1994, Ersts and Rosenbaum 2003). The habitat requirements of wintering humpbacks appear to be controlled by the conditions necessary for calving, such as warm water (75 to 80 degrees [°] Fahrenheit [24° to 28° Celsius]) and relatively shallow, low-relief ocean bottom in protected areas, created by islands or reefs (Smultea 1994, Clapham 2000, Craig and Herman 2000).

California Current Large Marine Ecosystem. The California, Oregon, and Washington stock of humpback whales use the waters within the Southern California portion of the Study Area as a summer feeding ground. Peak occurrence occurs in the Southern California portion of the Study Area from December through June (Calambokidis et al. 2001). During late summer, more humpback whales are sighted north of the Channel Islands, and limited occurrence is expected south of the northern Channel Islands (San Miguel, Santa Rosa, Santa Cruz) (Carretta et al. 2010).

Open Ocean. Most humpback whale sightings are in nearshore and continental shelf waters; however, humpback whales frequently travel through deep oceanic waters during migration (Calambokidis et al. 2001, Clapham and Mattila 1990, Clapham 2000), and can be expected to cross the Transit Corridor portion of the Study Area. Humpback whales migrating from breeding grounds in Hawaii to feeding grounds at higher latitudes may cross western portions of the Transit Corridor while whales migrating from breeding grounds in waters off Mexico and Central America to feeding grounds off California, Oregon, and Washington may cross eastern portions of the Transit Corridor.

Humpback migrations are complex and cover long distances (Calambokidis 2009, Barlow et al. 2011). Each year, most humpback whales migrate from high-latitude summer feeding grounds to low latitude winter breeding grounds, one of the longest migrations known for any mammal; individuals can travel nearly 4,970 mi. (7,998.4 km) from feeding to breeding areas (Clapham and Mead 1999). While there are exceptions, the vast majority of humpback whales that feed off Washington, Oregon, and California breed in waters off mainland Mexico and Central America (Barlow et al. 2011). Humpback whales that breed in Hawaii generally migrate to northern British Columbia and southeast Alaska to feed. Animals breeding in Hawaii have also been “matched” (i.e., identified as the same individual) to humpbacks feeding in southern British Columbia and northern Washington (where matches were also found to animals breeding in Central America). Hawaii humpbacks are also known to feed in the Gulf of Alaska, the Aleutian Islands, and Bering Sea, where surprisingly matches were also found to animals that breed near islands off Mexico (Isla Revillagigedos) (Forestell and Urban-Ramirez 2007, Barlow et al. 2011, Lagerquist et al. 2008) and between Japan and Hawaii (Salden et al. 1999). This study indicates that humpback whales migrating between Hawaii and British Columbia/southeast Alaska must cross paths with humpback whales migrating between the Gulf of Alaska/Aleutian Islands/Bering Sea and islands off Mexico. In addition, based on the identification of individual whales, there is evidence that some humpback whales (most likely males) move between winter breeding areas in Hawaii and Mexico (Forestall and Urban-Ramirez 2007) and Hawaii and Japan (Salden et al. 1999).

Satellite tagging of humpback whales in the Hawaiian Islands found that one adult traveled 155 mi. (249.4 km) to Oahu, Hawaii in 4 days, while a different individual traveled to Penguin Bank and 5 islands, totaling 530 mi. (852.9 km) in 10 days. Both of these trips imply faster travel between the islands than had been previously recorded (Mate et al. 1998). Three whales traveled independent courses, following north and northeast headings en route to the Gulf of Alaska, with the fastest averaging 93 mi. (150 km) per day. At this rate, the animal would take an estimated 39 days to travel the entire 2,600 mi. (4,200 km) migration route to the upper Gulf of Alaska (Mate et al. 1998). A recent study using acoustic recordings near the northwestern Hawaiian Islands indicates that humpback whales were present from early December through early June (Lammers et al. 2011).

3.4.2.5.3 Population and Abundance

The overall abundance of humpback whales in the north Pacific was recently estimated at 21,808 individuals (coefficient of variation = 0.04; this is an indicator of uncertainty and is described in a footnote in Table 3.4-1), confirming that this population of humpback whales has continued to increase and is now greater than some pre-whaling abundance estimates (Barlow et al. 2011). Data indicates the north Pacific population has been increasing at a rate of between 5.5 percent and 6.0 percent per year so approximately doubling every 10 years (Calambokidis et al. 2008). The current best estimate for the California, Oregon, and Washington stock is 2,043 (coefficient of variation = 0.10) (Carretta et al. 2010). Based on ship surveys conducted in the summer and fall from 1991 to 2005, it is estimated that 36 humpback whales (coefficient of variation = 0.51) occur off Southern California in the waters south of Point Conception (Barlow and Forney 2007).

The Central North Pacific stock has been estimated at 10,103 individuals on wintering grounds throughout the main Hawaiian Islands (Allen and Angliss 2013). The Hawaiian Islands Humpback Whale National Marine Sanctuary reported in 2010 that as many as 12,000 humpback whales migrate to Hawaiian waters each year (National Oceanic and Atmospheric Administration 2010). Based on aerial surveys conducted around the main Hawaiian Islands, the number of humpback whales was estimated at 4,491 (Mobley et al. 2001b).

3.4.2.5.4 Predator/Prey Interactions

Within the Southern California feeding grounds, humpback whales feed on a wide variety of invertebrates and small schooling fishes. The most common invertebrate prey are krill (tiny crustaceans); the most common fish prey are herring, mackerel, sand lance, sardines, anchovies, and capelin (Clapham and Mead 1999). Feeding occurs both at the surface and in deeper waters, wherever prey is abundant. Humpback whales are the only species of baleen whale that show strong evidence of cooperation when they feed in large groups (D'Vincent et al. 1985). It is believed that minimal feeding occurs in wintering grounds, such as the Hawaiian Islands (Balcomb 1987, Salden 1989).

This species is known to be attacked by both killer whales and false killer whales as evidenced by tooth rake scars on their bodies and fins (Jefferson et al. 2008). Humpback whales observed on the feeding grounds off Washington and California had the highest rate of rake marks of any of the feeding grounds observed (Steiger et al. 2008).

3.4.2.5.5 Species Specific Threats

Entanglement in fishing gear poses a threat to individual humpback whales throughout the Pacific. Humpback whales from the Central North Pacific stock have been reported seriously injured and killed from entanglement in fishing gear while in their Alaskan feeding grounds (Allen and Angliss 2013). From 2003 to 2007, an average of 3.4 humpback whales per year were seriously injured or killed due to entanglements with commercial fishing gear in Alaskan waters. This number is considered a minimum since observers have not been assigned to several fisheries known to interact with this stock and quantitative data on Canadian fishery entanglements are uncertain (Allen and Angliss 2013). In the Hawaiian Islands, there are also reports of humpback whale entanglements with fishing gear. According to the NMFS Pacific Islands Region Marine Mammal Response Network Activity Update (dated July 2007 [National Marine Fisheries Service 2007a]), there were reports of 26 distressed marine mammals in Hawaii found entangled in fishing gear during a 6-month period (November to April 2007). From November 1, 2009 through April 28, 2010, the Hawaii Whale Entanglement Response Network received 32 reports of entangled humpback whales from fishing gear including longline, monofilament (hook and line), and local crab pot (trap) gear.

A number of fisheries based out of U.S. ports on the west coast may incidentally take individuals belonging to the California, Oregon, and Washington stock of humpback whales. In California, Oregon, and Washington, a total of 18 humpback whales were observed entangled in fishing gear from 2004 to 2008 (Carretta et al. 2011). While 7 of these animals were entangled in unknown gillnet or other fishing gear such as lines and buoys, 11 were reported entangled in trap/pot fishery gear off California and Oregon. Two of the entangled whales were successfully disentangled, 2 were later confirmed dead, and the remaining 14 were considered seriously injured due to trailing fishing gear (Carretta et al. 2011). The estimated impact of fisheries on the California, Oregon, and Washington humpback whale stock is probably underestimated since an additional 12 unidentified whales were observed entangled in similar gear and it is likely that at least a portion of these were humpback whales. Based on reports from 2000 to 2010, a total of 36 humpback whales were entangled in fishing gear off California, 10 of which were reported within the Southern California Bight (Saez et al. 2012). An additional number of individual whales from the California, Oregon, and Washington stock are entangled in fishing gear from Mexican fisheries; however, quantitative data are not currently available for most of these fisheries (Carretta et al. 2011), nor for entanglements off Central America in this stock’s breeding grounds. Finally, serious injury or mortality of humpback whales from entanglement in gear may go unobserved because whales swim away with a portion of the net, line, buoys, or pots.

Humpback whales, especially calves and juveniles, are highly vulnerable to ship strikes. Younger whales spend more time at the surface, are less visible, and are found closer to shore (Herman et al. 1980, Mobley et al. 1999), thereby making them more susceptible to collisions. In their Alaskan feeding grounds, eight ship strikes were implicated in mortality or serious injuries of humpback whales between 2003 and 2007 and seven between 2006 and 2010 (Allen and Angliss 2011, 2013); when they migrate to and from Alaska, some of these whales pass through the SOCAL portion of the Study Area and others spend winter in Hawaii.

Available data from NMFS indicate that in waters off California between 1991 and 2010, there were eight ship strikes involving humpback whales (National Marine Fisheries Service Southwest Region Stranding Database 2011). The recorded number of serious injuries and mortality attributed to ship strikes most likely does not reflect the total because additional mortality from ship strikes probably goes unreported.

In the Hawaiian Islands, there were nine reported ship collisions with humpback whales in 2006 (none involved Navy vessels), as recorded by the NMFS Pacific Islands Region Marine Mammal Response Network Activity Updates (National Marine Fisheries Service 2007a). The number of confirmed ship strike reports was greater in 2007/2008; there were 12 reported ship-strikes with humpback whales: 9 reported as hit by vessels, and 3 observed with wounds indicating a recent ship strike (National Marine Fisheries Service 2008a). A humpback carcass was discovered on the shore of west Molokai in 2010 with indications that the death resulted from trauma consistent with a ship strike (National Marine Fisheries Service 2010e).

Humpback whales are potentially affected by loss of habitat, loss of prey (for a variety of reasons including climate variability), underwater noise, and pollutants. The Central North Pacific stock of humpback whales is the focus of whale-watching activities in both its feeding grounds (Alaska) and breeding grounds (Hawaii). Regulations addressing minimum approach distances and vessel operating procedures are in place to help protect the whales; however, there is still concern that whales may abandon preferred habitats if the disturbance is too high (Allen and Angliss 2010).

3.4.2.6 Blue Whale (*Balaenoptera musculus*)

The world's population of blue whales can be separated into three subspecies, based on geographic location and some morphological differences. The true blue whales have been divided into two subspecies found in the northern hemisphere (*Balaenoptera musculus musculus*) and the southern hemisphere (*Balaenoptera musculus intermedia*). The third subspecies, the pygmy blue whale (*Balaenoptera musculus brevicauda*), is known to have overlapping ranges with both subspecies of true blue whales (Best et al. 2003, Reeves et al. 2002).

3.4.2.6.1 Status and Management

The blue whale is listed as endangered under the ESA and as depleted under the MMPA. For the MMPA stock assessment reports, the Eastern North Pacific Stock of blue whales includes animals found in the eastern north Pacific from the northern Gulf of Alaska to the eastern tropical Pacific (Carretta et al. 2010).

3.4.2.6.2 Geographic Range and Distribution

The blue whale inhabits all oceans and typically occurs near the coast, over the continental shelf, though it is also found in oceanic waters. Their range includes the California Current and Insular Pacific-

Hawaiian Large Marine Ecosystems, and the open ocean. Blue whales have been sighted, acoustically recorded and satellite tagged in the eastern tropical Pacific (Ferguson 2005, Stafford et al. 2004).

Insular Pacific-Hawaiian Large Marine Ecosystem. Blue whales are found in the Hawaii portion of the Study Area, but this species is known to occur seasonally in this region and sighting frequency is low. Whales feeding along the Aleutian Islands of Alaska likely migrate to offshore waters north of Hawaii in winter.

California Current Large Marine Ecosystem. The west coast is known to be a feeding area for this species during summer and fall (Bailey et al. 2009, Carretta et al. 2010). This species has frequently been observed in the Southern California portion of the Study Area (Carretta et al. 2000, U.S. Department of the Navy 2011). Photographs of blue whales in California have been matched to individuals photographed off the Queen Charlotte Islands in northern British Columbia and the northern Gulf of Alaska (Calambokidis et al. 2009a). In the Southern California Bight, the highest densities of blue whales occurred along the 200-m isobath in waters with high surface chlorophyll concentrations (Redfern et al. in review).

Open Ocean. Most blue whale sightings are in nearshore and continental shelf waters; however, blue whales frequently travel through deep oceanic waters during migration (Širović et al. 2004). Most baleen whales spend their summers feeding in productive waters near the higher latitudes and winters in the warmer waters at lower latitudes (Širović et al. 2004). Blue whales in the north Pacific are known to migrate between higher latitude feeding grounds of the Gulf of Alaska and the Aleutian Islands to lower latitude breeding grounds of California and Baja California, Mexico (Calambokidis et al. 2009a). Blue whales observed in the spring, summer, and fall off California, Washington, and British Columbia are known to be part of a group that returns to feeding areas off British Columbia and Alaska (Calambokidis and Barlow 2004, Calambokidis et al. 2009b, Gregr et al. 2000, Mate et al. 1999, Stafford et al. 1999). These animals have shown site fidelity, returning to their mother's feeding grounds on their first migration (Calambokidis and Barlow 2004). They are known to migrate to waters off Mexico and as far as the Costa Rican Dome (Calambokidis and Barlow 2004, Calambokidis et al. 2009b). Winter migration movements south along the Baja California, Mexico coast to the Costa Rica Dome indicate that the Costa Rica Dome may be a calving and breeding area (Mate et al. 1999). Blue whales belonging to the western Pacific stock may feed in summer, south of the Aleutians and in the Gulf of Alaska, and migrate to wintering grounds in lower latitudes in the western Pacific and central Pacific, including Hawaii (Stafford et al. 2004, Watkins et al. 2000).

3.4.2.6.3 Population and Abundance

The current best available abundance estimate for the Eastern North Pacific stock of blue whales that occur off California, Oregon, and Washington is 2,497 (coefficient of variation = 0.24) (Carretta et al. 2011). There was a documented increase in the blue whale population size between 1979 and 1994, but there has not been evidence to suggest an increase in the population since then (Barlow 1994, Barlow and Taylor 2001, Carretta et al. 2010). In the north Pacific, up to five distinct populations of blue whales are believed to occur. In 2008, Cascadia Research conducted photographic identification surveys to make abundance estimates of blue whales along the U.S. West Coast. The results reflect an increase in blue whale abundance along the U.S. West Coast, although their numbers are highly variable off California, most likely due to the variability of its use as a feeding area (Calambokidis et al. 2009b).

There currently is no estimate of abundance for the Central North Pacific stock of blue whales due to a lack of sighting information (Carretta et al. 2011).

3.4.2.6.4 Predator/Prey Interactions

This species preys almost exclusively on various types of zooplankton, especially krill. They lunge feed and consume approximately 6 tons (5,500 kilograms) of krill per day (Jefferson et al. 2008, Pitman et al. 2007). They sometimes feed at depths greater than 330 ft. (100 m), where their prey maintains dense groupings (Acevedo-Gutiérrez et al. 2002). Blue whales have been documented to be preyed on by killer whales (Jefferson et al. 2008, Pitman et al. 2007). There is little evidence that killer whales attack this species in the north Atlantic or southern hemisphere, but 25 percent of photo-identified whales in the Gulf of California carry rake scars from killer whale attacks (Sears and Perrin 2008).

3.4.2.6.5 Species Specific Threats

Blue whales are susceptible to entanglement in fishing gear and ship strikes. Available data from NMFS indicate that in waters off California between 1991 and 2010, there were 14 ship strikes involving blue whales (National Marine Fisheries Service Southwest Region Stranding Database 2011).

3.4.2.7 Fin Whale (*Balaenoptera physalus*)

3.4.2.7.1 Status and Management

The fin whale is listed as endangered under the ESA and as depleted under the MMPA. Pacific fin whale population structure is not well known. In the North Pacific, there is a California, Oregon, and Washington stock; a Hawaii stock; and an Alaska stock recognized (Carretta et al. 2010).

3.4.2.7.2 Geographic Range and Distribution

The fin whale is found in all the world's oceans and is the second largest species of whale (Jefferson et al. 2008). Fin whales prefer temperate and polar waters and are scarcely seen in warm, tropical waters (Reeves et al. 2002). Fin whales typically congregate in areas of high productivity. They spend most of their time in coastal and shelf waters, but can often be found in waters of approximately 6,562 ft. (2,000 m) (Aissi et al. 2008, Reeves et al. 2002). Attracted for feeding, fin whales are often seen closer to shore after periodic patterns of upwelling and the resultant increased krill density (Azzellino et al. 2008). This species of whale is not known to have a specific habitat and is highly adaptable, following prey, typically off the continental shelf (Azzellino et al. 2008, Panigada et al. 2008). The range of the fin whale is known to include the California Current and Insular Pacific-Hawaiian Large Marine Ecosystems, and the open ocean.

Insular Pacific-Hawaiian Large Marine Ecosystem. Fin whales are found in Hawaiian waters, but this species is considered to be rare in this portion of the Study Area (Carretta et al. 2010, Shallenberger 1981). There are known sightings from Kauai, Oahu, Hawaii and a single stranding record from Maui, Hawaii (Mobley et al. 1996, Shallenberger 1981, U.S. Department of the Navy 2011). Five sightings were made in offshore waters during a 2002 survey of waters within the Hawaiian Exclusive Economic Zone, and a single sighting was made during aerial surveys from 1993 to 1998 (Barlow et al. 2006, Carretta et al. 2010, Mobley et al. 1996, Mobley et al. 2000). The most recent sighting was a single juvenile fin whale reported off Kauai in 2011 (U.S. Department of the Navy 2011). Based on sighting data and acoustic recordings, fin whales are likely to occur in Hawaiian waters mainly in fall and winter (Barlow et al. 2006, Barlow et al. 2008, Barlow et al. 2004).

California Current Large Marine Ecosystem. This species has been documented from 60° North (N) to 23° N, and they have frequently been recorded in offshore waters within the Southern California portion of the Study Area (Carretta et al. 2010, Mizroch et al. 2009). Aggregations of fin whales are present year-round in southern and central California (Forney et al. 1995). Aerial surveys conducted in October and

November 2008 by the Marine Mammal Research Consultants within the Southern California portion of the Study Area resulted in the sighting of 22 fin whales (Oleson and Hill 2009, Acevedo-Gutiérrez et al. 2002). Navy-sponsored monitoring in the SOCAL Range Complex for the 2009–2010 period also recorded the presence of fin whales (U.S. Department of the Navy 2010). Moore and Barlow (2011) indicate that, since 1991, there is strong evidence of increasing fin whale abundance in the California Current area; they predict continued increases in fin whale numbers over the next decade, and that perhaps fin whale densities are reaching “current ecosystem limits.”

Open Ocean. The distribution of fin whales in the Pacific during the summer includes the northern area of the Hawaii portion of the Study Area to 32° N off the coast of California (Barlow 1995, Forney et al. 1995). Fin whales are relatively abundant in north Pacific offshore waters, including the Hawaii portion of the Study Area (Berzin and Vladimirov 1981, Mizroch et al. 2009). Acoustic signals that may be attributed to the fin whale have also been detected in the Transit Corridor portion of the Study Area (Northrop et al. 1968, Watkins et al. 2000). Fin whales have been recorded in the eastern tropical Pacific (Ferguson 2005) and are frequently sighted there during offshore ship surveys.

Locations of breeding and calving grounds for the fin whale are unknown, but it is known that the whales typically migrate seasonally to higher latitudes every year to feed and migrate to lower latitudes to breed (Kjeld et al. 2006; MacLeod et al. 2006b). The fin whale’s ability to adapt to areas of high productivity controls migratory patterns (Canese et al. 2006, Reeves et al. 2002). Fin whales are one of the fastest cetaceans, capable of attaining speeds of 25 mi. (40.2 km) per hour (Jefferson et al. 2008, Marini et al. 1996).

3.4.2.7.3 Population and Abundance

The current best available abundance estimate for the Hawaiian stock of fin whales is 174 (coefficient of variation = 0.72) (Barlow 2003). The current best available abundance estimate of fin whales in California, Oregon, and Washington waters is 3,044 (coefficient of variation = 0.18) (Carretta et al. 2011). Survey estimate numbers for both stocks are considered to be an underestimate because large whales that could not be identified in the field (due to distance, bad sighting conditions, etc.) were recorded in these and other surveys as “unidentified rorqual” or “unidentified large whale” (Carretta et al. 2010). A recent study indicates that the abundance of fin whales in waters off the U.S. west coast has increased during the 1991–2008 survey period, most likely from *in situ* population growth combined with distribution shifts (Moore and Barlow 2011).

3.4.2.7.4 Predator/Prey Interactions

This species preys on small invertebrates such as copepods as well as squid, and schooling fishes, such as capelin, herring, and mackerel (Goldbogen et al. 2006, Jefferson et al. 2008). The fin whale is not known to have a significant number of predators. However, in regions where killer whales are abundant, some fin whales exhibit attack scars on their flippers, flukes, and flanks suggesting possible predation by killer whales (Aguilar 2008).

3.4.2.7.5 Species Specific Threats

Fin whales are susceptible to both ship strikes and entanglement in fishing gear. Available data from NMFS indicate that in waters off California between 1991 and 2010, there were 11 ship strikes involving fin whales (National Marine Fisheries Service Southwest Region Stranding Database 2011). Based on reports from 2000 to 2010, a total of 2 fin whales were entangled in fishing gear off California, both of which were reported within the Southern California Bight (Saez et al. 2012).

3.4.2.8 Sei Whale (*Balaenoptera borealis*)

The sei whale is a medium-sized rorqual falling in size between fin whale and Bryde's whale (discussed in Section 3.4.2.9, Bryde's Whale) and given the difficulty of some field identifications and similarities in the general appearance of three species, may sometimes be recorded in surveys as unidentified rorqual.

3.4.2.8.1 Status and Management

The sei whale is listed as endangered under the ESA and as depleted under the MMPA. A recovery plan for the sei whale was completed in 2011 and provides a research strategy for obtaining data required to estimate population abundance and trends, and to identify factors that may be limiting the recovery of this species (National Marine Fisheries Service 2011d). Only a single eastern north Pacific stock is recognized in the U.S. Exclusive Economic Zone (Carretta et al. 2010). However, some mark-recapture, catch distribution, and morphological research indicates that more than one stock exists: one between 175° W and 155° W, and another east of 155° W (Carretta et al. 2010; Masaki 1976, 1977). The Eastern North Pacific population has been protected since 1976, but is likely still impacted by the effects of continued unauthorized takes from whaling (Carretta et al. 2010).

3.4.2.8.2 Geographic Range and Distribution

Sei whales have a worldwide distribution and are found primarily in cold temperate to subpolar latitudes. During the winter, sei whales are found from 20° N to 23° N and during the summer from 35° N to 50° N (Horwood 2009; Masaki 1976, 1977; Smultea et al. 2010). However, a recent survey of the Northern Mariana Islands recorded sei whales south of 20° N in the winter (Fulling et al. 2011). They are considered absent or at very low densities in most equatorial areas.

Insular Pacific-Hawaiian Large Marine Ecosystem. The first verified sei whale sighting made nearshore of the main Hawaiian Islands occurred in 2007 (Smultea et al. 2007, Smultea et al. 2010) and included the first subadults seen in the main Hawaiian islands. A line-transect survey conducted in February 2009 by the Cetacean Research Program surrounding the Hawaiian Islands resulted in the sighting of three Bryde's/sei whales. An additional sighting occurred in 2010 of Perret Seamount (U.S. Department of Navy 2011). On March 18, 2011 off Maui, the Hawaiian Islands Entanglement Response Network found a subadult sei whale entangled in rope and fishing gear (National Marine Fisheries Service 2011c). An attempt to disentangle the whale was unsuccessful although a telemetry buoy attached to the entangled gear was reported to be tracking the whale over 21 days as it moved north and over 250 nm from the Hawaiian Islands.

The sei whale has been considered rare in the Hawaii portion of the Study Area based on reported sighting data and the species' preference for cool temperate waters. Sei whales were not sighted during aerial surveys conducted within 25 nm of the main Hawaiian Islands from 1993 to 1998 (Mobley et al. 2000). Based on sightings made during the NMFS-Southwest Fisheries Science Center shipboard survey assessment of Hawaiian cetaceans (Barlow et al. 2004), sei whales are expected to occur in deep waters on the north side of the islands only. However, in 2007 two sei whale sightings occurred north of Oahu, Hawaii during a short survey in November and these included three subadult whales. These latter sightings suggest that the area north of the main Hawaiian Islands may be part of a reproductive area for north Pacific sei whales (Smultea et al. 2010).

California Current Large Marine Ecosystem. Sei whales are distributed in offshore waters in the Southern California portion of the Study Area (Carretta et al. 2010). They are generally found feeding along the California Current (Perry et al. 1999). There are records of sightings in California waters as early as May and June, but primarily are encountered there during July to September and leave California waters by mid-October. Aerial surveys conducted in October and November 2008 off the Southern California coast resulted in the sighting of one sei (or possibly fin) whale (Oleson and Hill 2009).

Open Ocean. Sei whales are most often found in deep oceanic waters of the cool temperate zone. They appear to prefer regions of steep bathymetric relief, such as the continental shelf break, canyons, or basins between banks and ledges (Best and Lockyer 2002, Gregr and Trites 2001, Kenney and Winn 1987, Schilling et al. 1992). On feeding grounds, the distribution is largely associated with oceanic frontal systems (Horwood 1987). Characteristics of preferred breeding grounds are unknown, since they have generally not been identified. Sei whales are likely present in the Transit Corridor portion of the Study Area, and are seen at least as far south as 20° N into the North Pacific Gyre (Horwood 1987, 2009).

Sei whales spend the summer feeding in high latitude subpolar latitudes and return to lower latitudes to calve in winter. Whaling data provide some evidence of differential migration patterns by reproductive class, with females arriving at and departing from feeding areas earlier than males (Horwood 1987, Perry et al. 1999). Sei whales are known to swim at speeds greater than 15 mi. (25 km) per hour and may be the fastest cetacean, after the fin whale (Horwood 2009, Jefferson et al. 2008).

3.4.2.8.3 Population and Abundance

The best current estimate of abundance for the Eastern North Pacific stock of sei whales that occur off California, Oregon, and Washington waters out to 300 nm is 126 animals (coefficient of variation = 0.53) (Carretta et al. 2010). A 2002 shipboard line-transect survey of the entire U.S. Exclusive Economic Zone off the coast of Hawaii resulted in a summer and fall abundance estimate of 77 sei whales (coefficient of variation = 1.06) (Barlow 2003). This abundance estimate is considered the best available estimate for U.S. Exclusive Economic Zone off the coast of Hawaii, but may be an underestimate, as sei whales are expected to be mostly at higher latitudes on their feeding grounds during this time of year (Carretta et al. 2010). No data are available on current population trends.

3.4.2.8.4 Predator/Prey Interactions

Feeding occurs primarily around dawn, which appears to be correlated with vertical migrations of prey species (Horwood 2009). Unlike other rorquals, the sei whale skims to obtain its food, though, like other rorqual species, it does some lunging and gulping (Horwood 2009). In the north Pacific, sei whales feed on a diversity of prey, including copepods, krill, fish [specifically sardines and anchovies], and cephalopods [squids, cuttlefish, octopuses] (Horwood 2009; Nemoto and Kawamura 1977). The dominant food for sei whales off California during June through August is the northern anchovy, while in September and October they eat mainly krill (Horwood 2009, Rice 1977).

Sei whales, like other large baleen whales, are likely subject to occasional attacks by killer whales.

3.4.2.8.5 Species Specific Threats

Based on the statistics for other large whales, it is likely that ship strikes also pose a threat to sei whales along the west coast.

3.4.2.9 Bryde's Whale (*Balaenoptera brydei/edeni*)

Bryde's whales (*Balaenoptera brydei/edeni*) are among the least known of the large baleen whales. Their classification and true number remain uncertain (Alves et al. 2010). Until recently, all medium-sized baleen whales were considered members of one of two species, *Balaenoptera edeni* (Bryde's whale) or *Balaenoptera borealis* (sei whale). However, at least three genetically-distinct types of these whales are now known, including the so-called pygmy or dwarf Bryde's whales (*Balaenoptera brydei*) (Kato and Perrin 2008, Rice 1998). The International Whaling Commission continues to use the name *Balaenoptera edeni* for all Bryde's-like whales, although at least two species are recognized. In 2003, a new species (Omura's whale, *Balaenoptera omurai*) was described, and it became evident that the term pygmy Bryde's whale had been mistakenly used for specimens of *Balaenoptera omurai* (Reeves et al. 2004). Omura's whale is not currently known to occur in the Study Area and appears to be restricted to the western Pacific and Indian oceans (Jefferson et al. 2008), therefore is not described in this section.

3.4.2.9.1 Status and Management

This species is protected under the MMPA and is not listed under the ESA. The International Whaling Commission recognizes three management stocks of Bryde's whales in the north Pacific: western north Pacific, eastern north Pacific, and east China Sea (Donovan 1991), although the biological basis for defining separate stocks of Bryde's whales in the central north Pacific is not clear (Carretta et al. 2010). Bryde's whales within the U.S. Exclusive Economic Zone off the coast of Hawaii are divided into two areas: (1) Hawaiian waters and (2) the eastern tropical Pacific, east of 150° W and including the Gulf of California and waters off California (Carretta et al. 2010), within the Study Area.

3.4.2.9.2 Geographic Range and Distribution

Insular Pacific-Hawaiian Large Marine Ecosystem. Bryde's whales are only occasionally sighted in the Insular Pacific-Hawaiian Large Marine Ecosystems (Carretta et al. 2010, Jefferson et al. 2008, Smultea et al. 2008b). The first verified Bryde's whale sighting made nearshore of the main Hawaiian Islands occurred in 2007 (Smultea et al. 2008b, Smultea et al. 2010). A line-transect survey conducted in February 2009 by the Cetacean Research Program surrounding the Hawaiian Islands resulted in the sighting of three Bryde's/sei whales (Oleson and Hill 2009). A summer/fall 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone of the Hawaiian Islands resulted in 13 Bryde's whale sightings throughout the Study Area (Barlow 2003). Sightings are more frequent in the northwest Hawaiian Islands than in the main Hawaiian Islands (Barlow et al. 2004, Carretta et al. 2010, Smultea et al. 2008b, Smultea et al. 2010).

California Current Large Marine Ecosystem. Bryde's whales are only occasionally sighted in the California Current Large Marine Ecosystems (Carretta et al. 2010, Jefferson et al. 2008, Smultea et al. 2008b). Aerial surveys conducted in October and November 2008 off the Southern California coast resulted in the sighting of one Bryde's whale (Smultea et al. 2012). This was the first sighting in this area since 1991 when a Bryde's whale was sighted within 300 nm of the California coast (Barlow 1995).

Open Ocean. Bryde's whales occur primarily in offshore oceanic waters of the north Pacific. They are distributed throughout the North Pacific Gyre and North Pacific Transition Zone, in the Hawaiian portion of the Study Area. Data suggest that winter and summer grounds partially overlap in the central north Pacific (Kishiro 1996, Ohizumi et al. 2002). Bryde's whales are distributed in the central north Pacific in summer; the southernmost summer distribution of Bryde's whales inhabiting the central north Pacific is about 20° N (Kishiro 1996). Some whales remain in higher latitudes (around 25° N) in both winter and summer, but are not likely to move poleward of 40° N (Jefferson et al. 2008, Kishiro 1996). Bryde's whales in some areas of the world are sometimes seen very close to shore and even inside enclosed bays (Baker and Madon 2007, Best et al. 1984).

Long migrations are not typical of Bryde's whales, although limited shifts in distribution toward and away from the equator, in winter and summer, have been observed (Best 1996, Cummings 1985). They have been recorded swimming at speeds of 15 mi. (24.1 km) per hour (Jefferson et al. 2008, Kato and Perrin 2008).

3.4.2.9.3 Population and Abundance

Little is known of population status and trends for most Bryde's whale populations. Current genetic research confirms that gene flow among Bryde's whale populations is low and suggests that management actions treat each as a distinct entity to ensure proper conservation of biological diversity (Kanda et al. 2007). The best estimate of the eastern tropical Pacific population is 13,000 (coefficient of variation = 0.20) individuals, with only an estimated 12 (coefficient of variation = 2.0) individuals in California, Oregon, and Washington waters (Carretta et al. 2010). However, a recent study suggests that the seasonal presence (summer to early winter) of Bryde's whale in the Southern California Bight has been increasing over the last decade (Kerosky et al. 2012). A 2002 shipboard line-transect survey of the entire U.S. Exclusive Economic Zone off the coast of Hawaii yielded an abundance estimate of 469 (coefficient of variation = 0.45) Bryde's whales (Barlow 2003), which is the best available abundance estimate for the Hawaiian stock (Carretta et al. 2010).

3.4.2.9.4 Predator/Prey Interactions

Bryde's whales primarily feed on schooling fish and are lunge feeders. Prey includes anchovy, sardine, mackerel, herring, krill, and other invertebrates, such as pelagic red crab (Baker and Madon 2007, Jefferson et al. 2008, Nemoto and Kawamura 1977). Bryde's whales have been observed using "bubble nets" to herd prey (Jefferson et al. 2008, Kato and Perrin 2008). Bubble nets are used in a feeding strategy where the whales dive and release bubbles of air that float up in a column and trap prey inside where they lunge through the column to feed. Bryde's whale is known to be prey for killer whales, as evidenced by an aerial observation of 15 killer whales attacking a Bryde's whale in the Gulf of California (Weller 2008).

3.4.2.9.5 Species Specific Threats

Serious injury or mortality from interactions with fishing gear poses a threat to Bryde's whales throughout the Study Area.

3.4.2.10 Minke Whale (*Balaenoptera acutorostrata*)

Until recently, all minke whales were classified as the same species. Three subspecies of the minke whale are now recognized, however, only *Balaenoptera acutorostrata scammoni* is present in the north Pacific and the Study Area (Jefferson et al. 2008).

3.4.2.10.1 Status and Management

The minke whale is protected under the MMPA and is not listed under the ESA. Because the "resident" minke whales from California to Washington appear behaviorally distinct from migratory whales further north and those in Hawaii, minke whales in coastal waters of California, Oregon, and Washington (including Puget Sound) are considered as a separate stock from the Alaskan stock (Carretta et al. 2010).

3.4.2.10.2 Geographic Range and Distribution

The minke whale range is known to include the California Current and Insular Pacific-Hawaiian Large Marine Ecosystems, North Pacific Gyre and the North Pacific Transition Zone (Okamura et al. 2001, Yamada 1997). The northern boundary of their range is within subarctic and arctic waters (Kuker et al. 2005).

Insular Pacific-Hawaiian Large Marine Ecosystem. Minke whales previously were considered a rare species in Hawaiian waters due to limited sightings during visual and aerial surveys. The first documented sighting of a minke whale close to the main Hawaiian islands was made off the southwest coast of Kauai in 2005 (Norris et al. 2005, Rankin et al. 2007). Recent research suggests minke whales are somewhat common in Hawaii (Rankin et al. 2007, U.S. Department of the Navy 2011). Those found in the Hawaii portion of the Study Area are known to belong to seasonally migrating populations that feed in higher latitudes (Barlow 2006). During a survey around the Hawaiian Islands, minke whales were identified as the source of the mysterious “boing” sound of the north Pacific Ocean, specifically offshore of Kauai and closer in, near the Pacific Missile Range Facility, Barking Sands region (Barlow et al. 2004, Rankin and Barlow 2005). This new information has allowed acoustical detection of minke whales, although they are rarely observed during visual surveys (Barlow 2006, Barlow et al. 2004, Rankin et al. 2007). Recent research using a survey vessel’s towed acoustic array and the Navy’s hydrophones off Kauai in 2009-2010 (35 days total) provided bearings to 1,975 minke whale “boing” vocalizations located within the instrumented range offshore of the Pacific Missile Range Facility (U.S. Department of the Navy 2011); this is an area where training and testing has routinely occurred for decades.

The minke is present in summer and fall in the Southern California portion of the Study Area (Carretta et al. 2009). They often use both nearshore and offshore waters as habitats for feeding and migration to wintering areas.

Open Ocean. These whales generally participate in annual migrations between low-latitude breeding grounds in the winter and high-latitude feeding grounds in the summer (Kuker et al. 2005). Minke whales generally occupy waters over the continental shelf, including inshore bays, and even occasionally enter estuaries. However, records from whaling catches and research surveys worldwide indicate an open ocean component to the minke whale’s habitat. The migration paths of the minke whale include travel between breeding to feeding grounds and have been shown to follow patterns of prey availability (Jefferson et al. 2008).

3.4.2.10.3 Population and Abundance

The abundance estimate for minke whales from 2005 and 2008 summer/fall ship surveys in California, Oregon, and Washington waters is approximately 478 individuals (coefficient of variation = 1.36) (Carretta et al. 2010). There is no population estimate for the Hawaiian stock of minke whales (Carretta et al. 2010).

3.4.2.10.4 Predator/Prey Interactions

This species preys on small invertebrates and schooling fish, such as sand eel, pollock, herring, and cod. Similar to other rorquals, minke whales are lunge feeders, often plunging through patches of shoaling fish or krill (Hoelzel et al. 1989, Jefferson et al. 2008). In the north Pacific, major foods include small invertebrates, krill, capelin, herring, pollock, haddock, and other small shoaling fish (Jefferson et al. 2008, Kuker et al. 2005, Lindstrom and Haug 2001). Minke whales are prey for killer whales (Ford et al. 2005); a minke was observed being attacked by killer whales near British Columbia (Weller 2008).

3.4.2.10.5 Species-Specific Threats

Serious injury or mortality from interactions with fishing gear poses a threat to minke whales throughout the Study Area. Additionally, ship strikes also pose a threat to minke whales along the west coast.

3.4.2.11 Gray Whale (*Eschrichtius robustus*)

3.4.2.11.1 Status and Management

There are two north Pacific populations of gray whales: the Western subpopulation and the Eastern subpopulation. Both populations (stocks) could be present in the Southern California portion of the Study Area during their northward and southward migration (see Sumich and Show 2011). The Western subpopulation, which was previously also known as the western north Pacific or the Korean-Okhotsk population, has recently been designated the Western North Pacific stock (Carretta et al. 2013). This stock is critically endangered and shows no apparent signs of recovery, while the Eastern Pacific population (also known as the eastern north Pacific or the California-Chukchi population) appears to have recovered from exploitation and was removed from listing under the ESA in 1994 (Swartz et al. 2006). All populations of gray whale are protected under the MMPA; the Western North Pacific stock is listed as endangered under the ESA and depleted under the MMPA.

A group of a few hundred gray whales, known as the Pacific Coast Feeding Group, feeds along the Pacific coast between southeastern Alaska and southern California throughout the summer and fall (Calambokidis et al. 2002). This group of whales has generated uncertainty regarding the stock structure of the Eastern North Pacific population (Carretta et al. 2013). Photo-identification, telemetry, and genetic studies suggest that the Pacific Coast Feeding Group is demographically distinct (Calambokidis et al. 2010; Mate et al. 2010; Frasier et al. 2011). Currently, however, the Pacific Coast Feeding Group is not treated as a distinct stock in the NMFS Stock Assessment Reports but this may change in the future based on new information (Carretta et al. 2013).

Gray whales began to receive protection from commercial whaling in the 1930s. However, hunting of the western population continued for many more years. The International Whaling Commission sets a quota allowing catch of gray whales annually from the eastern population for aboriginal subsistence.

3.4.2.11.2 Geographic Range and Distribution

Gray whales primarily occur in shallow waters over the continental shelf and are considered to be one of the most coastal of the great whales (Jefferson et al. 2008; Jones and Swartz 2009). Feeding grounds are generally less than 225 ft. (68.6 m) deep (Jones and Swartz 2009). Breeding grounds consist of subtropical lagoons (Jones and Swartz 2009). These warm water protected lagoons are more conducive to rearing calves and mating and offer protection from predation by killer whales (Jones and Swartz 2009). Females may also use the shallow lagoons to escape from harassment by courting males, which concentrate at the lagoon entrances and outer coastal areas (Jones and Swartz 2009). The three major breeding lagoons of Eastern North Pacific gray whales are in Baja California, Mexico (Alter et al. 2009, Urban-R. et al. 2003).

California Current Large Marine Ecosystem. Eastern gray whales are known to migrate along the California coast in the California Current Large Marine Ecosystem on both their northward and southward migration (Sumich and Show 2011). Eastern gray whales are frequently observed in the Southern California portion of the Study Area (Carretta et al. 2000, Forney et al. 1995, Henkel and Harvey 2008, Hobbs et al. 2004). During aerial surveys off San Clemente Island, California eastern gray whales were the most abundant marine mammal from January through April, a period that covers both the northward and southward migrations (Carretta et al. 2000, Forney et al. 1995).

Open Ocean. Although they generally remain mostly over the shelf during migration, some animals may be found in more offshore waters; the Transit Corridor portion of the Study Area could be a secondary range (Jones and Swartz 2009; Rugh et al. 2008).

This species makes the longest annual migration of any mammal, 9,320 to 12,425 mi. (15,000–20,000 km) roundtrip (Jefferson et al. 2008, Jones and Swartz 2009). The migration connects arctic feeding grounds with southern mating and calving regions, calving in temperate and in subtropical coastal waters in winter. Winter grounds extend from central California south along Baja California, the Gulf of California, and the mainland coast of Mexico. In the fall, whales start the southward migration from November to late December, and mainly follow the coast to Mexico. The trip averages 2 months. The northward migration to the feeding grounds occurs in two phases. The first phase in late January through March consists of newly-pregnant females, who go first to maximize feeding time, followed by adult females and males, then juveniles. The second phase, in April through May, consists primarily of mothers and calves that have remained in the breeding area longer, allowing calves to strengthen and rapidly increase in size before the northward migration (Jones and Swartz 2009).

Most of the Eastern North Pacific gray whale stock summers in the shallow waters of the northern Bering Sea, Chukchi Sea, and western Beaufort Sea (Rice and Wolman 1971), but, as noted above, a small proportion (a few hundred individuals) known as the Pacific Coast Feeding Group spend the summer and fall feeding along the Pacific coast from southeastern Alaska to central California (Sumich 1984; Calambokidis et al. 2002; Gosho et al. 2011).

The migration routes of the Western North Pacific stock of gray whale are poorly known (Weller et al. 2002). Previous sighting data suggested that the remaining population of western gray whale had a limited range extent between the Okhotsk Sea off the coast of Sakhalin Island and the South China Sea (Weller et al. 2002). However, recent long-term studies of radio-tracked whales indicate that the coastal waters of eastern Russia, the Korean Peninsula, and Japan are part of the migratory route (Weller et al. 2012). There is also photographic evidence of a match between a whale found off Sakhalin and the Pacific coast of Japan, more than 932 mi. (1,500 km) south of the Sakhalin feeding area (Weller et al. 2008). Further, photo-catalog comparisons of eastern and western North Pacific gray whale populations as well as genetic and telemetry studies suggest that there is more exchange between the western and eastern populations than previously thought, since “Sakhalin” whales were found off Santa Barbara, California; British Columbia, Canada; and Baja California, Mexico (Weller et al. 2013).

Gray whales are generally slow-moving animals (Jefferson et al. 2008). Migrating gray whales sometimes exhibit a unique “snorkeling” behavior, whereby they surface cautiously, exposing only the area around the blowhole, exhale quietly without a visible blow, and sink silently beneath the surface (Jones and Swartz 2009). Mate and Urban-Ramirez (2003) report an average gray whale speed of approximately 2.8 knots (5.2 km/hr) based on a tagged migrating animal. At this swim speed, and based on the three main migration routes presented in Sumich and Snow (2011), it should take approximately 24–36 hours for a gray whale to cross through the Southern California portion of the Study Area (approximately 80–155 mi.; 130–250 km). It is assumed they will do this twice a year during their annual southbound and northbound migration legs.

3.4.2.11.3 Population and Abundance

Recent abundance estimates for the Eastern North Pacific gray whale population have ranged between 17,000 and 20,000 (Swartz et al. 2006; Rugh et al. 2008). For stock assessment purposes, NMFS currently uses an abundance of 19,126 animals (coefficient of variation = 0.071; Carretta et al. 2013). The eastern population appears to be generally increasing, despite the 1999 event in which an unusually large number of gray whales stranded along the coast, from Mexico to Alaska (Gulland et al. 2005).

Based on a defined range for the Pacific Coast Feeding Group of between 41°N to 52°N, the 2008 abundance estimate is 194 (standard error = 17.0) whales (Carretta et al. 2013).

The Western North Pacific subpopulation of gray whale was once considered extinct but now small numbers are known to exist (Weller et al. 2002). The most recent estimate of this population is 155 individuals (95 percent confidence interval = 142 to 165 whales; International Union for Conservation of Nature 2012). Based on the data in Weller at al. (2013), the Navy conservatively estimates 23 Western North Pacific gray whales may migrate along the U.S. Pacific coast and the species are assumed, for purposes of the analysis in the HSTT EIS/OEIS, to transit through the Southern California portion of the Study Area.

Given the emergent nature of the science associated with the Western North Pacific stock of gray whales, there is no Study Area density or population data available at this time. Therefore, based on the abundance estimate and Study Area estimate presented above, the resulting ratio of the Western North Pacific stock (0.12 percent) to that of the Eastern North Pacific stock (99.88 percent) was therefore used to prorate the modeled exposures previously calculated for only Eastern North Pacific gray whales in order to estimate acoustic effects to each of the two stocks.

3.4.2.11.4 Predator/Prey Interactions

Gray whales are primarily bottom feeders. Their prey includes a wide range of invertebrates living on or near the seafloor; these occur during the summer in dense colonies on the continental shelf seafloor of arctic regions (Swartz et al. 2006). The whales filter amphipods and other crustaceans with their baleen plates. The whales carry most of the sediment with them when they surface to breathe, creating mud plumes in their wake (Jefferson et al. 2008, Jones and Swartz 2009). Gray whales occasionally engulf fishes, herring eggs, cephalopods, and crab larvae (Jefferson et al. 2008, Jones and Swartz 2009, Newell and Cowles 2006). Although generally fasting during the migration and calving season, opportunistic feeding (on whatever food is available) may occur in or near the calving lagoons or in the shallow coastal waters along the migration path (Jones and Swartz 2008). During the feeding season, an adult gray whale is known to consume approximately 2,645 pounds (lb.) (1,199.8 kilograms [kg]) of food daily (Jones and Swartz 2008).

The gray whale is preyed on by killer whales. Many individuals exhibit attack scars indicating not all attacks are fatal, however fatalities are known. Killer whales target calves during the spring migration into colder northern waters (Jones and Swartz 2008).

3.4.2.11.5 Species Specific Threats

Gray whales are susceptible to entanglement in fishing gear, ship strikes, pollution, and subsistence harvesting. Available data from NMFS indicate that in waters off California between 1991 and 2010, there were 30 ship strikes involving gray whales (National Marine Fisheries Service Southwest Region Stranding Database 2011). Based on reports from 2000 to 2010, a total of 22 gray whales were entangled in fishing gear off California, 16 of which were reported within the Southern California Bight (Saez et al. 2012). Gray whales have historically been harvested by subsistence hunters in Alaska and Russia. The International Whaling Commission sets catch limits on the annual subsistence harvest for these areas.

3.4.2.12 Sperm Whale (*Physeter macrocephalus*)

The sperm whale is the only large whale that is an odontocete (toothed whale).

3.4.2.12.1 Status and Management

The sperm whale has been listed as endangered since 1970 under the precursor to the ESA (National Marine Fisheries Service 2009e), and is depleted under the MMPA. Sperm whales are divided into three stocks in the Pacific; two (Hawaii and California/Oregon/Washington) occur within the Study Area. Based on genetic analyses, Mesnick et al. (2011) found that sperm whales in the California Current are demographically independent from animals in Hawaii and the eastern tropical Pacific.

3.4.2.12.2 Geographic Range and Distribution

The sperm whale's range occurs throughout the entire Study Area. Primarily, this species is typically found in the temperate and tropical waters of the Pacific (Rice 1989). The secondary range includes the areas of higher latitudes in the northern part of the Study Area (Jefferson et al. 2008, Whitehead 2008, Whitehead et al. 2008). This species appears to have a preference for deep waters (Jefferson et al. 2008). Typically, sperm whale concentrations correlate with areas of high productivity. These areas are generally near drop offs and areas with strong currents and steep topography (Gannier and Praca 2007, Jefferson et al. 2008).

Insular Pacific-Hawaiian Large Marine Ecosystem. Sperm whales occur in Hawaii waters and are one of the more abundant large whales found in that region (Baird et al. 2003b, Mobley et al. 2000).

California Current Large Marine Ecosystem. Sperm whales are found year round in California waters (Barlow 1995; Forney and Barlow 1993). Sperm whales are known to reach peak abundance from April through mid-June and from the end of August through mid-November (Carretta et al. 2010).

Open Ocean. Sperm whales show a strong preference for deep waters (Rice 1989, Whitehead 2003). Their distribution is typically associated with waters over the continental shelf break, over the continental slope, and into deeper waters.

Sperm whales are somewhat migratory. General shifts occur during summer months for feeding and breeding, while in some tropical areas, sperm whales appear to be largely resident (Rice 1989, Whitehead 2003, Whitehead et al. 2008). Pods of females with calves remain on breeding grounds throughout the year, between 40° N and 45° N (Rice 1989, Whitehead 2003), while males migrate between low-latitude breeding areas and higher-latitude feeding grounds (Pierce et al. 2007). In the northern hemisphere, "bachelor" groups (males typically 15 to 21 years old and bulls [males] not taking part in reproduction) generally leave warm waters at the beginning of summer and migrate to feeding grounds that may extend as far north as the perimeter of the arctic zone. In fall and winter, most return south, although some may remain in the colder northern waters during most of the year (Pierce et al. 2007).

3.4.2.12.3 Population and Abundance

The current best available estimate of abundance for the California, Oregon, and Washington stock is 971 (coefficient of variation = 0.31) (Carretta et al. 2010). The current best available abundance estimate for the Hawaiian stock of sperm whales is 6,919 (coefficient of variation = 0.81) (Barlow 2003, Carretta et al. 2010). Sperm whales within the northern-most portion of the Study Area are estimated at 26,300 (Barlow and Taylor 2005).

3.4.2.12.4 Predator/Prey Interactions

Sperm whales are known to occur in groups for both predator defense and foraging purposes. Sperm whales feed on squid, other cephalopods, and bottom-dwelling fish and invertebrates (Davis et al. 2007, Marcoux et al. 2007, Rice 1989). Exactly how sperm whales search for, detect, and capture their prey remains uncertain. False killer whales, pilot whales, and killer whales have been documented harassing and on occasion attacking sperm whales (Baird 2009a).

3.4.2.12.5 Species Specific Threats

Sperm whales are susceptible to entanglement in fishing gear, ingestion of marine debris, and ship strikes. Based on reports from 2000 to 2010, a total of two sperm whales were entangled in fishing gear off California, both of which were reported within the Southern California Bight (Saez et al. 2012). Available data from NMFS indicate that in waters off California between 1991 and 2010, there was one ship strike involving a sperm whale (National Marine Fisheries Service Southwest Region Stranding Database 2011).

3.4.2.13 Pygmy Sperm Whale (*Kogia breviceps*)

There are two species of *Kogia*: the pygmy sperm whale (*Kogia breviceps*) and the dwarf sperm whale (*Kogia sima*; discussed in Section 3.4.2.14, Dwarf Sperm Whale). Before 1966 they were considered to be the same species until morphological distinction was shown (Handley 1966). Dwarf and pygmy sperm whales are difficult to distinguish from one another at sea, and many misidentifications have been made. Sightings of either species are often categorized as the genus *Kogia* (Jefferson et al. 2008).

3.4.2.13.1 Status and Management

The pygmy sperm whale is protected under the MMPA but is not listed under the ESA. Pygmy sperm whales are divided into two discrete stocks: (1) California, Oregon, and Washington waters and (2) Hawaiian waters (Carretta et al. 2010).

3.4.2.13.2 Geographic Range and Distribution

Pygmy sperm whales apparently occur close to shore, sometimes over the outer continental shelf. However, several studies have suggested that this species generally occurs beyond the continental shelf edge (Bloodworth and Odell 2008; MacLeod et al. 2004). The pygmy sperm whale frequents more temperate habitats than the other *Kogia* species, which is more of a tropical species.

Insular Pacific-Hawaiian Large Marine Ecosystem. Sightings of pygmy sperm whales are rarely reported in Hawaii. During boat surveys between 2000 and 2003 in the main Hawaiian Islands, this species was observed, but less commonly than the dwarf sperm whale (Baird 2005; Baird et al. 2003b; Barlow et al. 2004). Pygmy sperm whales are one of the more commonly stranded species in the Hawaiian Islands, and this frequency of strandings indicates that the species is likely more common than sightings suggest (Maldini et al. 2005).

California Current Large Marine Ecosystem. A total of two sightings of this species have been made in offshore waters along the California coast during previous surveys (Carretta et al. 2010).

Open Ocean. Although deep oceanic waters may be the primary habitat for pygmy sperm whales, very few oceanic sightings offshore have been recorded within the Study Area. However, this may be because of the difficulty of detecting and identifying these animals at sea (Caldwell and Caldwell 1989, Maldini et al. 2005). Records of this species from both the western (Japan) and eastern Pacific (California) suggest that the range of this species includes the North Pacific Central Gyre, and North Pacific Transition Zone (Carretta et al. 2010, Jefferson et al. 2008, Katsumata et al. 2004, Marten 2000, Norman et al. 2004). Their range generally includes tropical and temperate warm water zones and is not likely to extend north into subarctic waters (Bloodworth and Odell 2008, Jefferson et al. 2008).

Little is known about possible migrations of this species. No specific information regarding routes, seasons, or resighting rates in specific areas is available.

3.4.2.13.3 Population and Abundance

Few abundance estimates have been made for this species, and too little information is available to obtain a reliable population estimate for pygmy sperm whales in West Coast waters (Carretta et al. 2010). The current abundance estimate for pygmy sperm whales found along the West Coast is based on the mean of two ship surveys of California, Oregon, and Washington waters in 2005 and 2008. The resulting abundance estimate is 579 (coefficient of variation = 1.02) individuals (Carretta et al. 2010). The current best available abundance estimate for the Hawaiian stock of pygmy sperm whales is based on a 2002 shipboard line-transect survey of the entire Hawaiian Islands Exclusive Economic Zone, resulting in an estimate of 7,138 (coefficient of variation = 1.12) pygmy sperm whales (Carretta et al. 2010). The frequency of strandings suggests they may not be as uncommon as sightings would suggest (Jefferson et al. 2008, Maldini et al. 2005).

3.4.2.13.4 Predator/Prey Interactions

Pygmy sperm whales feed on cephalopods and, less often, on deep-sea fishes and shrimps (Beatson 2007, Caldwell and Caldwell 1989). A recent study in Hawaiian waters showed cephalopods were the primary prey of pygmy sperm whales, making up 78.7 percent of prey abundance and 93.4 percent contribution by mass (West et al. 2009). Stomach samples revealed an extreme diversity of cephalopod prey, with 38 species from 17 different families (West et al. 2009). Pygmy sperm whales have not been documented to be prey to any other species though they are likely subject to occasional killer whale predation like other whale species.

3.4.2.13.5 Species Specific Threats

Pygmy sperm whales are susceptible to fisheries interactions. In 1992 and 1993 there were two pygmy sperm whale mortalities observed in the California drift gillnet fishery. Additionally, in 2002 a whale stranded in California with a gunshot wound which is likely to have resulted from a fishery interaction.

3.4.2.14 Dwarf Sperm Whale (*Kogia sima*)

There are two species of *Kogia*: the pygmy sperm whale (discussed in Section 3.4.2.13, Pygmy Sperm Whale) and the dwarf sperm whale, which had been considered to be the same species, until recently. Genetic evidence suggests that there might also be two separate species of dwarf sperm whales globally, one in the Atlantic and one in the Indo-Pacific (Jefferson et al. 2008). Dwarf and pygmy sperm whales are difficult to distinguish from one another at sea, and many misidentifications have been made. Sightings of either species are often categorized as the genus *Kogia* (Jefferson et al. 2008).

3.4.2.14.1 Status and Management

The dwarf sperm whale is protected under the MMPA and is not listed under the ESA. Dwarf sperm whales within the Pacific U.S. Exclusive Economic Zone are divided into two separate areas: (1) waters off California, Oregon and Washington, and (2) Hawaiian waters (Carretta et al. 2010).

3.4.2.14.2 Geographic Range and Distribution

Dwarf sperm whales tend to occur over the outer continental shelf, and they may be relatively coastal in some areas with deep waters nearshore (MacLeod et al. 2004). Although the dwarf sperm whale appears to prefer more tropical waters than the pygmy sperm whale, the exact habitat preferences of the species are not well understood. Dwarf sperm whales have been observed in both outer continental shelf and more oceanic waters. Records of this species from both the western Pacific (Taiwan) and eastern Pacific (California) suggest that its range includes the southern portions of the California Current Large Marine Ecosystem, all waters of the North Pacific Central Gyre, the Insular Pacific-Hawaiian Large Marine Ecosystem, and the southern portion of the North Pacific Transition Zone (Carretta et al. 2010, Jefferson et al. 2008, Wang and Yang 2006, Wang et al. 2001).

Insular Pacific-Hawaiian Large Marine Ecosystem. During vessel surveys between 2000 and 2003 in the main Hawaiian Islands, this species was the sixth most commonly observed species, typically in deep water (up to 10,400 ft. [3,169.9 m]) (Baird 2005, Baird et al. 2003b, Barlow et al. 2004). Dwarf sperm whales are one of the more commonly stranded species in the Hawaiian Islands (Maldini et al. 2005), and the frequency of strandings indicates that the species is likely more common than sightings suggest.

California Current Large Marine Ecosystem. Along the U.S. Pacific coast, no reported sightings of this species have been confirmed as dwarf sperm whales. This may be somewhat due to their pelagic distribution, cryptic behavior (i.e., “hidden” because they are not very active at the surface and do not have a conspicuous blow), and physical similarity to the pygmy sperm whale (Jefferson et al. 2008, McAlpine 2009). However, the presence of dwarf sperm whales off the coast of California has been demonstrated by at least five dwarf sperm whale strandings in California between 1967 and 2000 (Carretta et al. 2010). It is likely that most *Kogia* species off California are *Kogia breviceps* (Nagorsen and Stewart 1983).

Open Ocean. Although deep oceanic waters may be the primary habitat for this species, very few oceanic sightings offshore have occurred within the Study Area. The lack of sightings may be due to the difficulty of detecting and identifying these animals at sea (Jefferson et al. 2008, Maldini et al. 2005).

3.4.2.14.3 Population and Abundance

Limited information is available to estimate the population size of dwarf sperm whales off the west coast. There are no known records of sightings of this species despite many vessel surveys in the region. What records of sightings that do come from the west coast for *Kogia* species are likely to be of pygmy sperm whales (Carretta et al. 2010). The current best available estimate for the Hawaiian stock of the dwarf sperm whale is from a 2002 shipboard line-transect survey of the entire Hawaiian Islands Exclusive Economic Zone. The resulting estimate was 17,519 (coefficient of variation = 0.74) dwarf sperm whales (Carretta et al. 2010). The frequency of strandings suggests they may not be as uncommon as sightings would suggest (Jefferson et al. 2008).

3.4.2.14.4 Predator/Prey Interactions

Dwarf sperm whales feed on cephalopods and, less often, on deep sea fishes and shrimps (Caldwell and Caldwell 1989, Sekiguchi et al. 1992). Dwarf sperm whales generally forage near the seafloor (McAlpine 2009). Killer whales are predators of dwarf sperm whales (Dunphy-Daly et al. 2008).

3.4.2.14.5 Species Specific Threats

There are no significant species-specific threats to dwarf sperm whales in the Study Area.

3.4.2.15 Killer Whale (*Orcinus orca*)

A single species of killer whale is currently recognized, but strong and increasing evidence indicates the possibility of several different species of killer whales worldwide, many of which are called “ecotypes” (Ford 2008). The different geographic forms of killer whale are distinguished by distinct social and foraging behaviors and other ecological traits. In the north Pacific, these recognizable geographic forms are variously known as ‘‘residents’’, ‘‘transients” and “offshore” ecotypes (Hoelzel et al. 2007).

3.4.2.15.1 Status and Management

The killer whale is protected under the MMPA, and the overall species is not listed on the ESA. The southern resident population in Puget Sound (not found in the Study Area) is listed as endangered under the ESA and is depleted under the MMPA. The north Pacific transient stock is also depleted under the MMPA. Five killer whale stocks are recognized within the Pacific U.S. Exclusive Economic Zone, with only the eastern north Pacific transient stock (Alaska through California), the eastern north Pacific offshore stock (Southeast Alaska through California), and the Hawaiian stock occurring in the Study Area (Carretta et al. 2010).

3.4.2.15.2 Geographic Range and Distribution

Killer whales are found in all marine habitats from the coastal zone (including most bays and inshore channels) to deep oceanic basins and from equatorial regions to the polar pack ice zones of both hemispheres. Although killer whales are also found in tropical waters and the open ocean, they are most numerous in coastal waters and at higher latitudes (Dahlheim and Heyning 1999). The range of this species is known to include the California Current and Insular Pacific-Hawaiian Large Marine Ecosystems, the North Pacific Gyre, and North Pacific Transition Zone. As noted above, only the eastern north Pacific transient stock and the eastern north Pacific offshore stock are expected to occur in the Southern California portion of the Study Area.

Insular Pacific-Hawaiian Large Marine Ecosystem. Although killer whales apparently prefer cooler waters, they have been observed in Hawaiian waters (Barlow 2006, Shallenberger 1981). Sightings are extremely infrequent in Hawaiian waters, and typically occur during winter, suggesting those sighted are seasonal migrants to Hawaii (Baird et al. 2003a, Mobley et al. 2001a). Baird (2006) documented 21 sightings of killer whales within the Hawaiian Exclusive Economic Zone, primarily around the main Hawaiian Islands. A single adult female was also sighted off Kauai in July 2011 (Cascadia Research 2012a). There are also documented strandings for this species from the Hawaiian Islands (Maldini et al. 2005).

California Current Large Marine Ecosystem. Along the west coast of North America, all three ecotypes of killer whales are known to occur (from stranding records and acoustic detection) along the entire Alaskan coast, in British Columbia and Washington inland waterways, and along the outer coasts of Washington, Oregon, and California (Calambokidis and Barlow 2004, Dahlheim et al. 2008, Ford and Ellis

1999, Forney et al. 1995). Although they are not commonly observed in Southern California coastal areas, killer whales are found year round off the coast of Baja California. This species is known to move in and out of the Gulf of California and around the Baja California peninsula (Carretta et al. 2010, Forney et al. 1995).

Open Ocean. This species is known to occur in deep oceanic waters off Hawaii and elsewhere in the Pacific (Carretta et al. 2010, Miyashita et al. 1996, Wang et al. 2001). In the eastern tropical Pacific, killer whales are known to occur from offshore waters of San Diego to Hawaii and south to Peru (Barlow 2006, Ferguson 2005). Offshore killer whales are known to inhabit both the western and eastern temperate Pacific and likely have a continuous distribution across the north Pacific (Steiger et al. 2008).

In most areas of their range, killer whales do not show movement patterns that would be classified as traditional migrations. However, there are often seasonal shifts in density, both onshore/offshore and north/south.

3.4.2.15.3 Population and Abundance

Based on a rough estimate of the proportion of killer whales in each stock, the current best available abundance estimate for the eastern north Pacific offshore stock is 240 individuals (coefficient of variation = 0.49) and 451 individuals (coefficient of variation = 0.49) for the transient stock (Carretta et al. 2011). The current best available abundance estimate for the Hawaiian stock, based on a 2002 shipboard survey of the entire Hawaiian Islands Exclusive Economic Zone, is 349 (coefficient of variation = 0.98) killer whales (Carretta et al. 2011).

3.4.2.15.4 Predator/Prey Interactions

Killer whales feed on a variety of prey, including bony fishes, elasmobranchs (a class of fish composed of sharks, skates, and rays), cephalopods, seabirds, sea turtles, and other marine mammals (Fertl et al. 1996, Jefferson et al. 2008). Some populations are known to specialize in specific types of prey (Jefferson et al. 2008, Krahn et al. 2004, Wade et al. 2009). The killer whale has no known natural predators; it is considered to be the top predator of the oceans (Ford 2008).

3.4.2.15.5 Species Specific Threats

Boat traffic has been shown to affect the behavior of the endangered southern resident killer whale population around San Juan Island, Washington (Lusseau et al. 2009). In the presence of boats, whales were significantly less likely to be foraging and significantly more likely to be traveling (Lusseau et al. 2009). These changes in behavior were particularly evident when boats were within 330 ft. (100 m) of the whales. While this population of killer whales is not present in the Study Area, their behavior may be indicative of other killer whale populations that are present.

Another issue that has been recognized as a potential threat to the endangered southern resident killer whale population is the potential reduction in prey, particularly Chinook salmon (Ford et al. 2009). As noted above, while this population of killer whales is not present in the Study Area, prey reduction may be a threat to other killer whale populations as well.

Additionally killer whales may be particularly susceptible to interactions with fisheries including entanglement.

3.4.2.16 False Killer Whale (*Pseudorca crassidens*)

3.4.2.16.1 Status and Management

Not much is known about most false killer whale populations globally. They are not expected to be present in the SOCAL portion of HSTT but are present in Hawaiian waters. NMFS currently recognizes three stocks of false killer whale in Hawaiian waters: the Hawaii pelagic stock, the Northwestern Hawaiian Islands stock, and the Main Hawaiian Islands insular stock (Forney et al. 2010; Oleson et al. 2010; Bradford et al. 2012; Carretta et al. 2012; National Oceanic and Atmospheric Administration 2012). All stocks of false killer whale are protected under the MMPA. However, the Main Hawaiian Islands insular stock (considered resident to the main Hawaiian Islands consisting of Kauai, Oahu, Molokai, Lanai, Kahoolawe, Maui, and Hawaii) was recently listed as endangered under the ESA (National Marine Fisheries Service 2012). Because of this species' historic decline in numbers, NMFS proposed listing the Main Hawaiian Islands insular false killer whales as endangered on 17 November 2010 (National Marine Fisheries Service 2010e) and published the Final Rule listing the stock as endangered on 28 November 2012, effective as of 28 December 2012 (National Marine Fisheries Service 2012).The historic decline has been the result of various non-Navy factors that include the small population size of this stock, evidence of decline of the local Hawaii stock, and incidental take by commercial fisheries (Oleson et al. 2010). Based on recent estimates, approximately eight false killer whales from the Main Hawaiian Islands insular and Hawaii Pelagic stocks are killed or seriously injured by commercial longline fisheries each year (McCracken and Forney 2010). This number is based on a 5-year average and is most likely an underestimate since it does not include any animals that were unidentified and might have been false killer whales. Due to recent evidence of a serious decline in this population (Reeves et al. 2009), a Take Reduction Team (a team of experts to study the specific topic, also referred to as a Biological Reduction Team) was formed by the National Oceanic and Atmospheric Administration on January 19, 2010 as required by the MMPA. The Take Reduction Team conducted a status review which was published in August 2010 (Oleson et al. 2010) and the draft Take Reduction Plan (also required under MMPA) for assessing ways to reduce mortality and serious injury to this population was available for public comment until October 2011.

NMFS considers all false killer whales found within 40 km (22 nm) of the Hawaiian Islands as part of the Main Hawaiian Islands insular stock, and all false killer whales beyond 140 km (76 nm) as part of the Hawaii Pelagic stock (National Marine Fisheries Service 2012). Animals belonging to the Northwestern Hawaiian Islands stock are considered insular to the Northwestern Hawaii Islands (Bradford et al. 2012); however, animals encountered off Kauai were identified as belonging to this stock[15] (National Oceanic and Atmospheric Administration 2012). Previously it was recognized that the ranges for the two stocks (Hawaii pelagic and Main Hawaiian Islands insular) overlap by 100 km (Carretta et al. 2011; Bradford et al. 2012), but given their presently identified ranges there is also overlap between all three stocks (National Oceanic and Atmospheric Administration 2012). This 100 km (54 nm) overlap area of the three false killer whale stocks is approximately where the majority of Navy training and testing has historically occurred and where the majority of acoustic modeling is focused in the subsequent analysis in this EIS/OEIS. This overlap therefore precludes analysis of differential impact between the stocks based on spatial criteria.

The density data used in the Navy's modeling and analyses were derived from habitat-based density models for the combined stocks, since limited sighting data did not allow for stock-specific models (Becker et al. 2012). Habitat-based density models allow predictions of cetacean densities on a finer

[15] The island of Kauai is adjacent to the southern end of the Northwest Hawaiian Islands but approximately 155 miles from Nihoa Island, which is the closest Island in the Northwest Hawaiian Island group.

spatial scale than traditional analyses (Barlow et al. 2009) and are thus better suited for spatially-explicit effects analyses. Separate abundance numbers were provided for the Main Hawaiian Islands insular and Hawaii pelagic stocks in the 2011 Pacific Stock Assessment Report; however, these estimates are based on older survey data and it was noted that the abundance of both Hawaiian stocks of false killer whale should be revised to incorporate new information (Carretta et al. 2013). Updated population estimates, along with the addition of a newly recognized Northwestern Hawaiian Islands Stock, have recently been provided (Bradford et al. 2012; Carretta et al. 2013). Given the recent ESA listing of the insular stock, the Navy derived a conservative ratio based on the abundance estimates for the three Hawaiian stocks as reported in the 2012 Pacific Stock Assessment Report (Carretta et al. 2013; Main Hawaiian Islands insular stock: n=151; Hawaii pelagic stock: n=1,503; and Northwestern Hawaiian Islands stock: n=552). The ratio of the Main Hawaiian Islands insular stock (0.07) to that of the pelagic stock (0.68) and Northwestern Hawaiian Islands stock (0.25) was then used to prorate the total modeled exposures in order to estimate acoustic exposures for each of these three stocks of false killer whale in Hawaiian waters. Although activities using sonar do not generally take place within the boundaries of the Northwestern Hawaiian Islands, animals belonging to this stock were first identified off Kauai and recent satellite tracking of tagged animals has documented travel between Kauai and areas to the northwest such as the French Frigate Shoals (Cascadia Research 2012a).

3.4.2.16.2 Geographic Range and Distribution

The range of this species is known to include waters of the California Current and Insular Pacific-Hawaiian Large Marine Ecosystems and the North Pacific Gyre.

Insular Pacific-Hawaiian Large Marine Ecosystem. The false killer whale is regularly found within Hawaiian waters and has been reported in groups of up to 100 (Shallenberger 1981, Baird et al. 2003a). A handful of stranding records exists for this species in the Hawaiian Islands (Maldini et al. 2005). Distribution of Main Hawaiian Islands insular false killer whales has been assessed using data from visual surveys and satellite tag data. Tagging data from seven groups of individuals tagged off the islands of Hawaii and Oahu indicate that the whales move rapidly and semi-regularly throughout the main Hawaiian Islands and have been documented as far as 112 km offshore over a total range of 31,969 mi^2 (82,800 km^2) (Baird et al. 2012). Baird et al. (2012) note, however, that limitations in the sampling "suggest the range of the population is likely underestimated, and there are probably other high-use areas that have not been identified." Photo identification studies also document that the animals regularly use both leeward and windward sides of the islands (Baird et al. 2005, Baird 2009a, Baird et al. 2010b, Forney et al. 2010, Baird et al. 2012). Some individual false killer whales tagged off the island of Hawaii have remained around that island for extended periods (days to weeks), but individuals from all tagged groups eventually were found broadly distributed throughout the main Hawaiian Islands (Baird 2009a, Forney et al. 2010). Individuals utilize habitat over varying water depths from < 164 ft. (50 m) to > 13,123 ft. (4,000 m) (Baird et al. 2010b). It has been hypothesized that inter-island movements may depend on the density and movement patterns of their prey species (Baird 2009a).

California Current Large Marine Ecosystem. False killer whales have been detected in acoustic surveys and are commonly observed in the eastern tropical Pacific generally south of the Study Area (Oswald et al. 2003; Wade and Gerrodette 1993). A handful of sightings from the west coast have occurred in Southern California, from areas such as Monterey Bay, Santa Catalina, and the Channel Islands (Baird et al. 2009a; Miller and Scheffer 1986). Sightings from vessel surveys also have occurred off Baja California, Mexico (Chivers et al. 2007). False killer whales also occur in waters off northern California (Baird et al. 2009a; Jefferson et al. 2008). Given they are few in number, the 2012 Pacific Stock Assessment report does not include false killer whales as a managed stock in California waters.

Open Ocean. In the north Pacific, this species is known to occur in deep oceanic waters off Hawaii, and elsewhere in the Pacific (Carretta et al. 2010; Miyashita et al. 1996; Wang et al. 2001).

False killer whales are not considered a migratory species, although seasonal shifts in density likely occur. Seasonal movements in the western north Pacific may be related to prey distribution (Odell and McClune 1999). Satellite-tracked individuals around the Hawaiian islands indicate that false killer whales can move extensively among different islands and also sometimes move from an island coast to as far as 60 mi. (96.6 km) offshore (Baird 2009a; Baird et al. 2010b).

3.4.2.16.3 Population and Abundance

False killer whales found in waters surrounding the main Hawaiian Islands are known to be genetically separate from the population in the outer part of the Hawaiian Exclusive Economic Zone and the central tropical Pacific (Chivers et al. 2007, Reeves et al. 2009). Recent genetic research by Chivers et al. (2010) indicates that the Main Hawaiian Islands insular and Hawaii pelagic populations of false killer whales are independent and do not interbreed. Current abundance estimates for the three Hawaiian stocks of false killer whales come from the 2012 Pacific Stock Assessment Report (Carretta et al. 2013) and Bradford et al. (2012). The current estimate of the Main Hawaiian Islands insular stock is 151 individuals (coefficient of variation = 0.20), the Hawaii pelagic stock is 1,503 individuals (coefficient of variation = 0.66), and the Northwestern Hawaiian Islands stock is 552 individuals (coefficient of variation = 1.09), but the latter will be revised when additional data are analyzed (Carretta et al. 2013).

Recent studies based on false killer whale sightings near Hawaii between 1989 and 2007 provide evidence that the Main Hawaiian Islands insular stock of false killer whales may have declined (Baird 2009a, Chivers et al. 2010, Oleson et al. 2010). During aerial surveys conducted in 1989, three large groups of false killer whales were observed (group sizes 380, 460 and 470) on three different days (Reeves et al. 2009). When compared to encounter rates of aerial surveys conducted between 1993 and 2003, evidence of decline is apparent (Oleson et al. 2010). Further evidence of decline in the Main Hawaiian Islands insular stock is shown by the high encounter rate during the 1989 survey (17 percent of sightings) compared to boat-based surveys conducted in 2000-2006 (1.5 percent of sightings), as well as a decline in average group size (195 during the 1989 surveys compared to 15 during the boat-based surveys) (Oleson et al. 2010). Two groups of false killer whales that had been observed near the Hawaiian Island of Kauai did not appear to be part of the Main Hawaiian Islands insular social group (Oleson et al. 2010). These animals have since been recognized as members of the Northwestern Hawaiian Islands stock (Bradford et al. 2012; National Oceanic and Atmospheric Administration 2012).

3.4.2.16.4 Predator/Prey Interactions

False killer whales feed primarily on deep-sea cephalopods and fish (Odell and McClune 1999). They may prefer large fish species, such as mahi mahi and tunas. Twenty-five false killer whales that stranded off the coast of the Strait of Magellan were examined and found to feed primarily on cephalopods and fish. Squid beaks were found in nearly half of the stranded animals. The most important prey species were found to be the squid species, *Martialiabyadesi* and *Illex argentinus,* followed by the coastal fish, *Macruronus magellanicus* (Alonso et al. 1999). False killer whales have been observed to attack other cetaceans, including dolphins, and large whales, such as humpback and sperm whales (Baird 2009b). They are known to behave aggressively toward small cetaceans in tuna purse seine nets. Unlike other whales or dolphins, false killer whales frequently pass prey back and forth among individuals before they start to eat the fish, in what appears to be a way of affirming social bonds (Baird et al. 2010b). This species is believed to be preyed on by large sharks and killer whales (Baird 2009b). Like many marine mammals, false killer whales accumulate high levels of toxins in their blubber over the course of their long lives. Because they feed on large prey at the top of the food chain (e.g., squid, tunas) they may be impacted by competition with fisheries (Cascadia Research 2010).

3.4.2.16.5 Species Specific Threats

In Hawaiian waters, false killer whales are particularly susceptible to fishery interactions and entanglements (Forney et al. 2010).

3.4.2.17 Pygmy Killer Whale (*Feresa attenuata*)

The pygmy killer whale is often confused with the false killer whale and melon-headed whale, which are similar in overall appearance to this species.

3.4.2.17.1 Status and Management

The pygmy killer whale is protected under the MMPA and is not listed under the ESA. For the MMPA stock assessment reports, there is a single Pacific management stock including only animals found within the U.S. Exclusive Economic Zone of the Hawaiian Islands (Carretta et al. 2010).

3.4.2.17.2 Geographic Range and Distribution

The pygmy killer whale is generally an open ocean deepwater species (Davis et al. 2000; Wursig et al. 2000).

Insular Pacific-Hawaiian Large Marine Ecosystem. Although rarely seen in nearshore waters, sightings have been relatively frequent in the Insular Pacific-Hawaiian Large Marine Ecosystem (Barlow et al. 2004, Donahue and Perryman 2008, Pryor et al. 1965, Shallenberger 1981, Smultea et al. 2007). A line-transect survey conducted in February 2009 by the Cetacean Research Program surrounding the Hawaiian Islands resulted in the sighting of one pygmy killer whale (Oleson and Hill 2009). Six strandings have been documented from Maui and the Island of Hawaii (Carretta et al. 2010, Maldini et al. 2005).

Open Ocean. This species’ range in the open ocean generally extends to the southern regions of the North Pacific Gyre and the southern portions of the North Pacific Transition Zone. Many sightings have occurred from cetacean surveys of the eastern tropical Pacific (Au and Perryman 1985; Barlow and Gisiner 2006; Wade and Gerrodette 1993). This species is also known to be present in the western Pacific (Wang and Yang 2006). Its range is generally considered to be south of 40° N and continuous across the Pacific (Donahue and Perryman 2008; Jefferson et al. 2008).

Migrations or seasonal movements are not known for this species.

3.4.2.17.3 Population and Abundance

Although the pygmy killer whale has an extensive global distribution, it is not known to occur in high densities in any region and thus is probably one of the least abundant of the pantropical delphinids. The current best available abundance estimate for the pygmy killer whale derives from a 2002 shipboard survey of the Hawaiian Islands U.S. Exclusive Economic Zone. The estimate was 956 (coefficient of variation = 0.83) individuals (Barlow 2006).

3.4.2.17.4 Predator/Prey Interactions

Pygmy killer whales feed predominantly on fish and squid. They have been known to attack other dolphin species, apparently as prey, although this is not common (Jefferson et al. 2008; Perryman and

Foster 1980; Ross and Leatherwood 1994). The pygmy killer whale has no documented predators (Weller 2008). It may be subject to predation by killer whales.

3.4.2.17.5 Species Specific Threats

Fisheries interactions are likely as evidenced by a pygmy killer whale that stranded on Oahu with signs of hooking injury (National Marine Fisheries Service 2007a) and the report of mouthline injuries noted in some individuals (Baird unpublished data cited in Carretta et al. 2011). It has been suggested that pygmy killer whales may be particularly susceptible to loud underwater sounds, such as active sonar and seismic operations, based on the stranding of pygmy killer whales in Taiwan (Wang and Yang 2006). The suggestion by Wang and Yang (2006) that sonar may have caused the strandings is predicated on the assumption that exercises taking place could have involved sonar, that if sonar was used hundreds of kilometers from the stranding locations that it could have impacted whales in Taiwan, that the coincident occurrence of undersea earthquakes offshore of some of the stranding locations be dismissed, and that a super typhoon also coinciding with some of the strandings also be dismissed. In summary, the suggestion by Wang and Yang (2006) that active sonar and/or seismic operations may have resulted in the strandings is currently not supported by the data available.

3.4.2.18 Short-finned Pilot Whale (*Globicephala macrorhynchus*)

3.4.2.18.1 Status and Management

Short-finned pilot whales are protected under the MMPA and are not listed under the ESA. For MMPA stock assessment reports, short-finned pilot whales within the Pacific U.S. Exclusive Economic Zone are divided into two discrete areas: (1) waters off California, Oregon and Washington, and (2) Hawaiian waters (Carretta et al. 2010). The short-finned pilot whale is widely distributed throughout most tropical and warm temperate waters of the world.

3.4.2.18.2 Geographic Range and Distribution

A number of studies in different regions suggest that the distribution and seasonal inshore/offshore movements of pilot whales coincide closely with the abundance of squid, their preferred prey (Bernard and Reilly 1999; Hui 1985; Payne and Heinemann 1993). Short-finned pilot whale distribution off Southern California changed dramatically after El Niño in 1982–1983, when squid did not spawn as usual in the area, and pilot whales virtually disappeared from the area for 9 years (Shane 1995). This species' range generally extends to the southern regions of the North Pacific Gyre and the California Current and Insular Pacific-Hawaiian Large Marine Ecosystems. Many sightings have occurred from cetacean surveys of the eastern tropical Pacific, where the species is reasonably common (Au and Perryman 1985; Barlow 2006; Wade and Gerrodette 1993).

California Current Large Marine Ecosystem. Along the U.S. Pacific coast, short-finned pilot whales are most abundant south of Point Conception (which is north of Santa Barbara, California) (Carretta et al. 2010; Reilly and Shane 1986). A few hundred pilot whales are believed to group each winter at Santa Catalina Island (Carretta et al. 2010; Reilly and Shane 1986), although these animals are not seen as regularly as in previous years. Stranding records for this species from Oregon and Washington waters are considered to be beyond the normal range of this species rather than an extension of its range (Norman et al. 2004).

Insular Pacific-Hawaiian Large Marine Ecosystem. Short-finned pilot whales are known to occur in waters surrounding the Hawaiian Islands (Barlow 2006; Shallenberger 1981; Smultea et al. 2007). They are most commonly observed around the main Hawaiian Islands, are relatively abundant around Oahu and the Island of Hawaii, and are also present around the northwestern Hawaiian Islands (Barlow 2006; Maldini Feinholz 2003; Shallenberger 1981). Fourteen strandings of this species have been recorded at the main Hawaiian Islands, including five mass strandings (Carretta et al. 2010; Maldini et al. 2005).

Open Ocean. The short-finned pilot whale occurs mainly in deep offshore areas; thus, the species occupies waters over the continental shelf break, in slope waters, and in areas of high topographic relief (Olson 2009). While pilot whales are typically distributed along the continental shelf break, movements over the continental shelf are commonly observed in the northeastern United States (Payne and Heinemann 1993) and close to shore at oceanic islands, where the shelf is narrow and deeper waters are found nearby (Gannier 2000; Mignucci-Giannoni 1998).

Short-finned pilot whales are not considered a migratory species, although seasonal shifts in abundance have been noted in some portions of the species' range.

3.4.2.18.3 Population and Abundance

From at least the 1950s until the early 1980s, short-finned pilot whales were fairly abundant in nearshore waters of Southern California, with an apparent resident population around Santa Catalina Island (Shane 1994). Distribution off Southern California changed dramatically after the 1982-1983 El Niño, when squid did not spawn as usual in the area, and short-finned pilot whales virtually disappeared from the area for 9 years (Shane 1994). Pilot whales appear to have returned to California waters as evidenced by an increase in sighting records, as well as incidental fishery bycatches (Carretta et al. 2005); however, with decreased abundance since the late 1970s and early 1980s (Forney et al. 1995).

The 2005–2008 average abundance estimate for short-finned pilot whales in California, Oregon, and Washington waters, derived from two ship-based surveys, was 760 individuals (coefficient of variation = 0.64) (Carretta et al. 2010). A 2002 shipboard survey of the entire Hawaiian Islands U.S. Exclusive Economic Zone resulted in an abundance estimate of 8,870 (coefficient of variation = 0.38) short-finned pilot whales and is considered to be the best available estimate (Barlow et al. 2006).

3.4.2.18.4 Predator/Prey Interactions

Pilot whales feed primarily on squid but also take fish (Bernard and Reilly 1999). They are generally well adapted to feeding on squid (Jefferson et al. 2008; Werth 2006a, b). Pilot whales are not generally known to prey on other marine mammals, but records from the eastern tropical Pacific suggest that the short-finned pilot whale does occasionally chase and attack, and may eat, dolphins during fishery operations (Olson 2009; Perryman and Foster 1980). They have also been observed harassing sperm whales in the Gulf of Mexico (Weller et al. 1996).

This species is not known to have any predators (Weller 2008). It may be subject to predation by killer whales.

3.4.2.18.5 Species Specific Threats

Short finned pilot whales are particularly susceptible to fisheries interactions and entanglement.

3.4.2.19 Melon-headed Whale (*Peponocephala electra*)

This small tropical dolphin species, the melon-headed whale, is similar in appearance to the pygmy killer whale.

3.4.2.19.1 Status and Management

The melon-headed whale is protected under the MMPA and is not listed under the ESA. For the MMPA stock assessment reports, there is a single Pacific management stock including only animals found within the U.S. Exclusive Economic Zone of the Hawaiian Islands (Carretta et al. 2010).

3.4.2.19.2 Geographic Range and Distribution

Melon-headed whales are found worldwide in tropical and subtropical waters. They have occasionally been reported at higher latitudes, but these movements are considered to be beyond their normal range, because the records indicate these movements occurred during incursions of warm water currents (Perryman et al. 1994). The range of this species is known to include waters of the California Current and Insular Pacific-Hawaiian Large Marine Ecosystems and the North Pacific Gyre (Jefferson et al. 2008; Perryman 2008). In the north Pacific, occurrence of this species is well known in deep waters off many areas, including the Hawaii portion of the Study Area (Au and Perryman 1985; Carretta et al. 2010; Ferguson 2005; Perrin 1976; Wang et al. 2001).

Insular Pacific-Hawaiian Large Marine Ecosystem. The melon-headed whale is regularly found within Hawaiian waters (Baird et al. 2003a; Baird et al. 2003b; Mobley et al. 2000; Shallenberger 1981). Large groups are seen regularly, especially off the Waianae coast of Oahu, the north Kohala coast of Hawaii, and the leeward coast of Lanai (Baird 2006; Shallenberger 1981). A line-transect survey conducted in February 2009 by the Cetacean Research Program surrounding the Hawaiian Islands resulted in the sighting of one melon-headed whale (Oleson and Hill 2009). A total of 14 stranding records exist for this species in the Hawaiian Islands (Carretta et al. 2010; Maldini et al. 2005).

Open Ocean. Melon-headed whales are most often found in offshore deep waters but sometimes move close to shore over the continental shelf. Brownell et al. (2009) found that melon-headed whales near oceanic islands rest near shore during the day, and feed in deeper waters at night. During ship-based bird surveys in the eastern tropical Pacific, this species was observed from the U.S.-Mexico border south to Peru, typically associated with pelagic sea birds while foraging (Pitman and Ballance 1992).

The melon-headed whale is not known to migrate.

3.4.2.19.3 Population and Abundance

The current best available abundance estimate for the Hawaiian stock of melon-headed whale, derived from a 2002 shipboard survey of the entire Hawaiian Islands U.S. Exclusive Economic Zone, is 2,950 (coefficient of variation = 1.17) (Carretta et al. 2010).

3.4.2.19.4 Predator/Prey Interactions

Melon-headed whales prey on squid, pelagic fishes, and occasionally crustaceans. Most of the fish and squid families eaten by this species consist of mid-water forms found in waters up to 4,920 ft. (1,500 m) deep, suggesting that feeding takes place deep in the water column (Jefferson and Barros 1997). Melon-headed whales are believed to be preyed on by killer whales and have been observed fleeing from killer whales in Hawaiian waters (Baird et al. 2006a).

3.4.2.19.5 Species Specific Threats

There are no significant species-specific threats to melon-headed whales in Hawaii, although it is likely that they are susceptible to fisheries interactions.

3.4.2.20 Long-beaked Common Dolphin (*Delphinus capensis*)

Common dolphins now represent two species-short-beaked common dolphin (*Delphinus delphis*) and long-beaked common dolphin (*Delphinus capensis*)-rather than a single species as previously considered. Therefore, much of the biological information for dolphins of the genus *Delphinus* cannot be reliably applied to one or the other, especially in regions where the two species overlap (Heyning and Perrin 1994).

3.4.2.20.1 Status and Management

This species is protected under the MMPA and is not listed under the ESA. For the MMPA stock assessment reports, there is a single Pacific management stock including only animals found within the U.S. Exclusive Economic Zone of California (Carretta et al. 2013).

3.4.2.20.2 Geographic Range and Distribution

The long-beaked common dolphin appears to be restricted to waters relatively close to shore (Jefferson and Van Waerebeek 2002; Perrin 2008a), apparently preferring shallower and warmer water than the short-beaked common dolphin (Perrin 2008a). Long-beaked common dolphins are commonly found within 50 nm of the coast (Carretta et al. 2010). In tropical regions, where common dolphins are routinely sighted, they are generally found in upwelling zones with nutrient rich waters (Au and Perryman 1985; Ballance and Pitman 1998; Jefferson et al. 2008). The range of this species is known to include waters of the California Current Large Marine Ecosystem and the North Pacific Gyre (Carretta et al. 2010; Dizon et al. 1994; Ferguson 2005).

California Current Large Marine Ecosystem. The long-beaked common dolphin's range within the California Current Large Marine Ecosystem is considered to be within about 50 nm of the West Coast, from Baja California north through central California. Stranding data and sighting records suggest that this species' abundance fluctuates seasonally and from year to year off California (Carretta et al. 2010; Zagzebski et al. 2006). It is found off Southern California year round, but it may be more abundant there during the warm-water months (May to October) (Bearzi 2005a, b; Carretta et al. 2010).

The long-beaked common dolphin is not a migratory species, but seasonal shifts in abundance (mainly inshore/offshore) are known for some regions of its range.

3.4.2.20.3 Population and Abundance

The mean abundance estimate for the California stock is based on two shipboard surveys during 2008 and 2009. The resulting estimate is 107,016 (coefficient of variation = 0.42) long-beaked common dolphins, and most of these occur in southern and central California (Carretta et al. 2013).

3.4.2.20.4 Predator/Prey Interactions

The genus *Delphinus* is known to feed primarily on organisms in the ocean zones, usually composed of marine organisms that migrate from depth to surface and back again at different times of day (Evans 1994). Although this species has not been documented to be prey to any other species, it may be subject to predation by killer whales.

3.4.2.20.5 Species Specific Threats

Long-beaked common dolphins are particularly susceptible to fisheries interactions. Additionally, along California's coast mortality has been documented due to domoic acid toxicity, which is a neurotoxin associated with algal blooms.

3.4.2.21 Short-beaked Common Dolphin (*Delphinus delphis*)

Common dolphins now represent two species-short-beaked common dolphin (*Delphinus delphis*) and long-beaked common dolphin (*Delphinus capensis*)-rather than a single species as previously considered. Therefore, much of the biological information for dolphins of the genus *Delphinus* cannot be reliably applied to one or the other, especially in regions where the two species overlap (Heyning and Perrin 1994).

3.4.2.21.1 Status and Management

This species is protected under the MMPA and is not listed under the ESA. For the MMPA stock assessment reports, there is a single Pacific management stock including only animals found within the U.S. Exclusive Economic Zone of California, Oregon and Washington (Carretta et al. 2010).

3.4.2.21.2 Geographic Range and Distribution

Common dolphins in some populations appear to prefer to travel along bottom topographic features, such as escarpments and seamounts (Bearzi 2003; Evans 1994; Hui 1979). Short-beaked common dolphins are routinely sighted in upwelling-modified waters of the eastern tropical Pacific (Au and Perryman 1985; Ballance and Pitman 1998; Reilly 1990). This species prefers areas with large seasonal changes in surface temperature and thermocline depth (the point between warmer surface water and colder water) (Au and Perryman 1985). Although short-beaked common dolphins primarily occur in deep waters beyond the edge of the continental shelf, they do come into continental shelf waters in some areas and seasons (Jefferson et al. 2008; Perrin 2008a).

California Current Large Marine Ecosystem. Along the U.S. West Coast, short-beaked common dolphin distribution overlaps with that of the long-beaked common dolphin. Short-beaked common dolphins are found in the California Current Large Marine Ecosystem throughout the year, distributed between the coast and at least 345 mi. (555.2 km) from shore (Carretta et al. 2010; Forney and Barlow 1998). Short-beaked common dolphin abundance off California has increased dramatically since the late 1970s, along with a smaller decrease in abundance in the eastern tropical Pacific, suggesting a large-scale northward shift in the distribution of this species in the eastern north Pacific (Forney et al. 1995; Forney and Barlow 1998). In general, the northward extent of short-beaked common dolphin distribution appears to vary from year to year and with changing ocean conditions (Forney and Barlow 1998).

Although they are not truly migratory, the abundance of the short-beaked common dolphin off California varies, with seasonal and year-to-year changes in oceanographic conditions; movements may be north-south or inshore-offshore (Barlow 1995; Carretta et al. 2010; Forney and Barlow 1998).

3.4.2.21.3 Population and Abundance

The short-beaked common dolphin is the most abundant cetacean species off California (Carretta et al. 2010; Forney et al. 1995). The California, Oregon, and Washington stock has a current population estimate of 411,211 individuals (coefficient of variation = 0.21) (Carretta et al. 2010). The abundance of short-beaked common dolphins varies seasonally but may be increasing in California with a northward shift in the population (Barlow 1997; Forney 1997; Heyning and Perrin 1994).

3.4.2.21.4 Predator/Prey Interactions

Delphinus species fluctuate in vocal activity, with more vocal activity during late evening and early morning, apparently linked to feeding on the deep scattering layer, which rises in this same time frame (Goold 2000). Predation by killer whales on this species has been observed (Leatherwood et al. 1973).

3.4.2.21.5 Species Specific Threats

Short-beaked common dolphins are particularly susceptible to fisheries interactions and entanglement. Additionally, along California's coast mortality has been documented due to domoic acid toxicity, which is a neurotoxin associated with algal blooms.

3.4.2.22 Common Bottlenose Dolphin (*Tursiops truncatus*)

The classification of the genus *Tursiops* continues to be in question; two species are recognized, the common bottlenose dolphin (*Tursiops truncatus*) and the Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) (Rice 1998), though additional species are likely to be recognized with future analyses (Natoli et al. 2004).

3.4.2.22.1 Status and Management

The common bottlenose dolphin is protected under the MMPA and is not listed under the ESA. For the MMPA stock assessment reports, bottlenose dolphins within the Pacific U.S. Exclusive Economic Zone are divided into seven stocks: (1) California coastal stock, (2) California, Oregon and Washington offshore stock, (3) Kauai and Niihau, (4) Oahu, (5) the 4-Islands region, (6) Hawaii Island, and (7) the Hawaii pelagic stock (Carretta et al. 2011).

3.4.2.22.2 Geographic Range and Distribution

Common bottlenose dolphins are found most commonly in coastal and continental shelf waters of tropical and temperate regions of the world. They occur in most enclosed or semi-enclosed seas. The species inhabits shallow, murky, estuarine waters and also deep, clear offshore waters in oceanic regions (Jefferson et al. 2008; Wells et al. 2009). Common bottlenose dolphins are often found in bays, lagoons, channels, and river mouths and are known to occur in very deep waters of some ocean regions. The range of this species is known to include waters of the California Current and Insular Pacific-Hawaiian Large Marine Ecosystems, the North Pacific Gyre, and the North Pacific Transition Zone (Au and Perryman 1985; Carretta et al. 2010; Miyashita 1993; Wang and Yang 2006).

Insular Pacific-Hawaiian Large Marine Ecosystem. Common bottlenose dolphins are common throughout the Hawaiian Islands, and they are typically observed throughout the main islands and from the Island of Hawaii to Kure Atoll within 5 mi. (8.05 km) of the coast (Baird et al. 2009a; Shallenberger 1981). In the Hawaiian Islands, this species is found in both shallow coastal waters and deep offshore waters (Baird et al. 2003b). The offshore variety is typically larger than the inshore. Twelve stranding records from the main Hawaiian Islands exist (Maldini et al. 2005; Maldini Feinholz 2003). Common bottlenose dolphin vocalizations have been documented during acoustic surveys, and the species has been commonly sighted during aerial surveys in the Hawaiian Islands (Barlow et al. 2008; Barlow et al. 2004; Mobley et al. 2000).

California Current Large Marine Ecosystem. During surveys off California, offshore bottlenose dolphins were generally found at distances greater than 1.9 mi. (3.06 km) from the coast and throughout the southern portion of the California Current Large Marine Ecosystem (Bearzi et al. 2009; Carretta et al. 2010). Sighting records off California and Baja California suggest continuous distribution of offshore bottlenose dolphins in these regions. Aerial surveys during winter/spring 1991–1992 and shipboard surveys in summer/fall 1991 indicated no seasonality in distribution (Barlow 1995; Carretta et al. 2010; Forney et al. 1995).

California coastal bottlenose dolphins are found within about 0.6 mi. (0.9 km) of shore, generally from Point Conception to as far south as San Quintin, Mexico (Carretta et al. 1998; Defran and Weller 1999). With the increase in water temperatures off California due to El Niño, coastal common bottlenose dolphins have been consistently sighted off central California and as far north as San Francisco. The dolphins in the nearshore waters of San Diego, California differ somewhat from other coastal populations of this species in distribution, site fidelity, and school size (Defran and Weller 1999; Bearzi 2005a, b). Common bottlenose dolphins are known to occur year round in both coastal and offshore waters of Monterey Bay, Santa Monica Bay, San Diego Bay, and San Clemente Island, California (Maldini Feinholz 1996; Carretta et al. 2000; Bearzi 2005a, b; Henkel and Harvey 2008; Bearzi et al. 2009). In Southern California, animals are found within 1,640 ft. (500 m) of the shoreline 99 percent of the time and within 820 ft. (250 m) of the shoreline 90 percent of the time (Hanson and Defran 1993).

Open Ocean. In the eastern tropical Pacific and elsewhere, open ocean populations occur far from land. However, population density appears to be higher in nearshore areas (Scott and Chivers 1990). In California, separate coastal and offshore populations are known (Van Waerebeek et al. 1990). Common bottlenose dolphin vocalizations have also been detected through acoustic surveys in the eastern tropical Pacific (Oswald et al. 2003). In the north Pacific, common bottlenose dolphins have been documented in offshore waters as far north as about 41° N (Carretta et al. 2010).

Although in most areas bottlenose dolphins do not migrate (especially where they occur in bays, sounds, and estuaries), seasonal shifts in abundance do occur in many areas (Griffin and Griffin 2004).

3.4.2.22.3 Population and Abundance

The most recent abundance estimate for the California coastal stock of common bottlenose dolphins is based on photographic mark-recapture surveys conducted along the coast of San Diego, California in 2004 and 2005. The population estimate is 323 dolphins (coefficient of variation = 0.13) (Carretta et al. 2010; Dudzik et al. 2006). This estimate does not reflect the finding that approximately 35 percent of dolphins encountered lack identifiable dorsal fin marks; thus the true population size would be around 450 to 500 (Carretta et al. 2010; Defran and Weller 1999). The best available abundance estimate for the offshore bottlenose dolphin based on shipboard surveys off California, Oregon, and Washington from 2005 to 2008 is 1,006 (coefficient of variation = 0.48) (Carretta et al. 2010). The current best available abundance estimate of the Hawaiian Islands Stock Complex of common bottlenose dolphins comes from a ship survey of the entire Hawaiian Islands U.S. Exclusive Economic Zone in 2002. The resulting abundance estimate is 3,215 (coefficient of variation = 0.59) bottlenose dolphins (Barlow et al. 2006). Abundance estimates for the five stocks identified within the Hawaiian Islands Stock Complex are provided in Table 3.4-1. These stock-specific abundance numbers and a provisional boundary between the pelagic and insular stocks of bottlenose dolphin in Hawaii have been presented in the most recent (2010) Pacific Stock Assessment Report (Carretta et al. 2011). However, Carretta et al. (2011) consider these abundance numbers provisional for the following reasons:

- Kauai and Niihau – The currently available abundance estimate underestimates the total number of bottlenose dolphins around Kauai and Niihau because it only represents individuals with distinguishable photo-ID marks.
- Oahu – The currently available abundance estimate is based on a small sample size (n=11) and was derived using only individuals with distinguishable photo-ID marks, and does not include individuals from the Northeastern (windward) side of the island.
- 4-Island Region – The currently available abundance estimate underestimates the total number of bottlenose dolphins in the 4-Islands region because it only represents individuals with

distinguishable photo-ID marks and does not include individuals from the Northeastern (windward) sides of the larger two of the four islands (Maui and Molokai).

- Hawaii Island – The currently available abundance estimate underestimates the total number of bottlenose dolphins around the island of Hawaii because it only represents individuals with distinguishable photo-ID marks and does not include individuals from the Northeastern (windward) side of the island of Hawaii, which is larger than all the other Main Hawaiian Islands combined.
- Hawaii Pelagic – The currently available abundance estimate for the Hawaii pelagic stock is based on a single summer shipboard line-transect survey which occurred in 2002 and covered an area encompassing approximately 2.5 million square kilometers. The density estimate derived from this survey data was based on 9 sightings, and was then applied to the geographical area where the pelagic stock is thought to occur.

Navy training and testing activities can and do occasionally occur in the vicinity of more than one of the Main Hawaiian Islands and can involve both leeward and windward sides of the islands. In addition, the criteria and thresholds developed by the Navy and NMFS as cooperating agencies result in consideration of potential impacts at distances ranging from immediately adjacent to the activity (meters) to tens of kilometers from some acoustic stressors. These provisional numbers and generalized boundaries and locations for bottlenose dolphins stocks in Hawaii are insufficient to allow for an analysis of impacts on the individual five stocks and they are therefore treated as a group and discussed in terms of the Hawaii Stock Complex.

3.4.2.22.4 Predator/Prey Interactions

These animals are opportunistic feeders, taking a wide variety of fishes, cephalopods, and shrimps (Wells and Scott 1999), and using a variety of feeding strategies (Shane 1990). In addition to using echolocation, a process for locating prey by emitting sound waves that reflect back, bottlenose dolphins likely detect and orient to fish prey by listening for the sounds their prey produce, so-called passive listening (Barros and Myrberg 1987; Barros and Wells 1998). Nearshore bottlenose dolphins prey predominantly on coastal fish and cephalopods, while offshore individuals prey on open ocean cephalopods and a large variety of near-surface and mid-water fish species (Mead and Potter 1995). Pacific coast bottlenose dolphins feed primarily on surf perches (family Embiotocidae) and croakers (family Sciaenidae) (Wells and Scott 1999). Throughout its range this species is known to be preyed on by killer whales and sharks (Wells and Scott 2008).

3.4.2.22.5 Species Specific Threats

Common bottlenose dolphins are particularly susceptible to entanglement and other interactions with fishery operations.

3.4.2.23 Pantropical Spotted Dolphin (*Stenella attenuata*)

3.4.2.23.1 Status and Management

The species is protected under the MMPA and is not listed under the ESA. For the MMPA stock assessment reports, pantropical spotted dolphins are considered under a single management stock which includes animals found in the Hawaiian Islands and in adjacent international waters. Data from distribution patterns and morphological differences have been used to establish two stocks, the dolphins around Hawaii and those found in the eastern tropical Pacific (Perrin 1975; Dizon et al. 1994).

3.4.2.23.2 Geographic Range and Distribution

The pantropical spotted dolphin is distributed in offshore tropical and subtropical waters of the Pacific, Atlantic, and Indian Oceans between about 40° N and 40° S (Baldwin et al. 1999; Perrin 2008b). The species is much more abundant in the lower latitudes of its range. It is found mostly in deeper offshore waters but does approach the coast in some areas (Jefferson et al. 2008; Perrin 2001).

Insular Pacific-Hawaiian Large Marine Ecosystem. Based on known habitat preferences and sighting data, the primary occurrence for the pantropical spotted dolphin in the Insular Pacific-Hawaiian Large Marine Ecosystem is between 330 and 13,122 ft. (100.6 to 3,999.6 m) depth. This area of primary occurrence also includes a continuous band connecting all the main Hawaiian Islands, Nihoa, and Kaula, taking into account possible inter-island movements. Secondary occurrence is expected from the shore to 330 ft. (100.6 m), as well as seaward of 13,120 ft. (3,998.9 m).

Open Ocean. In the open ocean, this species ranges from 25° N (Baja California, Mexico) to 17° S (southern Peru) (Perrin and Hohn 1994). Pantropical spotted dolphins are associated with warm tropical surface water in the eastern tropical Pacific (Au and Perryman 1985; Reilly 1990). Au and Perryman (1985) noted that the species occurs primarily north of the Equator, off southern Mexico, and westward along 10° N.

Although pantropical spotted dolphins do not migrate, extensive movements are known in the eastern tropical Pacific (although these have not been strongly linked to seasonal changes) (Scott and Chivers 2009).

3.4.2.23.3 Population and Abundance

Morphological and coloration differences and distribution patterns have been used to establish that the spotted dolphins around Hawaii belong to a stock that is distinct from those in the eastern tropical Pacific (Carretta et al. 2010). The best available estimate of abundance for the pantropical spotted dolphin within the Hawaiian Islands U.S. Exclusive Economic Zone is 8,978 individuals (coefficient of variation = 0.48) (Carretta et al. 2010).

3.4.2.23.4 Predator/Prey Interactions

Pantropical spotted dolphins prey on near-surface fish, squid, and crustaceans and on some mid-water species (Perrin and Hohn 1994). Results from various tracking and food habit studies suggest that pantropical spotted dolphins in the eastern tropical Pacific and off Hawaii feed primarily at night on surface and mid-water species that rise with the deep scattering layer toward the water's surface after dark (Baird et al. 2001; Robertson and Chivers 1997). Pantropical spotted dolphins may be preyed on by killer whales and sharks, and have been observed fleeing killer whales in Hawaiian waters (Baird et al. 2006a). Other predators may include the pygmy killer whale, false killer whale, and occasionally the short-finned pilot whale (Perrin 2008b).

3.4.2.23.5 Species Specific Threats

There are no significant species-specific threats to pantropical spotted dolphins in Hawaii. However, pantropical spotted dolphins located in the eastern tropical Pacific have had high mortality rates associated with the tuna purse seine fishery (Wade 1994). Even though bycatch has been reduced for these fisheries, interactions may have negative effects on species survival and reproduction (Archer et al. 2010b).

3.4.2.24 Striped Dolphin (*Stenella coeruleoalba*)

3.4.2.24.1 Status and Management

This species is protected under the MMPA and is not listed under the ESA. In the western north Pacific, three migratory stocks are recognized. In the eastern Pacific, NMFS divides striped dolphin management stocks within the U.S. Exclusive Economic Zone into two separate areas: waters off California, Oregon, and Washington; and waters around Hawaii (Carretta et al. 2010).

3.4.2.24.2 Geographic Range and Distribution

Although primarily a warm-water species, the range of the striped dolphin extends higher into temperate regions than those of any other species in the genus *Stenella*. Striped dolphins also are generally restricted to oceanic regions and are seen close to shore only where deep water approaches the coast. In some areas (e.g., the eastern tropical Pacific), they are mostly associated with convergence zones and regions of upwelling (Au and Perryman 1985; Reilly 1990). The northern limits are the Sea of Japan, Hokkaido, Washington State, and along roughly 40° N across the western and central Pacific (Reeves et al. 2002). In the eastern tropical Pacific, striped dolphins inhabit areas with large seasonal changes in surface temperature and thermocline depth, as well as seasonal upwelling (Au and Perryman 1985; Reilly 1990). In some areas, this species appears to avoid waters with sea temperatures less than 68°F (20°C) (Van Waerebeek et al. 1998).

Insular Pacific-Hawaiian Large Marine Ecosystem. The striped dolphin regularly occurs around the Insular Pacific-Hawaiian Large Marine Ecosystem, although sightings are relatively infrequent there (Carretta et al. 2010). A comprehensive shipboard survey of the Hawaiian U.S. Exclusive Economic Zone resulted in only 15 sightings of striped dolphins (Barlow et al. 2004). The species occurs primarily seaward at a depth of about 547 ft. (1,000 m), based on sighting records and the species' known preference for deep waters. Striped dolphins are occasionally sighted closer to shore in Hawaii, so an area of secondary occurrence is expected from a depth range of 55 to 547 ft. (100 to 1,000 m). Occurrence patterns are assumed to be the same throughout the year (Mobley et al. 2000).

California Current Large Marine Ecosystem. In and near the California Current Large Marine Ecosystem, striped dolphins are found mostly offshore and are much more common in the warm-water period (summer/fall), although they are found there throughout the year. During summer/fall surveys, striped dolphins were sighted primarily from 100 to 300 nm offshore of the California coast. Based on sighting records, striped dolphins appear to have a continuous distribution in offshore waters from California to Mexico (Carretta et al. 2010). The striped dolphin also occurs far offshore, in waters affected by the warm Davidson Current as it flows northward (Archer 2009; Jefferson et al. 2008).

Open Ocean. The primary range of the striped dolphin includes the eastern and western waters of the North Pacific Transition Zone (Perrin et al. 1994a).

This species is nonmigratory in the Study Area.

3.4.2.24.3 Population and Abundance

The current best abundance estimate of the California, Oregon, and Washington stock is 10,908 (coefficient of variation = 0.34) striped dolphins (Carretta et al. 2010). The best available estimate of abundance for the Hawaiian stock of the striped dolphin is 13,143 individuals (coefficient of variation = 0.46) (Carretta et al. 2010).

3.4.2.24.4 Predator/Prey Interactions

Striped dolphins often feed in open sea or sea bottom zones along the continental slope or just beyond it in oceanic waters. Most of their prey possess light-emitting organs, suggesting that striped dolphins may be feeding at great depths, possibly diving to 655 to 2,295 ft. (200 to 700 m) (Archer and Perrin 1999). Striped dolphins may feed at night in order to take advantage of the deep scattering layer's diurnal vertical movements. Small mid-water fishes (in particular lanternfishes) and squids are the predominant prey (Perrin et al. 1994a). This species has been documented to be preyed upon by sharks (Ross 1971). It may also be subject to predation by killer whales.

3.4.2.24.5 Species Specific Threats

There are no significant species-specific threats to striped dolphins in the Study Area.

3.4.2.25 Spinner Dolphin (*Stenella longirostris*)

Four well differentiated geographical forms of spinner dolphins have been described as separate subspecies: *Stenella longirostris longirostris* (Gray's spinner dolphin), *Stenella longirostris orientalis* (eastern spinner dolphin), *Stenella longirostris centroamericana* (Central American spinner dolphin), and *Stenella longirostris roseiventris* (dwarf spinner dolphin).

3.4.2.25.1 Status and Management

The spinner dolphin is protected under the MMPA and the species is not listed under the ESA. The eastern spinner dolphin (*Stenella longirostris orientalis*) is listed as depleted under the MMPA. Hawaiian spinner dolphins are considered as separate stocks from those involved in the tuna purse-seine fishery in the eastern tropical Pacific (Dizon et al. 1994). Under the MMPA, there are six stocks found within the U.S. Exclusive Economic Zone of the Hawaiian Islands: (1) Hawaii Island, (2) Oahu/4-islands, (3) Kauai/Niihau, (4) Pearl & Hermes Reef, (5) Kure/Midway, and (6) Hawaii Pelagic, including animals found both within the Hawaiian Islands EEZ (outside of island-associated boundaries) and in adjacent international waters (Carretta et al. 2013). Based on an analysis of individual spinner dolphin movements, no dolphins have been found farther than 10 nm from shore and few individuals move long distances (from one main Hawaiian Island to another; Hill et al. 2011).

3.4.2.25.2 Geographic Range and Distribution

Spinner dolphins occur in both oceanic and coastal environments. Most sightings of this species have been associated with inshore waters, islands, or banks (Perrin and Gilpatrick 1994). Open ocean populations, such as those in the eastern tropical Pacific, often are found in waters with a shallow thermocline (rapid temperature difference with depth) (Au and Perryman 1985; Perrin 2008c; Reilly 1990). The thermocline concentrates open sea organisms in and above it, which spinner dolphins feed on. In the eastern tropical Pacific, spinner dolphins are associated with tropical surface waters typified by extensive stable thermocline ridging and relatively little annual variation in surface temperature (Au and Perryman 1985; Perrin 2008c). Coastal populations are usually found in island archipelagos, where they are tied to trophic and habitat resources associated with the coast (Norris and Dohl 1980; Poole 1995). This species does not occur in Study Area waters off California (Jefferson et al. 2008).

Insular Pacific-Hawaiian Large Marine Ecosystem. In the Hawaiian Islands, spinner dolphins occur along the leeward coasts of all the major islands and around several of the atolls northwest of the main Hawaiian Islands. Long-term site fidelity has been noted for spinner dolphins along the Kona coast of Hawaii, and along Oahu (Marten and Psarakos 1999; Norris et al. 1994). Monitoring for the Rim of the

Pacific Exercise in 2006 resulted in daily sightings of spinner dolphins within the offshore area of Kekaha Beach, Kauai, near the Pacific Missile Range Facility (U.S. Department of the Navy 2006).

Spinner dolphins occur year round throughout the Insular Pacific-Hawaiian Large Marine Ecosystem, with primary occurrence from the shore to the 13,122 ft. (3,999.6 m) depth. This takes into account offshore resting habitat and offshore feeding areas. Spinner dolphins are expected to occur in shallow water resting areas (about 162 ft. [49.4 m] deep or less) throughout the middle of the day, moving into deep waters offshore during the night to feed. Primary resting areas are along the west side of Hawaii, including Makako Bay, Honokohau Bay, Kailua Bay, Kealakekua Bay, Honaunau Bay, and Kauhako Bay, and off Kahena on the southeast side of the island (Östman-Lind et al. 2004). Along the Waianae coast of Oahu, Hawaii, spinner dolphins rest along Makua Beach, Kahe Point, and Pokai Bay during the day (Lammers 2004). Kilauea Bay on Kauai is also a popular resting bay for Hawaiian spinner dolphins (U.S. Department of the Navy 2006). Another area of occurrence is seaward of 2,187 fathoms (ftm) (4,000 m). Although sightings have been recorded around the mouth of Pearl Harbor, Hawaii, spinner dolphin occurrence is rare there (Lammers 2004). Occurrence patterns are assumed to be the same throughout the year.

Open Ocean. Throughout much of their range, spinner dolphins are found in the open ocean. Spinner dolphins are pantropical, ranging through oceanic tropical and subtropical zones in both hemispheres (the range is nearly identical to that of the pantropical spotted dolphin). The primary range of Gray's spinner dolphin is known to include waters of the North Pacific Gyre and the southern waters of the North Pacific Transition Zone. Its range generally includes tropical and subtropical oceanic waters south of 40° N, continuous across the Pacific (Jefferson et al. 2008; Perrin and Gilpatrick 1994).

Spinner dolphins are not considered a migratory species.

3.4.2.25.3 Population and Abundance

Hawaiian spinner dolphins belong to a separate stock than those animals found in the Eastern Tropical Pacific. The best available estimate of abundance for three of the Hawaiian stocks of spinner dolphin are as follows: Hawaii Island stock = 790 (coefficient of variation = 0.17), Oahu/4-islands stock = 335 (coefficient of variation = 0.09), and Kauai/Niihau stock = 601 (coefficient of variation = 0.20). There are no abundance estimates currently available for the Hermes Reef, Kure/Midway, or Hawaii Pelagic stocks (Carretta et al. 2013).

3.4.2.25.4 Predator/Prey Interactions

Spinner dolphins feed primarily on small mid-water fishes, squids, and shrimp, and they dive to at least 655 to 985 ft. (200 to 300 m) (Perrin and Gilpatrick 1994). They forage primarily at night, when the mid-water community migrates toward the surface and the shore (Benoit-Bird 2004; Benoit-Bird et al. 2001). Spinner dolphins track the horizontal migrations of their prey (Benoit-Bird and Au 2003), allowing for foraging efficiencies (Benoit-Bird 2004; Benoit-Bird and Au 2003). Foraging behavior has also been linked to lunar phases in scattering layers off of Hawaii (Benoit-Bird and Au 2004). Spinner dolphins may be preyed on by sharks, killer whales, pygmy killer whales, and short-finned pilot whales (Perrin 2008c).

3.4.2.25.5 Species Specific Threats

There are no significant species-specific threats to spinner dolphins in the Study Area.

3.4.2.26 Rough-toothed Dolphin (*Steno bredanensis*)

3.4.2.26.1 Status and Management

This species is protected under the MMPA and is not listed under the ESA. Rough-toothed dolphins are among the most widely distributed species of tropical dolphins, but little information is available regarding population status (Jefferson 2009b; Jefferson et al. 2008). There is a single Pacific management stock including only animals found within the U.S. Exclusive Economic Zone of the Hawaiian Islands (Carretta et al. 2010).

3.4.2.26.2 Geographic Range and Distribution

The range of this species is known to include waters of the California Current and Insular Pacific-Hawaiian Large Marine Ecosystems and the North Pacific Gyre. This species is known to prefer deep water but has been observed in waters of various depths. At the Society Islands, rough-toothed dolphins were sighted in waters with bottom depths ranging from less than 330 ft. (100 m) to more than 9,845 ft. (more than 3,000 m), although they apparently favored the 1,640 to 4,920 foot (500 to 1,500 m) range (Gannier 2000).

Insular Pacific-Hawaiian Large Marine Ecosystem. The occurrence of this species is well known in deep ocean waters off Hawaii (Baird et al. 2008a; Barlow et al. 2008; Carretta et al. 2010; Pitman and Stinchcomb 2002; Shallenberger 1981). Rough-toothed dolphin vocalizations have been detected during acoustic surveys in the eastern tropical Pacific (Oswald et al. 2003). A recent ship survey in the Hawaiian Islands found that sighting rates were highest in depths greater than 4,920 ft. (1,500 m) and resightings were frequent, indicating the possibility of a small population with high site fidelity (Baird et al. 2008a). This species has been observed as far northwest as French Frigate Shoals (Carretta et al. 2010). Eight strandings have been reported from the Hawaiian Islands of Maui, Oahu, and Hawaii (Maldini et al. 2005).

California Current Large Marine Ecosystem. The range of the rough-toothed dolphin is known to include the southern portion of the California Current Large Marine Ecosystem. Several strandings were documented for this species in central and Southern California between 1977 and 2002 (Zagzebski et al. 2006).

Open Ocean. The rough-toothed dolphin is regarded as an offshore species that prefers deep water, but it can occur in waters of variable bottom depth (Gannier and West 2005). It rarely occurs close to land, except around islands with steep drop-offs nearshore (Gannier and West 2005). In some areas, this species may frequent coastal waters and areas with shallow bottom depths (Davis et al. 1998; Fulling et al. 2003; Lodi and Hetzel 1999; Mignucci-Giannoni 1998; Ritter 2002).

There is no evidence that the rough-toothed dolphins migrate. No information regarding routes, seasons, or re-sighting rates in specific areas is available.

3.4.2.26.3 Population and Abundance

The current best available abundance estimate for the Hawaiian stock of rough-toothed dolphins derives from a 2002 shipboard line-transect survey of the entire Hawaiian Islands U.S. Exclusive Economic Zone, resulting in an estimate of 8,709 individuals (coefficient of variation = 0.45) (Barlow 2006).

3.4.2.26.4 Predator/Prey Interactions

Prey of rough-toothed dolphins includes fish and cephalopods. They are known to feed on large fish species, such as mahi mahi (Miyazaki and Perrin 1994; Pitman and Stinchcomb 2002). They also prey on reef fish, as Perkins and Miller (1983) noted that parts of reef fish had been found in the stomachs of stranded rough-toothed dolphins in Hawaii. Gannier and West (2005) observed rough-toothed dolphins feeding during the day on near-surface fishes, including flyingfishes.

Although this species has not been documented as prey by other species, it may be subject to predation from killer whales.

3.4.2.26.5 Species Specific Threats

Rough-toothed dolphins are particularly susceptible to fishery interactions including both commercial and recreational fishing activities.

3.4.2.27 Pacific White-sided Dolphin (*Lagenorhynchus obliquidens*)

3.4.2.27.1 Status and Management

This species is not listed under the ESA but is protected under the MMPA. Morphological studies indicate that two different populations of Pacific white-sided dolphins exist off California (Lux et al. 1997). However, the population boundaries are dynamic, and there is no reliable way to distinguish animals from the two populations in the field. Thus, these two populations are managed by NMFS as a single stock, the California, Oregon, and Washington stock (Carretta 2010). Genetic analysis has shown some variation between Pacific white-sided dolphins known to occur off Baja California, and those found off the coast of Point Conception, California (Caretta et al. 2010; Lux et al. 1997). Acoustic studies have also supported a distinction between these two populations off California (Soldevilla et al. 2008).

3.4.2.27.2 Geographic Range and Distribution

The Pacific white-sided dolphin is found in cold temperate waters across the northern rim of the Pacific Ocean (Carretta et al. 2010; Ferguson 2005; Jefferson et al. 2008; Reeves et al. 2002). It is typically found in deep waters along the continental margins and outer shelf and slope waters. It is also known to inhabit inshore regions of southeast Alaska, British Columbia, and Washington, and occurs seasonally off Southern California (Brownell et al. 1999; Forney and Barlow 1998).

Open Ocean. The Pacific white-sided dolphin is most common in temperate waters over the outer continental shelf and slope. Sighting records and captures in open sea driftnets indicate that this species also occurs in oceanic waters well beyond the shelf and slope (Ferrero and Walker 1996; Leatherwood et al. 1984). Salvadeo et al. (2010) concluded that the occurrence of the Pacific white-sided dolphin has decreased by approximately 10 times per decade since the 1980s in the Gulf of California.

California Current Large Marine Ecosystem. Primary habitat includes the cold temperate waters of the north Pacific Ocean and deep ocean regions. They range as far south as the mouth of the Gulf of California, northward to the southern Bering Sea and coastal areas of southern Alaska (Leatherwood et al. 1984; Jefferson et al. 2008). Off California, Forney and Barlow (1998) found significant north/south shifts in the seasonal distribution of Pacific white-sided dolphin, with the animals moving north into Oregon and Washington waters during the summer, and showing increased abundance in the Southern California Bight in the winter. Off California, the species is found mostly at the outer edge of the continental shelf and slope and does not frequently move into shallow coastal waters. Although Pacific white-sided dolphins do not migrate, seasonal shifts have been documented as noted above. From

November to April, Pacific white-sided dolphins can be found in shelf waters off the coast of Southern California. They move to the Oregon and Washington coasts and can be found in shelf waters in late spring (May) (Reeves et al. 2002; Tsutsui et al. 2001). They also occur in the waters of southeast Alaska in the cooler water months.

3.4.2.27.3 Population and Abundance

Additional genetic analysis suggests existence of several populations of Pacific white-sided dolphins throughout their range, which is differentiated geographically between offshore and nearshore areas. Four populations have been suggested: in the offshore waters of Baja California, in the offshore waters of California to Oregon, offshore of British Columbia and Alaska, and in the offshore waters west of 160° W (Hayano et al. 2004).

A number of abundance estimates for Pacific white-sided dolphins have been based on visual and acoustic surveys in different parts of their range (Black 2009; Reeves et al. 2002). The most accurate, up-to-date surveys have estimated the abundance of the California, Oregon, and Washington stock at 26,930 individuals (coefficient of variation = 0.28) (Carretta et al. 2010). No long-term trends have been proposed based on historical and recent visual surveys of this species (Carretta et al. 2010).

3.4.2.27.4 Predator/Prey Interactions

Pacific white-sided dolphins in the eastern north Pacific feed primarily on near-surface and mid-water fishes, such as lanternfish, anchovies, mackerel, and hake, as well as cephalopods (Black 1994; Brownell et al. 1999; Heise 1997; Jefferson et al. 2008; Morton 2000). Feeding appears to be mostly on deep scattering layer organisms by use of cooperative feeding methods (Black 2009; Jefferson et al. 2008). Large schools have been observed feeding cooperatively on large shoals of schooling fish (Black 2009; Jefferson et al. 2008). Pacific white-sided dolphins have been observed being preyed on by killer whales and typically flee when they come in contact with the predator (Black 2009).

3.4.2.27.5 Species Specific Threats

Pacific white-sided dolphins are particularly susceptible to entanglement and other fishery interactions.

3.4.2.28 Northern Right Whale Dolphin (*Lissodelphis borealis*)

3.4.2.28.1 Status and Management

This species it is not listed under the ESA but is protected by the MMPA. Dizon et al. (1994) examined a small sample of northern right whale dolphin specimens to determine whether there were different populations along the west coast of North America and in the open sea waters of the central north Pacific. Although no evidence of separate populations was found, separate stocks are assumed to exist. The management stock in U.S. waters consists of a single California, Oregon, and Washington stock (Caretta et al. 2010).

3.4.2.28.2 Geographic Range and Distribution

The northern right whale dolphin occurs in cool-temperate to subarctic waters of the north Pacific Ocean, from the west coast of North America to Japan and Russia. This species occurs in oceanic waters and along the outer continental shelf and slope, normally in waters colder than 68°F (20°C) (Jefferson and Lynn 1994; Leatherwood and Walker 1979). Northern right whale dolphins generally move nearshore only in areas where the continental shelf is narrow or where productivity on the shelf is especially high (Smith et al. 1986). Soldevilla et al. (2006) noted that northern right whale dolphins frequently had been sighted in shelf and offshore waters of Southern California. Leatherwood and

Walker (1979) reported sighting this species frequently around prominent banks and seamounts such as Tanner and Cortes banks in Southern California (Lipsky 2009).

California Current Large Marine Ecosystem. Off California, this species is known to occur year round, but abundance and distribution vary seasonally. This species is most abundant off central and northern California in relatively nearshore waters in winter (Dohl et al. 1983). In the cool water period, the peak abundance of northern right whale dolphins in the Southern California portion of the Study Area corresponds closely with the peak abundance of squid (Forney and Barlow 1998).

In the warm water period, the northern right whale dolphin is not as abundant in Southern California due to shifting distributions north into Oregon and Washington, as water temperatures increase (Barlow 1995; Carretta et al. 1995; Forney and Barlow 1998; Leatherwood and Walker 1979). As noted by Leatherwood and Walker (1979), a few sightings south of Point Conception occurred during the summer, well past the continental shelf, in the vicinity of the Transit Corridor. Primary areas of occurrence include all of the Channel Islands, within and adjacent to the Study Area.

Open Ocean. The primary range of the northern right whale dolphin occurs in the offshore waters of the North Pacific Transition Zone and California Current Large Marine Ecosystem. This oceanic species is distributed approximately from 30° N to 50° N, 145° W to 118° E and generally not as far north as the Bering Sea (Jefferson et al. 2008).

The species does not migrate, although seasonal shifts do occur. Occasional movements south of 30° N are associated with unusually cold water temperatures (Jefferson and Lynn 1994; Leatherwood and Walker 1979). Surveys suggest that, at least in the eastern north Pacific, seasonal inshore-offshore and north-south movements are related to prey availability, with peak abundance in the Southern California Bight during winter (Forney and Barlow 1998). Periods of peak abundance of northern right whale dolphins in Southern California correspond very closely with known periods of peak abundance of market squid, a major prey species (Jefferson and Lynn 1994; Leatherwood and Walker 1979). Leatherwood and Walker (1979) reported observation of this species off Pyramid Head, San Clemente Island, and Catalina Island, which are important squid fishing grounds in Southern California. Northern right whale dolphins are primarily found off California during the colder water months, with distribution shifting northward into Oregon and Washington as water temperatures increase during late spring and summer (Barlow 1995; Forney et al. 1995; Forney and Barlow 1998; Leatherwood and Walker 1979). Northern right whale dolphins can be found farther offshore of Southern California during the summer (Forney and Barlow 1998).

3.4.2.28.3 Population and Abundance

The current best estimate of abundance for the stock off the West Coast (California, Oregon, and Washington stock) is 8,334 individuals (coefficient of variation = 0.40), with no indication of an increase or decrease in abundance (Carretta et al. 2010).

3.4.2.28.4 Predator/Prey Interactions

Northern right whale dolphins are known to feed on a wide variety of near-surface and mid-water prey species, including fishes and cephalopods, such as squid. Otolith (earbone) identification has shown that the northern right whale dolphin preys on many different species (Leatherwood and Walker 1979). Market squid (*Loligo opalescens*) and lanternfish (family Myctophidae) appear to be the main prey species in Southern California waters (Jefferson et al. 2008). This species may be preyed on by killer whales and occasionally sharks (Lipsky 2009).

3.4.2.28.5 Species Specific Threats

Northern right whale dolphins are particularly susceptible to entanglement and other fishery interactions. The major threat appears to be bycatch in the California/Oregon thresher shark driftnet fishery, but catches are low-only about five to nine individuals per year (Carretta et al. 2010). Northern right whale dolphins have never been hunted extensively in a major fishery, although incidental catches have occurred in purse seines and driftnets (Jefferson et al. 2008).

3.4.2.29 Fraser's Dolphin (*Lagenodelphis hosei*)

Since its discovery in 1956, Fraser's dolphin was known only from skeletal specimens until it was once again identified in the early 1970s (Perrin et al. 1973). Although still one of the least-known species of cetaceans, Fraser's dolphin has become much better described as a species in recent years.

3.4.2.29.1 Status and Management

Fraser's dolphin is protected under the MMPA and is not listed under the ESA. For the MMPA stock assessment reports, there is a single Pacific management stock including only animals found within the U.S. Exclusive Economic Zone of the Hawaiian Islands (Carretta et al. 2010).

3.4.2.29.2 Geographic Range and Distribution

Fraser's dolphin is a tropical oceanic species, except where deep water approaches the coast (Dolar 2008).

Insular Pacific-Hawaiian Large Marine Ecosystem. Fraser's dolphins have only recently been documented within the Insular Pacific-Hawaiian Large Marine Ecosystem. The first published sightings were during a 2002 cetacean survey (Barlow 2006; Carretta et al. 2010), at which time the mean group size recorded was 286 (Barlow 2006). There are no records of strandings of this species in the Hawaiian Islands (Maldini et al. 2005). Fraser's dolphin vocalizations have been documented in the Hawaiian Islands (Barlow et al. 2008; Barlow et al. 2004). It is not known whether Fraser's dolphins found in Hawaiian waters are part of the same population that occurs in the eastern tropical Pacific (Carretta et al. 2010).

Open Ocean. In the offshore eastern tropical Pacific, this species is distributed mainly in upwelling-modified waters (Au and Perryman 1985; Reilly 1990). The range of this species includes deep open ocean waters of the North Pacific Gyre and the Insular Pacific-Hawaiian Large Marine Ecosystem and other locations in the Pacific (Aguayo and Sanchez 1987; Ferguson 2005; Miyazaki and Wada 1978).

This does not appear to be a migratory species, and little is known about its potential migrations. No specific information regarding routes, seasons, or resighting rates in specific areas is available.

3.4.2.29.3 Population and Abundance

The current best available abundance estimate for the Hawaiian stock of Fraser's dolphin derives from a 2002 shipboard survey of the entire Hawaiian Islands U.S. Exclusive Economic Zone, resulting in an estimate of 10,226 (Barlow 2006).

3.4.2.29.4 Predator/Prey Interactions

Fraser's dolphin feeds on mid-water fishes, squids, and shrimps and has not been documented to be prey to any other species (Jefferson and Leatherwood 1994; Perrin et al. 1994b). It may be subject to predation by killer whales.

3.4.2.29.5 Species Specific Threats

There are no significant species-specific threats to Fraser's dolphins in the Study Area.

3.4.2.30 Risso's Dolphin (*Grampus griseus*)

3.4.2.30.1 Status and Management

Risso's dolphin is protected under the MMPA and is not listed under the ESA. For the MMPA stock assessment reports, Risso's dolphins within the Pacific U.S. Exclusive Economic Zone are divided into two separate areas: waters off California, Oregon, and Washington; and Hawaiian waters (Carretta et al. 2010).

3.4.2.30.2 Geographic Range and Distribution

In the Pacific, the range of this species is known to include the North Pacific Gyre and the California Current and Insular Pacific-Hawaiian Large Marine Ecosystems. Occurrence of this species is well known in deep open ocean waters off Hawaii, and in other locations in the Pacific (Au and Perryman 1985; Carretta et al. 2010; Leatherwood et al. 1980; Miyashita 1993; Miyashita et al. 1996; Wang et al. 2001).

Insular Pacific-Hawaiian Large Marine Ecosystem. Risso's dolphins have been considered rare in Hawaiian waters (Shallenberger 1981). However, during a 2002 survey of the Hawaiian Islands U.S. Exclusive Economic Zone, seven sightings were reported; in addition, two sightings were reported from recent aerial surveys in the Hawaiian Islands (Barlow 2006; Mobley et al. 2000). During a more recent 2010 systematic survey of the Hawaiian Islands U.S. Exclusive Economic Zone, there were 13 sightings of Risso's dolphins. In 2009, Risso's dolphins were acoustically detected near Hawaii using boat-based hydrophones (U.S. Department of the Navy 2009a). In addition, Risso's dolphins were sighted eight times during Navy monitoring activities within HRC between 2005 and 2012 (HDR 2012). Five stranding records exist from the main Hawaiian Islands (Maldini et al. 2005).

California Current Large Marine Ecosystem. Off California, they are commonly seen over the slope and in offshore waters (Caretta et al. 2010; Forney et al. 1995; Jefferson et al. 2008). This species is frequently observed in the waters surrounding San Clemente Island, California. They are generally present year round in Southern California, but are more abundant in the cold-water months, suggesting a possible seasonal shift in distribution (Carretta et al. 2000; Soldevilla 2008). Several stranding records have been documented for this species in central and Southern California between 1977 and 2002 (Zagzebski et al. 2006).

Open Ocean. Several studies have documented that Risso's dolphins are found offshore, along the continental slope, and over the outer continental shelf (Baumgartner 1997; Canadas et al. 2002; Cetacean and Turtle Assessment Program 1982; Davis et al. 1998; Green et al. 1992; Kruse et al. 1999; Mignucci-Giannoni 1998). Risso's dolphins are also found over submarine canyons (Mussi et al. 2004).

Risso's dolphin does not migrate, although schools may range over very large distances, and seasonal shifts in centers of abundance are known for some regions.

3.4.2.30.3 Population and Abundance

This is a widely distributed species that occurs in all major oceans, and although no global population estimates exist, it is generally considered to be one of the most abundant of the large dolphins. The mean abundance for California, Oregon, and Washington waters, based on surveys between 2005 and 2008, was 6,272 (coefficient of variation = 0.30) Risso's dolphins (Carretta et al. 2010). The current best available abundance estimate for the Hawaiian stock of Risso's dolphin derives from a 2002 shipboard survey of the entire Hawaiian Islands U.S. Exclusive Economic Zone. The resulting abundance estimate was 2,372 (coefficient of variation = 0.97) Risso's dolphins (Barlow 2006).

3.4.2.30.4 Predator/Prey Interactions

Cephalopods and crustaceans are the primary prey for Risso's dolphins (Clarke 1996), which feed mainly at night (Baird et al. 2008; Jefferson et al. 2008). This dolphin may be preyed on by both killer whales and sharks, although there are no documented reports of predation by either species (Weller 2008).

3.4.2.30.5 Species Specific Threats

Risso's dolphins are particularly susceptible to entanglement and fisheries interactions.

3.4.2.31 Dall's Porpoise (*Phocoenoides dalli*)

3.4.2.31.1 Status and Management

This species is protected under the MMPA and is not listed under the ESA. Dall's porpoise is managed by NMFS in United States waters as two stocks: a California, Oregon, and Washington stock and an Alaskan stock (Allen and Angliss 2010; Carretta et al. 2010).

3.4.2.31.2 Geographic Range and Distribution

Dall's porpoise is one of the most common odontocete species in north Pacific waters (Calambokidis and Barlow 2004; Ferrero and Walker 1999; Jefferson 1991; Williams and Thomas 2007; Zagzebski et al. 2006). It is typically found in waters at temperatures less than 63°F (17°C) with depths of more than 590 ft. (179.8 m) (Houck and Jefferson 1999; Reeves et al. 2002). Groups are sometimes found more than 685 mi. (1,102.4 km) offshore. When inshore, they are found most often in deep channels with strong currents (Dahlheim et al. 2009; Miller 1989).

California Current Large Marine Ecosystem. In the Southern California portion of the Study Area, Dall's porpoises are sighted seasonally, mostly during the winter (Carretta et al. 2010). Inshore/offshore movements off Southern California have been reported, with individuals remaining inshore in fall and moving offshore in the late spring (Houck and Jefferson 1999). Seasonal movements have also been noted off Oregon and Washington, with higher densities of Dall's porpoises sighted offshore in winter and spring and inshore in summer and fall (Green et al. 1992).

Open Ocean. Dall's porpoise are found mainly in the waters of the North Pacific Transition Zone in outer continental shelf, slope, and oceanic waters (Houck and Jefferson 1999; Jefferson et al. 2008).

3.4.2.31.3 Population and Abundance

Population structure within North American waters has not been well studied. Dall's porpoises are very abundant, probably one of the most abundant small cetaceans in the cooler waters of the north Pacific Ocean. An estimated 42,000 (coefficient of variation = 0.33) individuals are present off the coast of California, Oregon, and Washington (Carretta et al. 2010).

3.4.2.31.4 Predator/Prey Interactions

The diet of Dall's porpoises, determined from analyses of stomach contents during studies in the north Pacific along the West Coast, included 33 species of near-surface and mid-water fishes, as well as squid (Houck and Jefferson 1999). Dall's porpoises are known to be preyed on by killer whales and large sharks

(Jefferson 2009a; Jefferson et al. 2008). Attacks by killer whales occur often in Alaskan waters, where they are considered to be a major predator to the Dall's porpoise (Jefferson 2009a).

3.4.2.31.5 Species Specific Threats

Dall's porpoises are particularly susceptible to fisheries interactions and entanglement. Mortality occurs as bycatch in a number of United States fisheries, but annual takes are considered small.

3.4.2.32 Cuvier's Beaked Whale (*Ziphius cavirostris*)

3.4.2.32.1 Status and Management

Cuvier's beaked whale is protected under the MMPA and is not listed under the ESA. Cuvier's beaked whale stocks are defined for three separate areas within Pacific U.S. waters: (1) Alaska, (2) California, Oregon, and Washington, and (3) Hawaii (Carretta et al. 2010).

3.4.2.32.2 Geographic Range and Distribution

Cuvier's beaked whales have an extensive range that includes all oceans, from the tropics to the polar waters of both hemispheres. Worldwide, beaked whales normally inhabit continental slope and deep oceanic waters. Cuvier's beaked whales are generally sighted in waters with a bottom depth greater than 655 ft. (199.6 m) and are frequently recorded in waters with bottom depths greater than 3,280 ft. (999.7 m) (Falcone et al. 2009; Jefferson et al. 2008). Cuvier's beaked whale range is known to include all waters of the California Current and Insular Pacific-Hawaiian Large Marine Ecosystems, the North Pacific Gyre, and the North Pacific Transition Zone (Jefferson et al. 2008; MacLeod and D'Amico 2006).

Insular Pacific-Hawaiian Large Marine Ecosystem. Cuvier's beaked whales are regularly found in waters surrounding the Hawaiian Islands having been sighted from vessels and aerial surveys. A line-transect survey conducted in February 2009 by the Cetacean Research Program surrounding the Hawaiian Islands resulted in the sighting of two Cuvier's beaked whales (Oleson and Hill 2009). They typically are found at depths exceeding 6,560 ft. (2,000 m) (Baird et al. 2009b; Baird et al. 2006b; Barlow et al. 2004). In the Hawaiian Islands, five strandings have been reported from Midway Island, Pearl and Hermes Reef, Oahu, and the Island of Hawaii (Maldini et al. 2005; Shallenberger 1981). Sightings have been reported off the Hawaiian Islands of Lanai, Maui, Hawaii, Niihau, and Kauai, supporting the hypothesis that there is a resident population found in the Hawaiian Islands (Baird et al. 2010a; Carretta et al. 2010; Mobley et al. 2000; Shallenberger 1981).

California Current Large Marine Ecosystem. Cuvier's beaked whale is the most commonly encountered beaked whale off the West Coast. There are no apparent seasonal changes in distribution, and this species is found from Alaska to Baja California, Mexico (Carretta et al. 2010; Mead 1989; Pitman et al. 1988). However, Mitchell (1968) reported strandings, from Alaska to Baja California, to be most abundant between February and September. Repeated sightings of the same individuals have been reported off San Clemente Island in Southern California, which indicates some level of site fidelity (Falcone et al. 2009).

Open Ocean. Cuvier's beaked whales are widely distributed in offshore waters of all oceans and thus occur in temperate and tropical waters of the Pacific, including waters of the eastern tropical Pacific (Barlow et al. 2006; Ferguson 2005; Jefferson et al. 2008; Pitman et al. 1988). In the Study Area, they are found mostly offshore in deeper waters off California and Hawaii (MacLeod and Mitchell 2006; Mead 1989; Ohizumi and Kishiro 2003; Wang et al. 2001). A single population likely exists in offshore waters of the eastern north Pacific, ranging from Alaska south to Mexico (Carretta et al. 2010).

Little is known about potential migration.

3.4.2.32.3 Population and Abundance

The current best available abundance estimate for California, Oregon, and Washington waters for Cuvier's beaked whale is 2,143 (coefficient of variation = 0.65) animals (Carretta et al. 2010). The current best available abundance estimate for the Hawaiian stock is 15,242 (coefficient of variation = 1.43), based on a 2002 shipboard line-transect survey of the Hawaiian Islands U.S. Exclusive Economic Zone (Barlow 2006).

3.4.2.32.4 Predator/Prey Interactions

Cuvier's beaked whales, similar to other beaked whale species, are apparently deepwater feeders. Stomach content analyses show that they feed mostly on deep-sea squid, fish, and crustaceans (Hickmott 2005; Santos et al. 2007). They apparently use suction to swallow prey (Jefferson et al. 2008; Werth 2006a, b). Cuvier's beaked whales may be preyed upon by killer whales (Heyning and Mead 2008; Jefferson et al. 2008).

3.4.2.32.5 Species Specific Threats

Cuvier's beaked commonly strand, and they are vulnerable to acoustic impacts (Frantzis et al. 2002; Cox et al. 2006; Southall et al. 2012). Additionally, Cuvier's beaked whales have been documented being entangled in fishing gear.

3.4.2.33 Baird's Beaked Whale (*Berardius bairdii*)

3.4.2.33.1 Status and Management

Baird's beaked whale is protected under the MMPA and is not listed under the ESA. Baird's beaked whale stocks are defined for the two separate areas within Pacific U.S. waters where they are found: (1) Alaska and (2) California, Oregon, and Washington (Carretta et al. 2010). Baird's beaked whales have a history of commercial harvesting in small numbers by the Russians, Canadians and Americans. The Japanese fishery has historically been responsible for large numbers of deaths (Jefferson et al. 2008).

3.4.2.33.2 Geographic Range and Distribution

Baird's beaked whale range is known to include the California Current Large Marine Ecosystem and the North Pacific Transition Zone. Distribution of Baird's beaked whales in the mid-Pacific, as well as their winter habitats, are not well known, but this species is generally found through the colder waters of the north Pacific, ranging from off Baja California, Mexico, to the Aleutian Islands of Alaska (Jefferson et al. 2008; MacLeod and D'Amico 2006).

California Current Large Marine Ecosystem. The continental shelf margins from the California coast to 125° West (W) longitude were recently identified as key areas for beaked whales (MacLeod and D'Amico 2006). Baird's beaked whale is found mainly north of 28° N in the eastern Pacific (Kasuya 1997; Reeves et al. 2003). Along the West Coast, Baird's beaked whales are seen primarily along the continental slope, from late spring to early fall (Carretta et al. 2010; Green et al. 1992). Baird's beaked whales are sighted less frequently and are presumed to be farther offshore during the colder water months of November through April (Carretta et al. 2010).

Open Ocean. Baird's beaked whales appear to occur mainly in deep waters over the continental slope, near oceanic seamounts and areas with submarine escarpments. They may be seen close to shore where deep water approaches the coast (Jefferson et al. 2008; Kasuya 2009).

Although the specific migration of this species is unknown, Baird's beaked whales in the western north Pacific are known to move between waters of depths ranging from 3,280 to 9,840 ft. (1,000 and 3,000 m), where fish that live on or near the bottom of the ocean are abundant (Ohizumi et al. 2003).

3.4.2.33.3 Population and Abundance

The population estimate for the California, Oregon, and Washington stock of Baird's beaked whale is 907 (coefficient of variation = 0.49) (Carretta et al. 2010). This species is rarely sighted during surveys along the West Coast of North America, and does not appear to occur in high densities anywhere in U.S. waters (Barlow et al. 2004; Forney 2007).

3.4.2.33.4 Predator/Prey Interactions

Baird's beaked whales feed mainly on bottom-dwelling fishes and cephalopods, but occasionally take open ocean fish, such as mackerel, sardine, and saury (Kasuya 2009; Ohizumi et al. 2003; Walker et al. 2002). Stomach contents from specimens taken in whaling operations off Vancouver Island and off central California included squid, octopus, various species of fishes, and skate egg cases (MacLeod et al. 2003). Baird's beaked whale is known to forage for prey opportunistically at depths of about 3,280 ft. (1,000 m) or more (Ohizumi et al. 2003). This species has been documented to be prey for killer whales and sharks, as evidenced by wounds and scars observed on their bodies (Jefferson et al. 2008; Kasuya 2009).

3.4.2.33.5 Species Specific Threats

There are no significant species-specific threats to Baird's beaked whales in the Study Area.

3.4.2.34 Blainville's Beaked Whale (*Mesoplodon densirostris*)

3.4.2.34.1 Status and Management

Due to difficulty in distinguishing the different *Mesoplodon* species from one another, the United States management unit is usually defined to include all *Mesoplodon* species that occur in the area. Blainville's beaked whale is protected under the MMPA and is not listed under the ESA. Although little is known of stock structure for this species, based on resightings and genetic analysis of individuals around the Hawaiian Islands, NMFS recognizes a Hawaiian stock of Blainville's beaked whale.

3.4.2.34.2 Geographic Range and Distribution

Blainville's beaked whales are one of the most widely distributed of the distinctive toothed whales within the *Mesoplodon* genus (Jefferson et al. 2008; MacLeod and Mitchell 2006). Blainville's beaked whale range is known to include the California Current and Insular Pacific-Hawaiian Large Marine Ecosystems, North Pacific Gyre, and the North Pacific Transition Zone (Jefferson et al. 2008; Pitman 2008a).

Insular Pacific-Hawaiian Large Marine Ecosystem. Blainville's beaked whales are regularly found in Hawaiian waters (Baird et al. 2003a; Baird et al. 2006b; Barlow et al. 2004). In Hawaiian waters, this species is typically found in areas where water depths exceed 3,280 ft. (1,000 m) along the continental slope (Barlow et al. 2006; Schorr et al. 2010). Blainville's beaked whale has been detected off the coast of Oahu, Hawaii for prolonged periods annually, and this species is consistently observed in the same site off the west coast of the Island of Hawaii (McSweeney et al. 2007). Blainville's beaked whales' vocalizations have been detected on acoustic surveys in the Hawaiian Islands, and stranding records are available for the region (Maldini et al. 2005; Rankin and Barlow 2007). A recent tagging study off the island of Hawaii found the movements of a Blainville's beaked whale to be restricted to the waters of the west and north side of the island (Baird et al. 2010a).

California Current Large Marine Ecosystem. There are a handful of known records of the Blainville's beaked whale from the coast of California and Baja California, Mexico, but the species does not appear to be common in this portion of the Study Area (Carretta et al. 2010; Mead 1989; Pitman et al. 1988).

Open Ocean. Blainville's beaked whales are found mostly offshore in deeper waters along the California coast, Hawaii, Fiji, Japan, and Taiwan, as well as throughout the eastern tropical Pacific (Leslie et al. 2005; MacLeod and Mitchell 2006; Mead 1989).

It is unknown whether this species makes specific migrations, and none have so far been documented. Populations studied in Hawaii have evidenced some level of residency (McSweeney et al. 2007).

3.4.2.34.3 Population and Abundance

The combined estimate of abundance for all species of *Mesoplodon* beaked whales in California, Oregon, and Washington waters out to 300 nm is 1,024 (coefficient of variation = 0.77) (Carretta et al. 2010).

The best available abundance estimate for Blainville's beaked whale Hawaiian stock is based on a 2002 shipboard line-transect survey of the entire Hawaiian Islands U.S. Exclusive Economic Zone. The resulting estimate is 2,872 (coefficient of variation = 1.25) (Barlow 2006).

3.4.2.34.4 Predator/Prey Interactions

This species preys on squid and possibly deepwater fish. Like other *Mesoplodon* species, Blainville's beaked whales apparently use suction for feeding (Jefferson et al. 2008; Werth 2006a, b). This species has not been documented to be prey to any other species, though it is likely subject to occasional killer whale predation like other whale species.

3.4.2.34.5 Species Specific Threats

Blainville's beaked whales have been shown to react to anthropogenic noise by avoidance (Tyack et al. 2011). In response to a simulated sonar signal and pseudorandom noise (a signal of pulsed sounds that are generated in a random pattern), a tagged whale ceased foraging at depth and slowly moved away from the source while gradually ascending toward the surface (Tyack et al. 2011).

3.4.2.35 Longman's Beaked Whale (*Indopacetus pacificus*)

3.4.2.35.1 Status and Management

Longman's beaked whale is protected under the MMPA and is not listed under the ESA. Longman's beaked whale is a rare beaked whale species and is considered one of the world's least-known cetacean (Dalebout et al. 2003; Pitman 2008a). Only one Pacific stock, the Hawaiian stock, is identified (Carretta et al. 2010).

3.4.2.35.2 Geographic Range and Distribution

Longman's beaked whale generally are found in warm tropical waters, with most sightings occurring in waters with sea surface temperatures warmer than 78 °F (26°C) (Anderson et al. 2006; MacLeod and D'Amico 2006; MacLeod et al. 2006a). Sighting records of this species in the Indian Ocean showed

Longman's beaked whale typically found over deep slopes 655 to 6,560+ ft. (200 to 2,000+ m) (Anderson et al. 2006).

Although the full extent of this species distribution is not fully understood, there have been many recorded sightings at various locations in tropical waters of the Pacific and Indian Oceans (Afsal et al. 2009; Dalebout et al. 2002; Dalebout et al. 2003; Moore 1972). Ferguson et al. (2001) reported that all Longman's beaked whale sightings were south of 25° N.

Records of this species indicate presence in the eastern, central, and western Pacific, including waters off the coast of Mexico. The range of Longman's beaked whale generally includes the California Current and Insular Pacific-Hawaiian Large Marine Ecosystems and the North Pacific Gyre (Gallo-Reynoso and Figueroa-Carranza 1995; Jefferson et al. 2008; MacLeod and D'Amico 2006).

Insular Pacific-Hawaiian Large Marine Ecosystem. Sighting records for this species indicate presence in waters to the west of the Hawaiian Islands (four Longman's beaked whales were observed during the 2002 Hawaiian Islands Cetacean and Ecosystem Assessment also known as the HICEAS survey, Barlow et al. 2004) and to the northwest of the Hawaiian archipelago (23°42'38" N and 176°33'78" W). During a more recent 2010 HICEAS survey, there were multiple sightings of Longman's beaked whale. Longman's beaked whales have also been sighted off Kona (Cascadia Research 2012b). Two known records exist of this species stranding in the Hawaiian Islands (Maldini et al. 2005; West et al. 2012).

Open Ocean. Worldwide, Longman's beaked whales normally inhabit continental slope and deep oceanic waters (greater than 655 ft. [200 m]), and are only occasionally reported in waters over the continental shelf (Canadas et al. 2002; Ferguson et al. 2006; MacLeod et al. 2006a; Pitman 2008a; Waring et al. 2001).

Little information regarding the migration of this species is available, but it is considered to be widely distributed across the tropical Pacific and Indian Oceans (Jefferson et al. 2008). It is unknown whether the Longman's beaked whale participates in a seasonal migration (Jefferson et al. 2008; Pitman 2008a).

3.4.2.35.3 Population and Abundance

Based on 2002 surveys of the Hawaiian Islands Exclusive Economic Zone, the best available abundance estimate of the Hawaiian stock is 1,007 (coefficient of variation = 1.26) individuals (Barlow 2006).

3.4.2.35.4 Predator/Prey Interactions

Based on recent tagging data from Cuvier's and Blainville's beaked whales, Baird et al. (2005b) suggested that feeding for Longman's beaked whale might occur at mid-water rather than only at or near the bottom (Heyning 1989; MacLeod et al. 2003). This species has not been documented to be prey to any other species, though it is likely subject to occasional killer whale predation like other whale species.

3.4.2.35.5 Species Specific Threats

Little information exists regarding species-specific threats to Longman's beaked whales in the Study Area. However, recently the first case of morbillivirus in the central Pacific was documented for a stranded juvenile male Longman's beaked whale at Hamoa beach, Hana, Maui (West et al. 2012).

3.4.2.36 Ginkgo-toothed Beaked Whale (*Mesoplodon ginkgodens*)

Due to the similarities between the species, the ginkgo-toothed beaked whales may be virtually indistinguishable at sea from other *Mesoplodon* species.

3.4.2.36.1 Status and Management

The ginkgo-toothed beaked whale is protected under the MMPA and is not listed under the ESA. Due to difficulty in distinguishing the different *Mesoplodon* species from one another, the United States management unit is defined to include all *Mesoplodon* species that occur in the area (Carretta et al. 2010; Jefferson et al. 2008). The ginkgo-toothed beaked whale has been combined with other *Mesoplodon* species to make up the California, Oregon, and Washington stock (Carretta et al. 2010).

3.4.2.36.2 Geographic Range and Distribution

Insular Pacific-Hawaiian Large Marine Ecosystem. Assuming that the ginkgo-toothed beaked whale distribution is continuous across the north and central Pacific, this species could be found in waters off Hawaii; however, no strandings, captures, or sightings have been recorded for this species in Hawaiian waters (MacLeod and D'Amico 2006). Baumann-Pickering et al. (2012) hypothesize that an unknown likely beaked whale signal detected at Cross Seamount in Hawaii is likely produced by a ginkgo-toothed beaked whale, although there has been no visual confirmation.

California Current Large Marine Ecosystem. The distribution of the ginkgo-toothed beaked whale likely includes the California Current Large Marine Ecosystem and North Pacific Gyre. The handful of known records of the ginkgo-toothed beaked whale are from strandings, one of which occurred in California (Jefferson et al. 2008; MacLeod and D'Amico 2006).

Open Ocean. Worldwide, beaked whales normally inhabit continental slope and deep ocean waters (greater than 655 ft. [200 m]) and are only occasionally reported in waters over the continental shelf (Canadas et al. 2002; Ferguson et al. 2006; MacLeod et al. 2006a; Pitman 2008a; Waring et al. 2001).

This species probably occurs only in the temperate and tropical waters of the Indo-Pacific; however, no specific information regarding migration is available (Jefferson et al. 2008; MacLeod and D'Amico 2006).

3.4.2.36.3 Population and Abundance

The combined estimate of abundance for all species of *Mesoplodon* beaked whales in California, Oregon, and Washington waters out to 300 nm is 1,024 (coefficient of variation = 0.77) (Carretta et al. 2010).

3.4.2.36.4 Predator/Prey Interactions

Current thinking is that all beaked whales probably feed at or close to the bottom in deep oceanic waters, taking suitable prey opportunistically or as locally abundant, typically by suction feeding (Heyning 1989; Heyning and Mead 1996; MacLeod et al. 2003). However feeding may also occur at mid-water rather than only at or near the bottom as shown from tagging data on Cuvier's and Blainville's beaked whales (Baird et al. 2004). This may also be the case with this species. This species has not been documented to be prey to any other species, though it is likely subject to occasional killer whale predation like other whale species.

Although no published stomach content analysis is available, ginkgo-toothed beaked whales presumably prey on squid and possibly fish, similar to other *Mesoplodon* species. These species occupy an ecological niche distinct from Cuvier's beaked whales by feeding on smaller squids, allowing the different beaked whale species to coexist (MacLeod 2005; MacLeod et al. 2003).

3.4.2.36.5 Species Specific Threats

Little information exists regarding species-specific threats to ginkgo-toothed whales in the Study Area.

3.4.2.37 Perrin's Beaked Whale (*Mesoplodon perrini*)

Perrin's beaked whale is a recently discovered species of marine mammal. The first description of the species was published in 2002 (Dalebout et al. 2002).

3.4.2.37.1 Status and Management

Perrin's beaked whale is protected under the MMPA and is not listed under the ESA. Due to difficulty in distinguishing the *Mesoplodon* species, the United States management unit is defined to include all *Mesoplodon* species that occur in the area. Perrin's beaked whale has been combined with other *Mesoplodon* species to make up the California, Oregon, and Washington stock (Carretta et al. 2010).

3.4.2.37.2 Geographic Range and Distribution

Worldwide, beaked whales normally inhabit continental slope and deep oceanic waters (greater than 655 ft. [200 m]) and are only occasionally reported in waters over the continental shelf (Canadas et al. 2002; Ferguson et al. 2006; MacLeod and Mitchell 2006; Pitman 2008a; Waring et al. 2001).

California Current Large Marine Ecosystem. Perrin's beaked whale range generally includes the California Current Large Marine Ecosystem and North Pacific Gyre (MacLeod et al. 2006a). Perrin's beaked whale is known only from five stranded specimens along the California coastline (Dalebout et al. 2002; MacLeod et al. 2006a). Stranded animals previously identified as Hector's beaked whale from the eastern north Pacific, specifically the California coast, have been reclassified as Perrin's beaked whale (Dalebout et al. 2002; Mead 1981, 1989; Mead and Baker 1987). While this stranding pattern suggests an eastern north Pacific Ocean distribution, too few records exist for this to be conclusive (Dalebout et al. 2002). Regional distribution and abundance within the California Current Large Marine Ecosystem have not been estimated to date, due to scarcity of data. Known records of this species come from five strandings from 1975 to 1997. These strandings include two at U.S. Marine Corps Base Camp Pendleton (33°15' N, 117°26' W), and one each at Carlsbad, (33°07' N, 117°20' W), Torrey Pines State Reserve (32°55' N, 117°15' W), and Monterey (36°37' N, 121°55' W) (Dalebout et al. 2002; Mead 1981), all of which are in California.

Open Ocean. It is assumed that Perrin's beaked whale primarily occurs in oceanic waters, mostly deeper than 3,280 ft. (1,000 m), based on the known habitat associations of other *Mesoplodon* species (Dalebout et al. 2002; Ferguson et al. 2006). Due to limited sightings and restriction of information regarding this species to stranding data, the full extent of its range is unknown; however, it likely occurs only in waters of the eastern north Pacific with depths exceeding 3,280 ft. (1,000 m) (MacLeod et al. 2006a).

No specific information regarding the migration of this species is available. It is not known whether Perrin's beaked whale is restricted to the north Pacific or if it participates in a seasonal migration (Pitman 2008a).

3.4.2.37.3 Population and Abundance

The combined estimate of abundance for all species of *Mesoplodon* beaked whales in California, Oregon, and Washington waters out to 300 nm is 1,024 (coefficient of variation = 0.77) (Carretta et al. 2010).

3.4.2.37.4 Predator/Prey Interactions

All beaked whales probably feed at or close to the bottom in deep oceanic waters taking suitable prey opportunistically or as locally abundant (Heyning 1989; Heyning and Mead 1996; MacLeod et al. 2003). However feeding may also occur at mid-water rather than only at or near the bottom as shown from recent tagging data on Cuvier's and Blainville's beaked whales (Baird et al. 2004). This may also be the case with this species. Stomach content analyses of captured and stranded individuals suggest beaked whales are deep divers that feed by suction on mid-water fishes, squids, and deepwater bottom-feeding invertebrates (Heyning 1989; Heyning and Mead 1996; MacLeod et al. 2003; Santos et al. 2007; Santos et al. 2001). Dalebout et al. (2002) reported finding deep-sea squid species, such as *Octopoteuthis deletron*, within stomach contents of stranded Perrin's beaked whales. *Mesoplodons* species occupy an ecological niche distinct from Cuvier's beaked whales by feeding on smaller squids, allowing the different beaked whale species to coexist (MacLeod 2005; MacLeod et al. 2003). This species has not been documented to be prey to any other species, though it is likely subject to occasional killer whale predation like other whale species.

3.4.2.37.5 Species Specific Threats

Little information exists regarding species-specific threats to Perrin's beaked whales in the Study Area.

3.4.2.38 Stejneger's Beaked Whale (*Mesoplodon stejnegeri*)

Stejneger's beaked whale was initially described in 1885 from a skull, and nothing more of the species was known for nearly a century. The late 1970s saw several strandings, but it was not until 1994 that the external appearance was well described from fresh (stranded) specimens.

3.4.2.38.1 Status and Management

Due to difficulty in distinguishing the *Mesoplodon* species, the United States management unit is usually defined to include all *Mesoplodon* species that occur in the area. Stejneger's beaked whale is protected under the MMPA and is not listed under the ESA. The Alaska Stejneger's beaked whale stock is recognized separately from *Mesoplodon* species off California, Oregon, and Washington (Allen and Angliss 2010).

3.4.2.38.2 Geographic Range and Distribution

Worldwide, beaked whales normally inhabit continental slope and deep oceanic waters (greater than 656 ft. [200 m]) (Canadas et al. 2002; Ferguson et al. 2006; MacLeod and Mitchell 2006; Pitman 2008a; Waring et al. 2001). They are occasionally reported in waters over the continental shelf (Pitman and Stinchcomb 2002).

California Current Large Marine Ecosystem. This species may be found in this large marine ecosystem and has an assumed preference for colder water (Jefferson et al. 2008; MacLeod et al. 2006a). The southern limit in the central Pacific is unknown but is likely to range between 50° N and 60° N, and 30° N (Loughlin and Perez 1985; MacLeod et al. 2006a).

Open Ocean. Stejneger's beaked whale appears to prefer cold to temperate and subpolar waters (Loughlin and Perez 1985; MacLeod et al. 2006a). This species has been observed in waters ranging in bottom depths from 2,395 to 5,120 ft. (730 to 1,560 m) on the steep slope of the continental shelf (Loughlin and Perez 1985). Stejneger's beaked whales are not considered to regularly occur in Southern California coastal waters (Jefferson et al. 2008; MacLeod et al. 2006a). The farthest south this species has been recorded in the eastern Pacific is Cardiff, California (33° N), but this may have been unusual (Loughlin and Perez 1985; MacLeod et al. 2006a; Mead 1989).

The specific migration of this species is not known, but high stranding rates in the winter and spring along the Pacific coast suggest that Stejneger's beaked whales migrate north during summer (Jefferson et al. 2008; Pitman 2008b).

3.4.2.38.3 Population and Abundance

The combined estimate of abundance for all species of *Mesoplodon* beaked whales in California, Oregon, and Washington waters out to 300 nm is 1,024 (coefficient of variation = 0.77) (Carretta et al. 2010).

3.4.2.38.4 Predator/Prey Interactions

Stejneger's beaked whales are known to feed primarily on squids of the families Gonatidae and Cranchiidae, typically in mid-water to near bottom depths. Stomach contents analyses of this species also include deep-sea fish (Jefferson et al. 2008; Walker and Hanson 1999; Yamada 1998). This species has not been documented to be prey to any other species, though it is likely subject to occasional killer whale predation like other whale species.

3.4.2.38.5 Species Specific Threats

Little information exists regarding species-specific threats to Stejneger's beaked whales in the Study Area.

3.4.2.39 Hubbs' Beaked Whale (*Mesoplodon carlhubbsi*)

Due to the similarities between the species, Hubbs' beaked whales may be virtually indistinguishable at sea from other *Mesoplodon* species.

3.4.2.39.1 Status and Management

Due to difficulty in distinguishing the different *Mesoplodon* species from one another, the United States management unit is defined to include all *Mesoplodon* species that occur in the area. Hubbs' beaked whale is protected under the MMPA and is not listed under the ESA. Hubbs' beaked whale has been combined with other *Mesoplodon* species to make up the California, Oregon, and Washington stock (Carretta et al. 2010).

3.4.2.39.2 Geographic Range and Distribution

Insular Pacific-Hawaiian Large Marine Ecosystem. Assuming that Hubbs' beaked whale distribution is continuous across the north and central Pacific, they could be found in waters off Hawaii; however, no strandings, captures, or sightings have been recorded for this species in Hawaiian waters (MacLeod and Mitchell 2006; Mead 1989).

California Current Large Marine Ecosystem. MacLeod et al. (2006a) speculated that the distribution might be continuous across the north Pacific between about 30° N and 45° N, but this remains to be confirmed. Mead (1989) speculated that the Hubbs' beaked whales' range includes the northernmost portion of the Study Area off California.

Open Ocean. Worldwide, beaked whales normally inhabit continental slope and deep oceanic waters (greater than 655 ft. [200 m]) and are occasionally reported in waters over the continental shelf (Canadas et al. 2002; Ferguson et al. 2006; MacLeod et al. 2006a; Pitman 2008a; Waring et al. 2001). Along the Pacific coast of North America, Hubbs' beaked whale distribution is generally associated with the deep subarctic current system (Mead 1989; Mead et al. 1982).

Little information regarding the migration of this species is available. It is not known whether Hubbs' beaked whale is restricted to the north Pacific or if it participates in a seasonal migration (Jefferson et al. 2008; Pitman 2008a).

3.4.2.39.3 Population and Abundance

The combined estimate of abundance for all species of *Mesoplodon* beaked whales in California, Oregon, and Washington waters out to 300 nm is 1,024 (coefficient of variation = 0.77) (Carretta et al. 2010).

3.4.2.39.4 Predator/Prey Interactions

All beaked whales probably feed at or close to the bottom in deep oceanic waters (Heyning 1989; Heyning and Mead 1996; MacLeod et al. 2003). However feeding may also occur at mid-water rather than only at or near the bottom as shown from tagging data on Cuvier's and Blainville's beaked whales (Baird et al. 2004). This may also be the case with this species. Stomach content analyses of Hubbs' beaked whales indicated squid beaks, fish ear bones, and other fish bones (MacLeod et al. 2003; Mead et al. 1982). *Mesoplodon* species occupy an ecological niche distinct from that of Cuvier's beaked whales by feeding on smaller squids, allowing the different beaked whale species to coexist (MacLeod 2005; MacLeod et al. 2003).

Adult male Hubbs' beaked whales may fight each other, although this has not been directly observed. It is inferred from the scars and scratches found on their bodies (Heyning 1984; Jefferson et al. 2008). This species has not been documented to be prey to any other species, though it is likely subject to occasional killer whale predation like other whale species.

3.4.2.39.5 Species Specific Threats

Little information exists regarding species-specific threats to Hubbs' beaked whales in the Study Area.

3.4.2.40 Pygmy Beaked Whale (*Mesoplodon peruvianus*)

Literature published before the pygmy beaked whale was identified referred to it by the common name "*Mesoplodon* species A" (Pitman and Lynn 2001). The pygmy beaked whale was first described as a new species in 1991 (Jefferson et al. 2008).

3.4.2.40.1 Status and Management

The pygmy beaked whale is protected under the MMPA and is not listed under the ESA. Due to difficulty in distinguishing the *Mesoplodon* species, the United States management unit is defined to include all *Mesoplodon* species that occur in the area. The pygmy beaked whale has been combined with other *Mesoplodon* species to make up the California, Oregon, and Washington stock (Carretta et al. 2010).

3.4.2.40.2 Geographic Range and Distribution

Worldwide, beaked whales normally inhabit continental slope and deep oceanic waters (greater than 656 ft. [200 m]) and are only occasionally reported in waters over the continental shelf (Canadas et al. 2002; Ferguson et al. 2006; MacLeod et al. 2006a; Pitman 2008a; Waring et al. 2001). Based on stranding data from the Pacific coast of Mexico, the range of the pygmy beaked whale generally includes the California Current Large Marine Ecosystem and North Pacific Gyre (Aurioles and Urban-Ramirez 1993; Jefferson et al. 2008; Urban-Ramirez and Aurioles-Gamboa 1992). The only records of the pygmy beaked whale north of the eastern tropical Pacific are from stranding records from Bahia de La Paz, Mexico (Aurioles and Urban-Ramirez 1993; Urban-Ramirez and Aurioles-Gamboa 1992). This species was first described in 1991 from stranded specimens from Peru, and since then, strandings have been recorded along the coasts of both North and South America at Mexico, Peru, and Chile (Pitman and Lynn 2001; Reyes et al. 1991; Sanino et al. 2007). Based on sightings and strandings, the pygmy beaked whale is presumed to be found only in the eastern tropical Pacific. MacLeod et al. (2006a) suggested that the pygmy beaked whale occurs in the eastern Pacific from about 30° N to about 30° South (S).

No specific information regarding the migration of this species is available. It is not known whether the pygmy beaked whale is restricted to the eastern tropical and warm temperate Pacific or if it participates in a seasonal migration (Jefferson et al. 2008; Pitman 2008a).

3.4.2.40.3 Population and Abundance

The combined estimate of abundance for all species of *Mesoplodon* beaked whales in California, Oregon, and Washington waters out to 300 nm is 1,024 (coefficient of variation = 0.77) (Carretta et al. 2010).

3.4.2.40.4 Predator/Prey Interactions

All beaked whales probably feed at or close to the bottom in deep oceanic waters taking suitable prey opportunistically or as locally abundant (Heyning 1989; Heyning and Mead 1996; MacLeod et al. 2003). However feeding may also occur at mid-water rather than only at or near the bottom as shown from recent tagging data on Cuvier's and Blainville's beaked whales (Baird et al. 2004). This may also be the case with this species. Stomach contents analyses are available for only two pygmy beaked whales; the contents included no squid beaks but did include ear bones of perches and ray-finned fish (Reyes et al. 1991). *Mesoplodon* species occupy an ecological niche distinct from Cuvier's beaked whales by feeding on smaller squids, allowing the different beaked whale species to coexist and the stomach contents of this species suggests even less overlap with the Cuvier's beaked whale (MacLeod 2005; MacLeod et al. 2003).This species has not been documented to be prey to any other species, though it is likely subject to occasional killer whale predation like other whale species.

3.4.2.40.5 Species Specific Threats

There are no significant species-specific threats to pygmy beaked whales in the Study Area.

3.4.2.41 California Sea Lion (*Zalophus californianus*)

3.4.2.41.1 Status and Management

The California sea lion is protected under the MMPA and is not listed under the ESA. The California sea lion previously included three subspecies: *Zalophus californianus wollebaeki,* found on the Galapagos Islands; *Zalophus californianus japonicas,* found in Japan, but now believed extinct; and *Zalophus californianus californianus,* found from southern Mexico to southwestern Canada (Carretta et al. 2010).

These are now given the status of full species *Zalophus californianus*. The California sea lion is separated into three separate stocks for management purposes: the United States stock, which begins at the U.S.-Mexico border and extends northward into Canada; the western Baja California stock, which extends from the U.S.-Mexico border to the southern tip of the Baja California peninsula; and the Gulf of California stock, which includes the Gulf of California from the southern tip of the Baja California peninsula and across to the mainland and extends to southern Mexico (Carretta et al. 2010). California sea lions were periodically hunted in the 19th and 20th centuries for a variety of products which significantly reduced the population until protection began in the mid-20th century (Jefferson et al. 2008).

3.4.2.41.2 Geographic Range and Distribution

In the nonbreeding season, adult and subadult males migrate northward along the coast of California to Washington and return south the following spring (Lowry and Forney 2005). Females and juveniles also disperse somewhat, but tend to stay in the Southern California area (Lowry and Forney 2005; Melin and DeLong 2000; Thomas et al. 2010). California sea lions from the west coast of the Baja California peninsula also migrate to Southern California during the fall and winter (Lowry and Forney 2005). There is a general distribution shift northwest in fall and southeast during winter and spring, probably in response to changes in prey availability (Carretta et al. 2010).

The California sea lion occurs in the eastern north Pacific from Puerto Vallarta, Mexico, through the Gulf of California and north along the west coast of North America to the Gulf of Alaska (Barlow et al. 2008; Jefferson et al. 2008; Maniscalco et al. 2004). Typically during the summer, California sea lions congregate near rookery islands and specific open-water areas. The primary rookeries off the coast of the United States are on San Nicolas, San Miguel, Santa Barbara, and San Clemente Islands (Carretta et al. 2000; Le Boeuf and Bonnell 1980; Lowry et al. 1992; Lowry and Forney 2005). Haulout sites are also found on Santa Catalina Island in the Southern California Bight (Le Boeuf 2002). This species is prone to invade human-modified coastal sites that provide good hauling substrate, such as marinas, buoys, bait barges, and rip-rap tidal control structures.

California Current Large Marine Ecosystem. California sea lions can be found in the California Current Large Marine Ecosystem, often using deeper waters as habitat (Barlow et al. 2008; Jefferson et al. 2008; Lander et al. 2010). California sea lions are usually found in waters over the continental shelf and slope; however, they are also known to occupy locations far offshore in deep, oceanic waters, such as Guadalupe Island, Alijos Rocks off Baja California (Jefferson et al. 2008; Zavala-Gonzalez and Mellink 2000). California sea lions are the most frequently sighted pinnipeds offshore of Southern California during the spring, and peak abundance is during the May through August breeding season (Green et al. 1992; Keiper et al. 2005).

Tagged California sea lions from Monterey Bay and San Nicolas Island, California, demonstrated that adult males can travel more than 175 mi. (450 km) from shore during longer foraging bouts; however, females and subadults normally stay mostly within 25 mi. (65 km) of the coast (Thomas et al. 2010). Most individuals stay within 20 mi. (50 km) of the rookery islands during the breeding season (Melin and DeLong 2000). Individuals breeding on the Channel Islands typically feed over the continental shelf and remain within 60 mi. (150 km) of the islands. Tagging results showed that lactating females foraging along the coast would travel as far north as Monterey Bay and offshore to the 3,280 ft. (1,000 m) depth (Melin and DeLong 2000; Henkel and Harvey 2008). During the nonbreeding season, most locations of occurrence are over the slope or offshore; during the breeding season, most locations of occurrence are over the continental shelf (Melin and DeLong 2000).

3.4.2.41.3 Population and Abundance

The California sea lion is the most abundant pinniped along the California coast. The estimated population size of the U.S. stock of the California sea lion is 296,750 (Carretta et al. 2013). Overall, the California sea lion population is abundant and generally increasing (Jefferson et al. 2008; Carretta et al. 2010).

In spite of the robustness of the overall species population, the abundance of California sea lions has declined over the last decade in the Gulf of California, Mexico. Recent time-series data analysis supported the hypothesis that the Gulf of California has four subpopulations of California sea lions, most of which exhibit lower-than-expected growth rates and two of which have high probabilities of extinction within the next 50 years (Ward et al. 2010).

3.4.2.41.4 Predator/Prey Interactions

California sea lions are known to feed in both sea bottom and open-water habitats, which allows for a broader feeding spectrum than other pinnipeds that have overlapping foraging areas (e.g., Guadalupe fur seal). The California sea lion is adapted to cope with changes in prey availability (Aurioles-Gamboa and Camacho-Rios 2007). California sea lions feed on a variety of fish and cephalopod species, including salmon, Pacific sardines, northern anchovy, Pacific mackerel, Pacific whiting, rockfish, market squid, bass, cutlassfish, cusk eels, and various species of midshipmen and lanternfish (Lowry and Forney 2005; Jefferson et al. 2008). California sea lions have been documented to be preyed on by killer whales, sharks, coyotes, and feral dogs. In the California Channel Islands, California sea lion pups were at one time observed being preyed on by bald eagles (Jefferson et al. 2008; Heath and Perrin 2009).

3.4.2.41.5 Species Specific Threats

California sea lions are susceptible to entanglement and other interactions with fishery operations. Along California's coast mortality has been documented due to domoic acid toxicity, which is a neurotoxin associated with algal blooms.

Starting in January 2013, an elevated number of strandings of California sea lion pups were observed in five Southern California counties, including San Diego County, which is part of the Study Area. These strandings were declared an Unusual Mortality Event by NMFS. This is the sixth Unusual Mortality Event involving California sea lions that has occurred in California since 1991. The 2013 Unusual Mortality Event has been confined to California sea lion pups born in the summer of 2012. The stranded pups were found to be emaciated, dehydrated, and underweight for their age. The informally presented (reported in newspapers) hypothesis was that a shift in the sea lion prey may have resulting in these young animals being abandoned by their mothers.

3.4.2.42 Northern Fur Seal (*Callorhinus ursinus*)

3.4.2.42.1 Status and Management

Two stocks of northern fur seals (*Callorhinus ursinus*) are recognized in United States waters: an eastern Pacific stock and a San Miguel Island stock (Carretta et al. 2010). The eastern Pacific stock is listed as depleted under the MMPA, while the San Miguel Island stock is protected under the MMPA but is not considered depleted (Carretta et al. 2010). The northern fur seal is not listed under the ESA.

3.4.2.42.2 Geographic Range and Distribution

The range of the northern fur seal is known to include the North Pacific Transition Zone and California Current Large Marine Ecosystem (Jefferson et al. 2008; Gentry 2009). Northern fur seals range throughout the north Pacific along the West Coast, from California (32° N) to the Bering Sea, and west to the Okhotsk Sea and Honshu Island, Japan (36° N) (Baird and Hanson 1997; Carretta et al. 2010). They are typically found over the edge of the continental shelf and slope Sterling (Sterling and Ream 2004; Gentry 2009). Northern fur seals are found throughout their offshore range throughout the year, although seasonal peaks are known to occur. Females and subadult males are often observed off Canada's west coast during winter (Baird and Hanson 1997).

Insular Pacific-Hawaiian Large Marine Ecosystem. Northern fur seals do not normally occur in Hawaiian waters. In July 2012, an adult female northern fur seal was found on the north shore of Oahu in an emaciated condition. This was the first known occurrence of a northern fur seal in Hawaii and they are considered extralimital to those waters.

California Current Large Marine Ecosystem. In California waters, the northern fur seal can be found on San Miguel Island, nearby Castle Rock, the Farallon Islands, and occasionally San Nicolas Island during summer (Baird and Hanson 1997; Pyle et al. 2001). Northern fur seal colonies are at Adams Cove on San Miguel Island and on Castle Rock, an offshore island 0.4 mi. (1.1 km) northwest of San Miguel Island (Stewart et al. 1993). Although both stocks are found off California during the fall and winter, animals from the San Miguel Island stock remain in or near the area throughout the year (Koski et al. 1998).

Most northern fur seals, excluding those of the San Miguel Island stock, migrate along continental margins from low-latitude winter foraging areas to northern breeding islands (Ragen et al. 1995; Gentry 2009). They leave the breeding islands in November and concentrate around the continental margins of the north Pacific Ocean in January and February, where they have access to vast, predictable food supplies (Gentry 2009). Juveniles have been known to conduct trips between 8 and 29 days in duration, ranging from 66 to 2,230 mi. (171 to 680 km) (Sterling and Ream 2004). Adult female fur seals equipped with radio transmitters have been recorded conducting roundtrip foraging trips of up to 285 mi. (740 km) (National Marine Fisheries Service 2007b).

3.4.2.42.3 Population and Abundance

The current population estimate for the San Miguel Island stock is 9,968 (Carretta et al. 2010). Abundance at San Miguel Island has increased steadily over the past 4 decades, except for two severe declines associated with El Niño-Southern Oscillation events in 1993 and 1998 (Carretta et al. 2010).

3.4.2.42.4 Predator/Prey Interactions

Northern fur seals are opportunistic feeders. The principal prey off California includes northern anchovy, hake, Pacific saury, squid, rockfishes, and salmon (Kajimura 1984; Jefferson et al. 2008; Gentry 2009). This species is known to feed along the continental slope and off the shelf; females forage in areas of 330 to 655 ft. (100 to 200 m) in depth, while males forage in areas greater than 1,310 ft. (400 m) in depth (Calambokidis et al. 2004; Gentry 2009). This species may be preyed on by killer whales and sharks (Jefferson et al. 2008; Gentry 2009).

3.4.2.42.5 Species Specific Threats

There are no significant species-specific threats to northern fur seals in the Study Area.

3.4.2.43 Guadalupe Fur Seal (*Arctocephalus townsendi*)

3.4.2.43.1 Status and Management

The Guadalupe seal is listed as threatened under the ESA and depleted under the MMPA. Guadalupe fur seals were hunted nearly to extinction during the 1800s. All individuals alive today are recent descendants from one breeding colony at Guadalupe Island, Mexico, and are considered a single stock (Carretta et al. 2010).

3.4.2.43.2 Geographic Range and Distribution

The Guadalupe fur seal is typically found on shores with abundant large rocks, often at the base of large cliffs. They are also known to inhabit caves, which provide protection and cooler temperatures, especially during the warm breeding season (Belcher and Lee 2002).

Before intensive hunting decreased their numbers, Guadalupe fur seals ranged from Monterey Bay, California, to the Revillagigedo Islands, Mexico (Aurioles-Gamboa and Camacho-Ríos 2007). Guadalupe fur seals are most common at Guadalupe Island, Mexico, their primary breeding ground (Melin and Delong 1999). A second rookery was found in 1997 at the San Benito Islands off Baja California (Maravilla-Chavez and Lowry 1999). Adult and juvenile males have been observed at San Miguel Island, California, since the mid-1960s, and in the late 1990s, a pup was born on the island (Melin and Delong 1999). Sightings have also occurred at Santa Barbara, San Nicolas, and San Clemente Islands (Stewart 1981; Stewart et al. 1993).

California Current Large Marine Ecosystem. Guadalupe fur seals can be found in deeper waters of the California Current Large Marine Ecosystem (Hanni et al. 1997; Jefferson et al. 2008). Adult males, juveniles, and nonbreeding females may live at sea during some seasons or for part of a season (Reeves et al. 1992). The movements of Guadalupe fur seals at sea are generally unknown, but strandings have been reported in northern California and as far north as Washington (Etnier 2002). The northward movement of this species possibly has resulted from an increase in its population (Etnier 2002).

Guadalupe fur seals may migrate at least 230 mi. (600 km) from their rookery sites, based on observations of individuals in the Southern California Bight (Seagars 1984; Stewart et al. 1993). Females with pups are restricted to rookery areas because they must return to nurse their pups. Males typically undertake some form of seasonal movement either after the breeding season or during the winter, when prey availability is reduced (Arnould 2009). Several observations suggest that this species travels alone or in small groups of fewer than five (Belcher and Lee 2002; Seagars 1984).

3.4.2.43.3 Population and Abundance

A 1993 population estimate of all age classes in Mexico was 7,408 (Carretta et al. 2010). There is no population estimate for Guadalupe fur seals occurring in United States waters.

3.4.2.43.4 Predator/Prey Interactions

Guadalupe fur seals feed on a variety of cephalopods, fish, and crustaceans (Aurioles-Gamboa and Camacho-Ríos 2007). In the San Benito Islands, and possibly at Guadalupe Island and the offshore waters of California, Guadalupe fur seals primarily feed on cephalopods (Aurioles-Gamboa and Camacho-Ríos 2007). Guadalupe fur seals predominantly forage at night to take advantage of prey migrating vertically through the water column (Arnould 2009; Ronald and Gots 2003). Females have been observed feeding in the California Current south of Guadalupe Island and making an average round trip of 915 mi. (2,375 km) (Ronald and Gots 2003). Guadalupe fur seals are known to be preyed on by sharks and killer whales (Belcher and Lee 2002; Jefferson et al. 2008).

3.4.2.43.5 Species Specific Threats

There are no significant species-specific threats to Guadalupe fur seals in the Study Area. Critical habitat for the Guadalupe fur seal has not been designated given that the only areas that meet the definition for critical habitat are outside of U.S. jurisdiction (National Oceanic and Atmospheric Administration 1985).

3.4.2.44 Hawaiian Monk Seal (*Monachus schauinslandi*)

3.4.2.44.1 Status and Management

The Hawaiian monk seal was listed as endangered under the ESA in 1976 (National Marine Fisheries Service 1976) and is listed as depleted under the MMPA. The species is considered a high priority for recovery, based on the high magnitude of threats, the high recovery potential, and the potential for economic conflicts while implementing recovery actions (National Marine Fisheries Service 2007d). Hawaiian monk seals are managed as a single stock. There are six main reproductive subpopulations: at French Frigate Shoals, Laysan Island, Lisianski Island, Pearl and Hermes Reef, Midway Island, and Kure Atoll in the northwestern Hawaiian Islands with small numbers also occurring at Necker, Nihoa, and the main Hawaiian Islands (e.g., in 2008 there were an estimated 113 individuals in the main Hawaiian Islands and the total population is estimated to be fewer than 1,200 individuals) (National Marine Fisheries Service 2010b). The approximate area encompassed by the northwestern Hawaiian Islands was designated as the Papahanaumokuakea National Marine Monument in 2006.

A recovery plan for the Hawaiian monk seal was completed in 1983 and was revised in 2007 (National Marine Fisheries Service 2007d) In 1986, critical habitat was designated for all beach areas, sand spits and islets (including all beach crest vegetation to its deepest extent inland), lagoon waters, inner reef waters, and ocean waters to a depth of 10 ftm (18.3 m) around Kure Atoll, Midway Islands (except Sand Island), Pearl and Hermes Reef, Lisianski Island, Laysan Island, Gardner Pinnacles, French Frigate Shoals, Necker Island, and Nihoa Island in the northwestern Hawaiian Islands (National Marine Fisheries Service 1986). In 1988, the critical habitat was extended to include Maro Reef and waters around previously recommended areas out to the 20 ftm (36.6 m) isobath (National Marine Fisheries Service 1988). In order to reduce the probability of direct interaction between Hawaiian-based long-line fisheries and monk seals, a Protected Species Zone was put into place in the northwestern Hawaiian Islands, prohibiting long-line fishing in this zone. In 2000, the waters from 3 to 50 nm around the northwestern Hawaiian Islands were designated the northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, and specific restrictions were placed on human activities there (Antonelis et al. 2006).

In July of 2008, NMFS received a petition requesting that the critical habitat in the northwestern Hawaiian Islands be expanded to include Sand Island at Midway and ocean waters out to a depth of 500 m and that the following critical habitat be added in the main Hawaiian Islands: key beach areas, sand spits and islets, including all beach crest vegetation to its deepest extent inland, lagoon waters, inner reef waters, and ocean waters to a depth of 200 m. In October 2008, NMFS published a 90-day finding in response to the petition, announcing that a revision to the current critical habitat designation may be warranted (National Marine Fisheries Service 2008d). These Hawaiian monk seal critical habitat areas are shown in Figure 3.4-1.

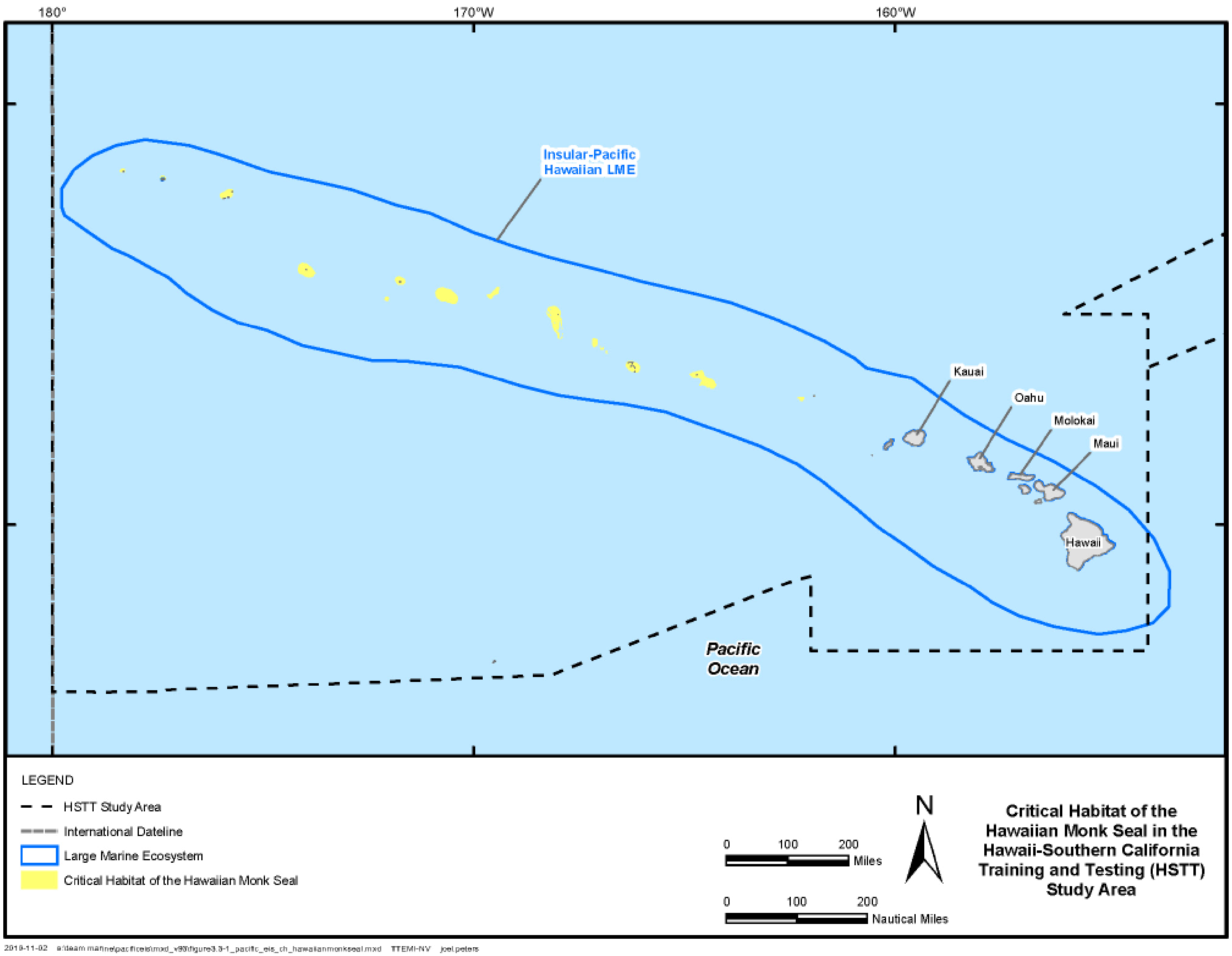


Figure 3.4-1: Critical Habitat of the Hawaiian Monk Seal in the Study Area

In June 2009, NMFS published a 12-month finding stating that it intended to revise critical habitat for the Hawaiian monk seal (National Marine Fisheries Service 2009c). In June 2011, NMFS proposed that critical habitat in the northwestern Hawaiian Islands be expanded to include Sand Island at Midway and ocean waters out to a depth of 500 m and that six new extensive areas in the main Hawaiian Islands be added (50 Code of Federal Regulations [C.F.R.] Part 226). Specific areas were excluded from critical habitat designation because it was determined that the national security benefits of exclusion outweighed the benefits of inclusion, and that their exclusion would not result in extinction of the species. The excluded areas include: Kingfisher Underwater Training area in marine areas off the northeast coast of Niihau; Pacific Missile Range Facility Main Base at Barking Sands, Kauai; Pacific Missile Range Facility Offshore Areas in marine areas off the western coast of Kauai; the Naval Defensive Sea Area and Puuloa Underwater Training Range in marine areas outside Pearl Harbor, Oahu; and the Shallow Water Minefield Sonar Training Range off the western coast of Kahoolawe in the Maui Nui area (50 C.F.R. Part 226).

The Pacific Island Regional Office of NMFS has the lead responsibility for the recovery of Hawaiian monk seals under the ESA and the MMPA. Since the early 1980s, NMFS has routinely applied flipper tags to weaned pups in the northwestern Hawaiian Islands (Antonelis et al. 2006). NMFS performed capture and release programs through the Head Start Program between 1981 and 1991, "to enhance the survival of young females and thereby increase their subsequent recruitment into the adult female population." From 1984 to 1995, under NMFS's Rehabilitation Project, undersized, weaned female pups from French Frigate Shoals and, in some cases, undersized juvenile females, were brought into captivity for 8 to 10 months on Oahu to increase their weight. They were then released into the wild at either Kure Atoll or Midway Islands, where they had a higher probability of survival (Antonelis et al. 2006). Because some males were injuring female seals, in July and August of 1994, 21 adult male Hawaiian monk seals that were known aggressors or that behaved like aggressors were relocated from Laysan Island to the main Hawaiian Islands (National Marine Fisheries Service 2009a). NMFS has relocated three female monk seals (a juvenile in 1981, a pup in 1991, and an adult in 2009) from the main Hawaiian Islands to the northwestern Hawaiian Islands (National Marine Fisheries Service 2009a).

Other agencies that also play an important role in the northwestern Hawaiian Islands are the Marine Mammal Commission, the U.S. Fish and Wildlife Service, which manages wildlife habitat and human activities within the lands and waters of the Hawaiian Islands National Wildlife Refuge and the Midway Atoll National Wildlife Refuge; the U.S. Coast Guard, which assists with enforcement and efforts to clean up marine pollution; the National Ocean Service, which conserves natural resources in the northwestern Hawaiian Islands Coral Reef Ecosystem Reserve; and the Western Pacific Regional Fishery Management Council, which develops fishery management plans and proposes regulations to NMFS for commercial fisheries around the northwestern Hawaiian Islands (Marine Mammal Commission 2002).

The State of Hawaii also has important responsibilities for monk seal conservation and recovery. It owns Kure Atoll and has jurisdiction over waters between the reserve boundary and 3 nm around all emergent lands in the northwestern Hawaiian Islands (except Midway) (Marine Mammal Commission 2002). In March 2007, the State of Hawaii put new regulations into place to restrict the use of lay nets on Oahu, Molokai, Lanai, Kauai, and Niihau and prohibited lay net use in state waters around the entire island of Maui and certain areas on Oahu (National Marine Fisheries Service 2010c). In 2008, in hopes of raising awareness about the plight of the species, Hawaii's Lieutenant Governor signed into law legislation that established the Hawaiian monk seal as the official state mammal.

When seals are reported on beaches in the main islands, NMFS works with state and local agencies to cordon off sections of beach around the seals. NMFS also relies on volunteer groups to observe seals and educate the public about their endangered status and protection measures. On Oahu, the Hawaiian Monk Seal Response Team Oahu is a team of over 50 volunteers who routinely assist National Oceanic and Atmospheric Administration Fisheries Pacific Island Regional Office and the Pacific Island Fisheries Science Center in monk seal response issues. Monk seal response programs also exist on Kauai, Maui and the Big Island, with some reporting from Molokai and Lanai (National Marine Fisheries Service 2010c).

There is also a multiagency marine debris working group that was established in 1998 to remove derelict fishing gear, which has been identified as a top threat to this species, from the northwestern Hawaiian Islands (Donohue and Foley 2007). Agencies involved in these efforts include The Ocean Conservancy, the City and County of Honolulu, the Coast Guard, the Fish and Wildlife Service, the Hawaii Wildlife Fund, the Hawaii Sea Grant Program, the National Fish and Wildlife Foundation, the Navy, the University of Alaska Marine Advisory Program, and numerous other state and private agencies and groups (Marine Mammal Commission 2002).

In 2010, National Oceanic and Atmospheric Administration Fisheries' Hawaiian Monk Seal Research Program and the Navy initiated a collaborative research effort to investigate potential impacts of Navy activities in HRC on Hawaiian monk seals. This research is underway and there are no conclusive results.

3.4.2.44.2 Geographic Range and Distribution

Monk seals can rapidly cover large areas in search of food and may travel hundreds of miles in a few days (Littnan et al. 2007).

Insular Pacific-Hawaiian Large Marine Ecosystem. The Hawaiian monk seal is the only endangered marine mammal whose range is entirely within the United States (National Marine Fisheries Service 2007d). Hawaiian monk seals can be found throughout the Hawaiian Island chain in the Insular Pacific-Hawaiian Large Marine Ecosystem. Sightings have also occasionally been reported on nearby island groups south of the Hawaiian Island chain, such as Johnston Atoll, Wake Island, and Palmyra Atoll (Caretta et al. 2010; Gilmartin and Forcada 2009; Jefferson et al. 2008; National Marine Fisheries Service 2009a). The six main breeding sites are in the northwestern Hawaiian Islands: Kure Atoll, Midway Islands, Pearl and Hermes Reef, Lisianski Island, Laysan Island, and French Frigate Shoals. Smaller breeding sites are on Necker Island and Nihoa Island, and monk seals have been observed at Gardner Pinnacles and Maro Reef. A small breeding population of monk seals is found throughout the main Hawaiian Islands, where births have been documented on most of the major islands, especially Kauai (Gilmartin and Forcada 2009; National Marine Fisheries Service 2007d, 2010b). It is possible that, before Western contact, Polynesians destroyed the Hawaiian monk seals from the main Hawaiian Islands and that the seals were driven to less desirable habitat in the northwestern Hawaiian Islands (Baker and Johanos 2004).

Combined ground and aerial surveys in the main Hawaiian Islands in 2000 and 2001 showed the number of seals to be greatest at the remote northwestern island of Niihau, which has the least human impact and is closer to the northwestern Hawaiian Islands populations. Abundances generally declined moving southeast along the island chain, where islands are more densely populated with humans (Baker and Johanos 2004). More seals have been documented on the islands of Kauai, Oahu, and Molokai than on Maui and Lanai and the Island of Hawaii (30 to 40 versus 5 to 10, respectively) (National Marine Fisheries Service 2010b).

Monk seals spend most of their time at sea in nearshore, shallow marine habitats (Littnan et al. 2007). When hauled out, Hawaiian monk seals seem to prefer beaches of sand, coral rubble, and rocky terraces (Baker et al. 2006; Jefferson et al. 2008).

Climate models predict that global average sea levels may rise considerably this century, potentially affecting species that rely on the coastal habitat. Topographic models of the low-lying northwestern Hawaiian Islands were created to evaluate potential effects of sea level rise by 2100. Monk seals, which require the islands for resting, molting, and nursing, may experience more crowding and competition if islands shrink (Baker et al. 2006).

Based on one study, on average, 10 to 15 percent of the monk seals migrate among the northwestern Hawaiian Islands and the main Hawaiian Islands (Caretta et al. 2010). Another source suggests that 35.6 percent of the main Hawaiian Island seals travel between islands throughout the year (Littnan 2011).

3.4.2.44.3 Population and Abundance

Currently, the best estimate for the total population of monk seals is 1,212 (Carretta et al. 2013). Population dynamics at the different locations in the northwestern Hawaiian Islands and the main Hawaiian Islands has varied considerably (Antonelis et al. 2006). The overall trend has been a steady decline, with the total number of Hawaiian monk seals decreasing from a 2007 estimate of 1,146 individuals (Littnan 2011). In the northwestern Hawaiian Islands, where most seals reside, the decline in abundance is approximately 4 percent per year. While this decline has been occurring in the northwestern Hawaiian Islands, the number of documented sightings and annual births in the main Hawaiian Islands has increased since the mid-1990s (Baker 2004). In the main Hawaiian Islands, a minimum abundance of 45 seals was found in 2000, and this increased to 52 in 2001 (Baker 2004). In 2009, 113 individual seals were identified in the main Hawaiian Islands based on flipper tag ID numbers or unique natural markings. The total number in the main Hawaiian Islands is estimated to be around 153 animals (Carretta et al. 2013).

Possible links between the spatial distribution of primary productivity in the northwestern Hawaiian Islands and trends of Hawaiian monk seal abundance have been assessed for the past 40-plus years. Results demonstrate that monk seal abundance trends appear affected by the quality of local environmental conditions (including sea surface temperature, vertical water column structure, and integrated chlorophyll) (Schmelzer 2000). Limited prey availability may be restricting the recovery of the northwestern Hawaiian Islands monk seals (Baker 2008; Brillinger et al. 2006; Caretta et al. 2010). Before the increase in births, a steady decline was noted in pup mortality in the westernmost atolls (Johnson et al. 1982). Studies performed on pup survival rate in the northwestern Hawaiian Islands between 1995 and 2004 showed severe fluctuations between 40 percent and 80 percent survival in the first year of life. Survival rates between 2004 and 2008 showed an increase at Lisianski Island and Pearl, Hermes, Midway, and Kure Atoll and a decrease at French Frigate Shoals and Laysan Island. Larger females have a higher survival rate than males and smaller females (Baker 2008).

Estimated chances of survival from weaning to age one are higher in the main Hawaiian Islands (77 percent) than in the northwestern Hawaiian Islands (42 to 57 percent) (Littnan 2011). The estimated main Hawaiian Islands intrinsic rate of population growth is greater as well, when compared to northwestern Hawaiian Islands estimates (1.13 versus 0.89 to 0.98, respectively) (Littnan 2011). If current trends continue, abundances in the northwestern Hawaiian Islands and main Hawaiian Islands will equalize in approximately 9 years (Littnan 2011). There are a number of possible reasons why pups in the main Hawaiian Islands are faring better. One is that the per capita availability of prey may be higher in the main Hawaiian Islands, due to the low monk seal population (Baker and Johanos 2004). Another may have to do with the structure of the marine communities. In the main Hawaiian Islands, the seals have less competition with other top predators, like large sharks, jacks, and other fish, which may enhance their foraging success (Baker and Johanos 2004; Parrish et al. 2008).

A third factor may be the limited amount of suitable foraging habitat in the northwestern Hawaiian Islands (Stewart et al. 2006). While foraging conditions are better in the main Hawaiian Islands than in the northwestern Hawaiian Islands, health hazards from exposure to pollutants and infectious disease agents associated with terrestrial animals pose risks not found in the northwestern Hawaiian Islands (Littnan et al. 2007). Despite these risks, a self-sustaining subpopulation in the main Hawaiian Islands could improve the monk seal's long-term prospects for recovery (Baker and Johanos 2004; Carretta et al. 2005; Marine Mammal Commission 2003).

3.4.2.44.4 Predator/Prey Interactions

Hawaiian monk seals feed opportunistically on at least 40 species of bottom or near-bottom fish, cephalopods, and spiny lobster (Goodman-Lowe 1998; Parrish et al. 2000). Some of the more common varieties of fish include wrasses, squirrel fish, triggerfish, parrotfish, and many varieties of eels. Juveniles feed on small, hidden, bottom-dwelling prey (Parrish et al. 2000). Foraging habitat near the breeding atolls and seamounts is commonly restricted to waters of less than 330 ft. (100 m) in depth (Parrish et al. 2000). The inner reef waters next to the islands are critical to weaned pups learning to feed; pups move laterally along the shoreline, but do not appear to travel far from shore during the first few months after weaning (Gilmartin and Forcada 2009). Feeding has been observed in reef caves, as well as on fish hiding among coral formations (Parrish et al. 2000). A recent study showed that this species is often accompanied by large predatory fish, such as jacks, sharks, and snappers, which possibly steal or compete for prey that the monk seals flush with their probing, digging and rock-flipping behavior. The juvenile monk seals may not be of sufficient size or weight to get prey back once it has been stolen. This was noted only in the French Frigate Shoals (Parrish et al. 2008).

Monk seals and are known to be preyed on by both killer whales and sharks. Shark predation is one of the major sources of mortality for this species especially in the northwestern Hawaiian Islands. Galapagos sharks are a large source of juvenile mortality in the northwestern Hawaiian Islands, with most predation occurring in the French Frigate Shoals (Antonelis et al. 2006; Gilmartin and Forcada 2009; Jefferson et al. 2008).

In an effort to better understand the habitat needs of foraging monk seals et al. (Stewart et al. 2006) used satellite-linked radio transmitters to document the geographic and vertical foraging patterns of 147 Hawaiian monk seals from all six northwestern Hawaiian Islands breeding colonies, from 1996 through 2002. Geographic patterns of foraging were complex and varied among colonies by season, age, and sex, but some general patterns were evident. Seals were found to forage extensively within barrier reefs of the atolls and on the leeward slopes of reefs and islands at all colony sites. They also ranged away from these sites along the Hawaiian Islands submarine ridge to most nearby seamounts and submerged reefs and banks (Stewart et al. 2006).

In 2005, 11 juvenile and adult monk seals were tracked in the main Hawaiian Islands using satellite-linked radio transmitters showing location, but not depth (Littnan et al. 2007). Similar to the northwestern Hawaiian Islands, monk seals showed a high degree of individual variability. Overall results showed most foraging trips to last from a few days to 1 to 2 weeks, with seals remaining within the 650 ft. (200 m) isobaths surrounding the main Hawaiian Islands and nearby banks (Littnan et al. 2007).

Recently NMFS and Navy have also monitored monk seals with cell phone tags (Littnan 2011; Reuland 2010). Preliminary results from one individual monk seal (R012) indicated travel of much greater distances and water depths than previously documented (Littnan 2011). The track of this monk seal extended as much as 470 mi. (756.4 km)from shore and a total distance of approximately 2,000 mi. (3,218.7 km)where the ocean is over 5,000 m (5,468.1 yards [yd.]) in depth (Figure 3.4-2).

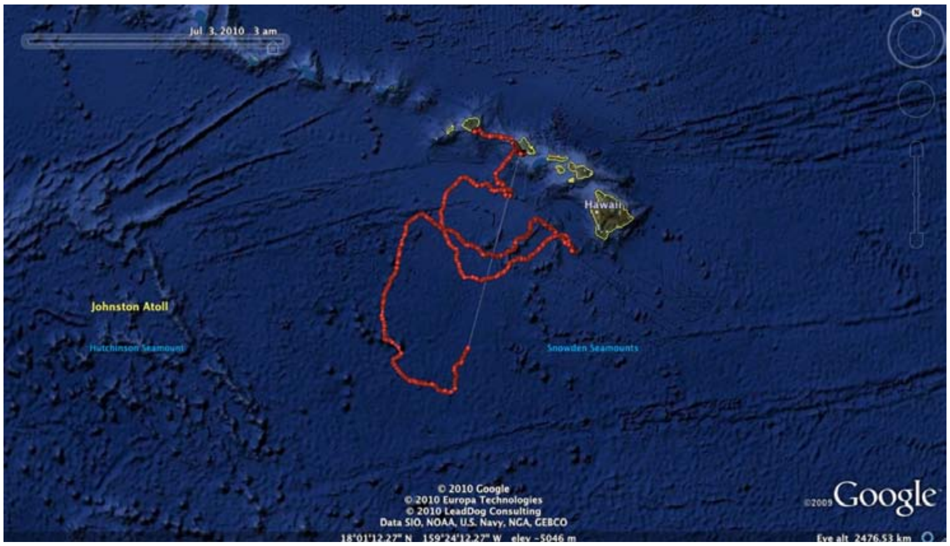


Figure 3.4-2: Track of Hawaiian Monk Seal R012 in June 2010

3.4.2.44.5 Species Specific Threats

Monk seals are particularly susceptible to fishery interactions and entanglements. In the northwestern Hawaiian Islands, derelict fishing gear has been identified as a top threat to the monk seal (Donohue and Foley 2007), while in the main Hawaiian Islands, high risks are associated with health hazards from exposure to pollutants and infectious disease agents associated with terrestrial animals. Limited prey availability may be restricting the recovery of the northwestern Hawaiian Islands monk seals (Baker 2008; Brillinger et al. 2006; Caretta et al. 2010). Since they rely on coastal habitats for survival, monk seals may be affected by future sea level rise and loss of habitat as predicted by global climate models. Another species-specific threat includes aggressive male monk seals that have been documented to injure and sometimes kill females and pups (National Marine Fisheries Service 2010c).

3.4.2.45 Northern Elephant Seal (*Mirounga angustirostris*)

The northern elephant seal is one of two species of elephant seal.

3.4.2.45.1 Status and Management

The northern elephant seal is protected under the MMPA and is not listed under the ESA. The northern elephant seal population has recovered dramatically after being reduced to perhaps no more than 10 to 100 animals surviving in Mexico in the 1890s (Caretta et al. 2010; Hoelzel 1999; Stewart et al. 1994). Movement and some genetic interchange occur among rookeries, but most elephant seals return to the rookeries where they were born to breed and thus may have limited genetic differentiation (Caretta et al. 2010). There are two distinct populations of northern elephant seals: one that breeds in Baja California, Mexico, and a population that breeds on islands off California in the U.S. Animals of this species in the Study Area are from the California Breeding Stock.

3.4.2.45.2 Geographic Range and Distribution

Northern elephant seals are found in both coastal and deep waters of the eastern and central north Pacific. Breeding and pupping take place on offshore islands and mainland rookeries (Caretta et al. 2010; Jefferson et al. 2008). With most of their prey are found in open oceans, the northern elephant seal is often found in deepwater zones (Jefferson et al. 2008; Stewart and DeLong 1995). Northern elephant seals spend little time nearshore, and migrate through offshore waters four times a year as they travel to and from breeding/pupping and molting areas on various islands and mainland sites along the Mexico and California coasts. Small colonies of northern elephant seals breed and haul-out on Santa Barbara Island with large colonies on San Nicolas and San Miguel Islands (U.S Department of the Navy 2008b).

Insular Pacific-Hawaiian Large Marine Ecosystem. There are two records of northern elephant seals being present in the Hawaiian Islands, indicating that movements beyond their normal range do occur but are very rare. A female, an immature male, and mature male were sighted on Midway Island in the northwestern Hawaiian Islands in 1978 (Tomich 1986). On 2 January 2002, a juvenile male elephant seal was discovered on Molokai and reported to be the second confirmed sighting since 2001 (National Marine Fisheries Service 2006). This same elephant seal was next encountered on 11 January 2002 on the Kona coast of Hawaii at Kawaihae Beach and later at the Kona Village Resort where it was captured and returned to California by the NMFS (Fujimori 2002).

California Current Large Marine Ecosystem. Northern elephant seals are found in coastal areas and deeper waters of the California Current Large Marine Ecosystem (Caretta et al. 2010; Jefferson et al. 2008). The foraging range of northern elephant seals extends thousands of kilometers offshore from the breeding range into the central North Pacific Transition Zone; however, their range is not considered to be continuous across the Pacific (Stewart and Huber 1993; Simmons et al. 2010). Adult males and females segregate while foraging and migrating (Stewart 1997; Stewart and DeLong 1995; Simmons et al. 2010). Adult females mostly range west to about 173° W, between the latitudes of 40° N and 45° N, whereas adult males range farther north into the Gulf of Alaska and along the Aleutian Islands to between 47° N and 58° N (Le Boeuf et al. 2000; Robinson et al. 2012; Stewart and DeLong 1995; Stewart and Huber 1993). Adults stay offshore during migration, while juveniles and subadults are often seen along the coasts of Oregon, Washington, and British Columbia (Stewart et al. 1993).

The northern elephant seal is found only in the north Pacific Ocean and occurs almost exclusively in the eastern and central north Pacific. Northern elephant seals breed on island and mainland rookeries from central Baja California, Mexico, to northern California (Stewart et al. 1993). This species is observed as far north as the Gulf of Alaska and is one of the most common pinnipeds observed in waters off Washington (Calambokidis et al. 2004; Jefferson et al. 2008). However, vagrant individuals do sometimes range to the western north Pacific. Northern elephant seals occur in Hawaiian waters only rarely as extralimital vagrants. The most far-ranging individual appeared on Nijima Island off the Pacific coast of Japan in 1989 (Kiyota et al., 1992). This demonstrates the great distances that these animals are capable of covering.

Breeding occurs primarily on offshore islands (Stewart and DeLong 1994). In California, elephant seals breed in the southern Channel Islands (Stewart and DeLong 1994). There are large rookeries on San Miguel and San Nicolas Islands and smaller rookeries on Santa Barbara and San Clemente Islands (Stewart and DeLong 1994; Stewart et al. 1993). Elephant seals use these islands as rookeries from late December to February, and to molt from April to July. Some evidence indicates that elephant seals may be expanding their pupping range northward, possibly in response to continued population growth (Hodder et al. 1998). Hodder et al. (1998) noted a possible emerging breeding colony at Shell Island off

Cape Arago in southern Oregon. Other northern mainland breeding rookeries include Ano Nuevo, Point Reyes and Cape San Martin (Stewart et al. 1994).

Open Ocean. Elephant seals spend more than 80 percent of their annual cycle at sea, making long migrations to offshore foraging areas and feeding intensively to build up the blubber stores required to support them during breeding and molting haulouts (Hindell and Perrin 2009). This migration takes place twice a year, the first for periods of up to 8 months. They range widely offshore in the northern Pacific Ocean. These migrations occur after the end of the breeding season from island rookeries in California waters to offshore foraging areas of the north Pacific and Gulf of Alaska. Typically this species returns to land to molt (2 to 4 months in duration) and then returns to sea before the following breeding season (Stewart and DeLong 1994).

3.4.2.45.3 Population and Abundance

The population estimate for the California stock is 124,000 (Carretta et al. 2010). The population in California continues to increase, but the Mexican stock appears to be stable or slowly decreasing (Carretta et al. 2010; Stewart and DeLong 1994).

3.4.2.45.4 Predator/Prey Interactions

The diet of the northern elephant seal is known to include 53 different prey species (Antonelis et al. 1994; Jefferson et al. 2008). They primarily feed on cephalopods, hake, and other near-surface and mid-water fishes and crustaceans, such as pelagic red crabs as well as open ocean prey and bottom-dwelling prey (Stewart and Huber 1993). This species is not known to feed in the Study Area. Elephant seals from the Mexico breeding stock probably feed farther south and over a broader longitudinal scale than those from the California breeding stock (Aurioles-Gamboa and Camacho-Ríos 2007). Male and female northern elephant seals are known to conduct different foraging strategies. Males feed near the eastern Aleutian Islands and in the Gulf of Alaska, and females feed farther south, south of 45° N (Carretta et al. 2010; Stewart and Huber 1993). Females range widely over deep water, apparently foraging on patchily distributed, vertically-migrating, open ocean prey (Le Boeuf et al. 2000). Males forage along the continental margin at the end of their migration and may feed on bottom-dwelling prey (Le Boeuf et al. 2000). Northern elephant seals are preyed on by killer whales and great white sharks, which have been known to group around the haulout and rookery sites of this species (Hindell and Perrin 2009; Jefferson et al. 2008; Klimley et al. 2001).

3.4.2.45.5 Species Specific Threats

There are no significant species-specific threats to northern elephant seals in the Study Area.

3.4.2.46 Harbor Seal (*Phoca vitulina*)

3.4.2.46.1 Status and Management

The harbor seal is protected under the MMPA and is not listed under the ESA. Harbor seals are distributed in temperate to cold water regions in the north Pacific. Two subspecies of this seal are recognized in the Pacific: *Phoca vitulina richardii* in the eastern Pacific, and *Phoca vitulina stejnegeri* in the western Pacific (Burns 2008; Jefferson et al. 2008).

3.4.2.46.2 Geographic Range and Distribution

The harbor seal is one of the most widely-distributed seals, found in nearly all temperate coastal waters of the northern hemisphere (Jefferson et al. 2008). Harbor seals, while primarily aquatic, also use the coastal terrestrial environment, where they haulout of the water periodically. Harbor seals are a coastal species, rarely found more than 7.7 mi. (20 km) from shore, and frequently occupying bays, estuaries, and inlets (Baird 2001). Individual seals have been observed several kilometers upstream in coastal rivers (Baird 2001). Harbor seals are not considered migratory (Burns 2008; Jefferson et al. 2008).

Ideal harbor seal habitat includes suitable haulout sites, shelter during the breeding periods, and sufficient food near haulout sites to sustain the population throughout the year (Bjorge 2002). Haulout sites vary, but include intertidal and subtidal rock outcrops, sandbars, sandy beaches, and even peat banks in salt marshes (Burns 2008; Gilbert and Guldager 1998; Prescott 1982; Schneider and Payne 1983; Wilson 1978).

Small numbers of harbor seals are found hauled out on coastal and island sites and forage in the nearshore waters of the SOCAL Range Complex, but are found in only moderate numbers compared to sea lions and elephant seals. The harbor seal haul-out sites include mainland beaches and all of the Channel Islands, including Santa Barbara, Santa Catalina, and San Nicolas Islands (Lowry et al. 2008).

California Current Large Marine Ecosystem. There are six stocks of harbor seal along the U.S. west coast with the California Stock occurring within the Study Area. The harbor seal is widely distributed in the eastern north Pacific ocean, extending from the Pribilof Islands in Alaska to Baja California, Mexico. (Carretta et al. 2011; Hauksson and Bogason 1997). In California, approximately 400 to 600 harbor seal haulout sites are widely distributed along the mainland and on offshore islands (Lowry and Forney 2005). Harbor seals have not been observed on the mainland coast of Los Angeles, Orange, and northern San Diego Counties (Henkel and Harvey 2008; Lowry et al. 2008).

3.4.2.46.3 Population and Abundance

The global population estimate of harbor seals is approximately 300,000 to 500,000. An estimated 242,000 of the *Phoca vitulina richardii* subspecies occur along the West Coast from Southern California to Alaska and in the Bering Sea-not inclusive of a small number of seals in Mexico (Allen and Angliss 2010; Caretta et al. 2010). The harbor seal population in California is estimated at 34,233 (Caretta et al. 2010).

3.4.2.46.4 Predator/Prey Interactions

The main prey species of the harbor seal are cod, some rockfish species, sand eels, saithe, herring, catfish, and capelin. Harbor seals are also known to feed on cephalopods. Pups feed on bottom-dwelling crustaceans during their first few weeks of foraging. Sand eels are the main prey for individuals foraging in the south of their range, while cod is the main prey for other geographic areas included in the harbor seal range. There is no seasonal variation in prey species, but capelin and herring are more numerous in the fall and winter (Hauksson and Bogason 1997; Jefferson et al. 2008; Reeves et al. 1992). Harbor seals are known to be preyed on by killer whales, sharks, eagles, ravens, gulls, and coyotes (Burns 2008; Weller 2008).

3.4.2.46.5 Species Specific Threats

There are no significant species-specific threats to harbor seals in the Study Area.

3.4.2.47 Sea Otter (*Enhydra lutris neris*)

The southern sea otter (*Enhydra lutris nereis*) occurs off the coast of central California ranging from Half Moon Bay in the north to Santa Barbara and at San Nicolas Island in the south (Tinker et al. 2006).

3.4.2.47.1 Status and Management

Unlike all other marine mammals in the Study Area which are under the jurisdiction of NMFS, the southern sea otter is a species under the federal jurisdiction of the United States Department of the Interior, Fish and Wildlife Service. The coastal population of southern sea otter is listed as threatened under the ESA but this coastal population was not present in the Study Area. In California, the southern sea otter range extends as far south as Santa Barbara County, elsewhere also referred to as part of central California (Tinker et al. 2006; U.S. Department of the Interior 2012b). The southern sea otter range therefore ended well north (approximately 78 mi. [126 km]) of the northern boundary of the SOCAL Range Complex (along a line from Dana Point to San Nicolas Island) portion of the Study Area.

In addition to the southern sea otter inhabiting the central California coastline, there was a translocated "non-essential experimental population"[16] of sea otters established by U.S. Fish and Wildlife Service on San Nicolas Island. San Nicolas Island is managed by the Navy and is within the overlapping boundaries of the Study Area and the Point Mugu Sea Range. The goal of the southern sea otter translocation program was to establish a population at San Nicolas Island sufficient to repopulate other areas of the range should a catastrophic oil spill affect the mainland (California coast) population. Between August 1987 and March 1990, the U.S. Fish and Wildlife Service released 140 sea otters at San Nicolas Island (U.S. Department of the Interior 2003). The Navy continues to support efforts by the U.S. Fish and Wildlife Service to assess the translocated colony of southern sea otters at San Nicolas Island and to encourage and facilitate ongoing research and adaptive management strategies to further the stewardship of these animals. Current and past Navy activities have not triggered any regulatory requirements pursuant to the MMPA or ESA for sea otter (U.S. Department of the Navy 2002).

3.4.2.47.2 Geographic Range and Distribution

Sea otters are primarily found nearshore in relatively shallow water areas since they dive to gather food from the ocean floor. Tinker et al., (2006) report that the critical foraging habitat depth range is 2 to 35m (6 to 115 ft.) for southern sea otter. Sea otters rarely come ashore and spend most of their life in the ocean where they regularly swim, feed, and rest and may occasionally be present in deeper waters when moving between areas or in attempts to establish new habitat (Burn and Doroff 2005). Tinker et al. (2006) indicate that sea otters spend between 36-52 percent of time at the surface between dives, depending on the size and type of prey being consumed.

California Current Large Marine Ecosystem. The southern sea otters at San Nicolas Island are there as a result of a translocation program conducted by the U.S. Fish and Wildlife Service under the governance of Public Law 99-625. There have been only two sea otters detected within the coastal area of the SOCAL Range Complex in the last 5 years. The first occurred in June 2006 with the discovery of a dead, severely emaciated immature male sea otter at North Island. Indications from necropsy suggested a probability that he had weaned, headed south along the coast (presumably from the Santa Barbara area), and was unable to find enough food to survive (Danil 2006). The second and most recent sighting occurred in October 2011 and was a single sea otter observed nearshore to the entrance to San Diego Bay. Adult and sub-adult males throughout the range tend to move to the southern range periphery (Santa Barbara County) during the late winter and early spring (Riedman and Estes 1990; Tinker et al. 2006); however, sea otters from the central California coastal population are considered extralimital (i.e., not expected in a given area) in the SOCAL Range Complex.

[16] As defined under Section 10 of the ESA and in Public Law 99-625; see U.S. Congress 1986 and DOI 2011.

3.4.2.47.3 Population and Abundance

There are approximately 51 independent southern sea otters (plus eight pups) currently at San Nicolas Island (Carswell 2013). On average, the San Nicolas Island otter translocated colony has slowed from an annual rate of approximately 9 percent since its low point in 1993 (Tinker et al. 2008). The average 2.5 percent growth rate for the translocated colony at San Nicolas Island over 3 years of the 5 years between 2006 and 2010) was higher than the remainder of the southern sea otter population with an average growth rate for this period of approximately 0.3 percent (U.S. Department of Interior 2012b). The current minimum population estimate of central California coastline (“mainland”) southern sea otters (2006–2010) is 2,719 (U. S. Department of Interior 2012b).

3.4.2.47.4 Predator/Prey Interactions

Sea otters forage on or near the bottom in shallow waters, often in kelp beds and bring their prey to the surface to feed. They may occasionally hunt visually, but are most likely tactile feeders, as evidenced by a tendency to forage at night (Shimek 1977; Wilkin 2003). Major prey items are benthic invertebrates, such as abalones, sea urchins, and rock crabs. Sea otters also eat other types of shellfish, cephalopods, and sluggish near-bottom fishes. The diet varies with the physical and biological characteristics of the habitats in which they live (see reviews by Estes et al. 2009; Riedman and Estes 1990). During El Niño events off the California coast, sea otters may also take advantage of unusually abundant prey. Squid (*Loligo* species) and red crabs (*Pleuroncodes planipes*) are examples of prey items that are only available from time to time (Estes et al. 2009).

Sea otters exhibit individual differences not only in prey choice but also in choice and method of tool use, in areas where they forage, and in water depth (Estes et al. 2009; Riedman and Estes 1990). Some tools, such as rocks or other hard objects, are hidden in skin flaps under the front limbs (Jefferson et al. 2008). In rocky-bottom habitats, sea otters generally forage for large-bodied prey offering the greatest caloric reward. In soft-bottom habitats, prey is smaller and more difficult to find; sea otters feed on a variety of burrowing invertebrates. Sea otters have been known to be preyed on by eagles and generally feed at night to avoid potential predators (Jefferson et al. 2008; Riedman and Estes 1990). They are also considered likely prey for killer whales and sharks. In some cases they have been preyed upon by coyotes (Weller 2008).

San Nicolas Island otters are subject to different habitat conditions and stressors than those inhabiting the central California coastline (Carretta et al. 2009; Tinker et al. 2008). Navy management and restricted access to the area has had a beneficial effect. As has been reported, the abundance of sea otter prey at San Nicolas exceeds that at the central California coastline by as much as three orders of magnitude (Tinker et al. 2008). As a result of greater prey availability for sea otter in the translocated colony at San Nicolas Island, the average food intake rate was more than double, only half as much time was spent foraging, and they were in better body condition in comparison to southern sea otter present along the central Calfornia coastline (Tinker et al. 2008).

3.4.2.47.5 Species Specific Threats

There are no known specific threats to the San Nicolas Island colony of southern sea otter (U.S. Department of the Navy 2002).

3.4.3 ENVIRONMENTAL CONSEQUENCES

This section evaluates how and to what degree the activities described in Chapter 2 (Description of Proposed Action and Alternatives) potentially impact marine mammals known to occur within the Study

Area. Tables 2.8-1 through 2.8-5 present the baseline and proposed typical training and testing activity locations for each alternative (including number of events and ordnance expended). The stressors vary in intensity, frequency, duration, and location within the Study Area. The stressors applicable to marine mammals in the Study Area that are analyzed below include the following:

- Acoustic (sonar and other active acoustic sources, explosives, pile driving, swimmer defense airguns, weapons firing, launch, and impact noise, vessel noise, aircraft noise)
- Energy (electromagnetic devices)
- Physical disturbance and strikes (vessels and in-water devices, military expended materials, seafloor devices)
- Entanglement (fiber optic cables, guidance wires, and parachutes)
- Ingestion (munitions, and military expended materials other than munitions)
- Secondary stressors

In this analysis, marine mammal species are grouped together based on similar biology (e.g., hearing) or behaviors (e.g., feeding or expected reaction to stressors) when most appropriate for the discussion. In addition, for some stressors, species are grouped based on their taxonomic relationship and discussed as follows: mysticetes (baleen whales), odontocetes (toothed whales), pinnipeds (seals and sea lions), and mustelids (sea otter).

When impacts are expected to be similar to all species or when it is determined there is no impact on any species, the discussion will be general and not species-specific. However, when impacts are not the same to certain species or groups of species, the discussion will be as specific as the best available data allow. In addition, if activities only occur in or will be concentrated in certain areas, the discussion will be geographically specific. Based on acoustic thresholds and criteria developed with NMFS, impacts from sound sources as stressors will be quantified at the species or stock level as is required pursuant to authorization of the proposed actions under the MMPA.

In cases where potential impacts rise to the level that warrants mitigation, mitigation measures designed to minimize the potential impacts are discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring). In addition to the measures presented, additional mitigations or different mitigations or both may subsequently be implemented in coordination with NMFS resulting from the MMPA authorization and ESA consultation processes.

3.4.3.1 Acoustic Stressors

3.4.3.1.1 Non-Impulsive and Impulsive Sound Sources

Long recognized by the scientific community (Payne and Web 1971), and summarized by the National Academies of Science, human-generated sound could possibly harm marine mammals or significantly interfere with their normal activities (National Research Council 2005). Assessing whether a sound may disturb or injure a marine mammal involves understanding the characteristics of the acoustic sources, the marine mammals that may be present in the vicinity of the sound, and the effects that sound may have on the physiology and behavior of those marine mammals. Although it is known that sound is important for marine mammal communication, navigation, and foraging (National Research Council 2003; National Research Council 2005), there are many unknowns in assessing impacts such as the potential interaction of different effects and the significance of responses by marine mammals to sound exposures (Nowacek et al. 2007; Southall et al. 2007). Furthermore, many other factors besides just the received level of sound may affect an animal's reaction such as the animal's physical condition, prior experience with the sound, and proximity to the source of the sound.

The methods used to predict acoustic effects to marine mammals build on the *Conceptual Framework for Assessing Effects from Sound-Producing Activities* (Section 3.0.5.7.1). Additional research specific to marine mammals is presented where available.

3.4.3.1.2 Analysis Background and Framework

3.4.3.1.2.1 Direct Injury

The potential for direct injury in marine mammals has been inferred from terrestrial mammal experiments and from post-mortem examination of marine mammals believed to have been exposed to underwater explosions (Richmond et al. 1973; Yelverton et al. 1973; Ketten et al. 1993). Additionally, non-injurious effects on marine mammals (e.g., Temporary Threshold Shift [TTS]) are extrapolated to injurious effects (e.g., Permanent Threshold Shift [PTS]) based on data from terrestrial mammals to derive the criteria serving as the potential for injury (Southall et al. 2007). Actual effects on marine mammals may differ from terrestrial animals due to anatomical and physiological adaptations to the marine environment, e.g., some characteristics such as a reinforced trachea and flexible thoracic cavity (Ridgway and Dailey 1972) may or may not decrease the risk of lung injury.

Potential direct injury from non-impulsive sound sources, such as sonar, is unlikely due to relatively lower peak pressures and slower rise times than potentially injurious sources such as explosives. Even for the most sensitive auditory tissues, including strandings associated with use of sonar, Ketten (2012) has recently summarized, "to date, there has been no demonstrable evidence of acute, traumatic, disruptive, or profound auditory damage in any marine mammal as the result [of] anthropogenic sound exposures, including sonar." Non-impulsive sources such as sonar also lack the strong shock wave such as that associated with an explosion. Therefore, primary blast injury and barotrauma (i.e., injuries caused by large, rapid pressure changes) could not be caused by non-impulsive sources such as sonar. The theories of sonar induced acoustic resonance and sonar induced bubble formation are discussed below. These phenomena, if they were to occur, would require the co-occurrence of a precise set of circumstances that in the natural environment under real-world conditions are unlikely to occur.

Primary Blast Injury and Barotrauma

The greatest potential for direct, non-auditory tissue effects is primary blast injury and barotrauma after exposure to high amplitude impulsive sources, such as explosions. Primary blast injury refers to those injuries that result from the initial compression of a body exposed to a blast wave. Primary blast injury is usually limited to gas- containing structures (e.g., lung and gut) and the auditory system (Phillips and Richmond 1990; Craig and Hearn 1998; Craig Jr. 2001). Barotrauma refers to injuries caused when large pressure changes occur across tissue interfaces, normally at the boundaries of air-filled tissues such as the lungs. Primary blast injury to the respiratory system, as measured in terrestrial mammals, may consist of pulmonary contusions, pneumothorax, pneumomediastinum, traumatic lung cysts, or interstitial or subcutaneous emphysema (Phillips and Richmond 1990). These injuries may be fatal depending upon the severity of the trauma. Rupture of the lung may introduce air into the vascular system, possibly producing air emboli that can cause a cerebral infarct or heart attack by restricting oxygen delivery to these organs. Though often secondary in life-threatening severity to pulmonary blast trauma, the gastrointestinal tract can also suffer contusions and lacerations from blast exposure, particularly in air-containing regions of the tract. Potential traumas include hematoma, bowel perforation, mesenteric tears, and ruptures of the hollow abdominal viscera. Although hemorrhage of solid organs (e.g., liver, spleen, and kidney) from blast exposure is possible, rupture of these organs is rarely encountered.

The only known occurrence of mortality or injury to a marine mammal due to a U.S. Navy training or testing event involving impulsive sources (use of underwater explosives) occurred in March 2011 in nearshore waters off San Diego, California, at the Silver Strand Training Complex. This area has been used for underwater demolitions training for at least three decades without incident. On this occasion, however, a group of long-beaked common dolphins entered the mitigation zone and approximately 1 minute after detonation, three animals were observed dead at the surface; a fourth animal was discovered three days later stranded dead approximately 42 mi. (68 km) to the north of the detonation site. Upon necropsy, all four animals were found to have sustained typical mammalian primary blast injuries (Danil and St. Ledger 2011). See Section 3.4.3.1.2.8 (Stranding), and U.S. Department of the Navy (2012a) for more information on the topic of stranding.

Auditory Trauma

Relatively little is known about auditory system trauma in marine mammals resulting from a known sound exposure. A single study spatially and temporally correlated the occurrence of auditory system trauma in humpback whales with the detonation of a 5,000 kilogram (kg) (11,023 pounds [lb.]) explosive (Ketten et al. 1993). The exact magnitude of the exposure in this study cannot be determined, but it is likely the trauma was caused by the shock wave produced by the explosion. There are no known occurrences of direct auditory trauma in marine mammals exposed to tactical sonar or other non-impulsive sound sources (Ketten 2012). The potential for auditory trauma in marine mammals exposed to impulsive sources (e.g., explosions) is inferred from tests of submerged terrestrial mammals exposed to underwater explosions (Richmond et al. 1973; Yelverton et al. 1973; Ketten et al. 1993).

Acoustic Resonance

Acoustic resonance has been proposed as a hypothesis suggesting that acoustically-induced vibrations (sound) from sonar or sources with similar operating characteristics could be damaging tissues of marine mammals. In 2002, NMFS convened a panel of government and private scientists to consider the hypothesis of mid-frequency sonar-induced resonance of gas-containing structures (e.g., lungs) (National Oceanic and Atmospheric Administration 2002). They modeled and evaluated the likelihood that Navy mid-frequency sonar caused resonance effects in beaked whales that eventually led to their stranding (U.S. Department of the Navy 2012a). The conclusions of that group were that resonance in air-filled structures was not likely to have caused the Bahamas stranding (National Oceanic and Atmospheric Administration 2002). The frequencies at which resonance was predicted to occur in uncollapsed lungs were below 50 Hz, well below the frequencies utilized by the mid-frequency sonar systems associated with the Bahamas event. Furthermore, air cavity vibrations, even at resonant frequencies, were not considered to be of sufficient amplitude to cause tissue damage, even under the worst-case scenario in which air volumes would be undamped by surrounding tissues and the amplitude of the resonant response would be maximal. These same conclusions would apply to other training and testing activities involving acoustic sources. Therefore, the Navy concludes that acoustic resonance is not likely under realistic conditions during training and testing activities, and this type of impact is not considered further in this analysis.

Bubble Formation (Acoustically Induced)

A suggested cause of injury to marine mammals is rectified diffusion (Crum and Mao 1996), the process of increasing the size of a bubble by exposing it to a sound field. The process is dependent upon a number of factors including the sound pressure level and duration. Under this hypothesis, one of three things could happen: (1) bubbles grow to the extent that tissue hemorrhage (injury) occurs, (2) bubbles develop to the extent that a complement immune response is triggered or the nervous tissue is subjected to enough localized pressure that pain or dysfunction occurs (a stress response without injury), or (3) the bubbles are cleared by the lung without negative consequence to the animal. The probability of rectified diffusion, or any other indirect tissue effect, will necessarily be based upon what is known about the specific process involved. Rectified diffusion is facilitated if the environment in which the ensonified bubbles exist is supersaturated with gas. Repetitive diving by marine mammals can cause the blood and some tissues to accumulate gas to a greater degree than is supported by the surrounding environmental pressure (Ridgway and Howard 1979). The dive patterns of some marine mammals (for example, beaked whales) are theoretically predicted to induce greater supersaturation (Houser et al. 2001a, b). If surface intervals between dives are short, there is insufficient time to clear nitrogen in tissues accumulated due to pressures experienced while diving. Subsequent dives can increase tissue nitrogen accumulation, leading to greater levels of nitrogen saturation at each ascent. If rectified diffusion were possible in marine mammals exposed to high-level sound, conditions of tissue supersaturation could theoretically speed the rate and increase the size of bubble growth. Subsequent effects due to tissue trauma and emboli would presumably mirror those observed in humans suffering from decompression sickness (e.g., nausea, disorientation, localized pain, breathing problems).

It is unlikely that the short duration of sonar or explosion sounds would be long enough to drive bubble growth to any substantial size, if such a phenomenon occurs. However, an alternative but related hypothesis has also been suggested: stable microbubbles could be destabilized by high-level sound exposures such that bubble growth then occurs through static diffusion of gas out of the tissues. In such a scenario, the marine mammal would need to be in a gas-supersaturated state for a long enough period of time for bubbles to become a problematic size. Recent research with *ex vivo* supersaturated bovine tissues suggested that for a 37 kHz signal, a sound exposures of approximately 215 dB re 1 µPa would be required before microbubbles became destabilized and grew (Crum et al. 2005). Assuming spherical spreading loss and a nominal sonar source level of 235 dB re 1 µPa at 1 m, a whale would need to be within 10 yd. (10 m) of the sonar dome to be exposed to such sound levels. Furthermore, tissues in the study were supersaturated by exposing them to pressures of 400 to 700 kPa for periods of hours and then releasing them to ambient pressures. Assuming the equilibration of gases with the tissues occurred when the tissues were exposed to the high pressures, levels of supersaturation in the tissues could have been as high as 400 to 700 percent. These levels of tissue supersaturation are substantially higher than model predictions for marine mammals (Houser et al. 2001a, b; Saunders et al. 2008). It is improbable that this mechanism is responsible for stranding events or traumas associated with beaked whale strandings. Both the degree of supersaturation and exposure levels observed to cause microbubble destabilization are unlikely to occur, either alone or in concert.

There is considerable disagreement among scientists as to the likelihood of this phenomenon (Piantadosi and Thalmann 2004; Evans and Miller 2003). Although it has been argued that traumas from recent beaked whale strandings are consistent with gas emboli and bubble-induced tissue separations (Fernandez et al. 2005; Jepson et al. 2003), nitrogen bubble formation as the cause of the traumas has not been verified. The presence of bubbles postmortem, particularly after decompression, is not necessarily indicative of bubble pathology (Moore et al.2009; Dennison et al. 2011; Bernaldo de Quiros et al. 2012). Prior experimental work has also demonstrated that post-mortem presence of bubbles following decompression in laboratory animals can occur as a result of invasive investigative procedures (Stock et al. 1980).

3.4.3.1.2.2 Nitrogen Decompression

Although not a direct injury, variations in marine mammal diving behavior or avoidance responses could possibly result in nitrogen tissue supersaturation and nitrogen off-gassing, possibly to the point of deleterious vascular and tissue bubble formation (Jepson et al. 2003; Saunders et al. 2008; Hooker et al. 2012). The mechanism for bubble formation from nitrogen saturated tissues would be indirect and also different from rectified diffusion, but the effects would be similar. Although hypothetical, the potential process is under debate in the scientific community (Saunders et al. 2008; Hooker et al. 2012). The hypothesis speculates that if exposure to a startling sound elicits a rapid ascent to the surface, tissue gas saturation sufficient for the evolution of nitrogen bubbles might result (Jepson et. al 2003; Fernández 2005; Hooker et al. 2012)). In this scenario, the rate of ascent would need to be sufficiently rapid to compromise behavioral or physiological protections against nitrogen bubble formation.

Previous modeling by Zimmer and Tyack (2007) suggested that even unrealistically rapid rates of ascent from normal dive behaviors are unlikely to result in supersaturation to the extent that bubble formation would be expected in beaked whales. Tyack et al. (2006) suggested that emboli observed in animals exposed to mid-frequency active sonar (Jepson et. al 2003, Fernández 2005) could stem instead from a behavioral response that involves repeated dives, shallower than the depth of lung collapse. A bottlenose dolphin was trained to repetitively dive to specific depths to elevate nitrogen saturation to the point that asymptomatic nitrogen bubble formation was predicted to occur. However, inspection of the vascular system of the dolphin via ultrasound did not demonstrate the formation of any nitrogen gas bubbles (Houser et al. 2010a).

More recently, modeling has suggested that the long, deep dives performed regularly by beaked whales over a lifetime could result in the saturation of long-halftime tissues (e.g., fat, bone lipid) to the point that they are supersaturated when the animals are at the surface (Saunders et al. 2008; Hooker et al. 2009, 2012). Proposed adaptations for prevention of bubble formation under conditions of persistent tissue saturation have been suggested (Fahlman et al. 2006; Hooker et al. 2009), while the condition of supersaturation required for bubble formation has been demonstrated in by-catch animals drowned at depth and brought to the surface (Moore et al. 2009). Since bubble formation is facilitated by compromised blood flow, it has been suggested that rapid stranding may lead to bubble formation in animals with supersaturated, long-halftime tissues because of the stress of stranding and the cardiovascular collapse that can accompany it (Houser et al. 2010a).

A fat embolic syndrome was identified by Fernández et al. (2005) coincident with the identification of bubble emboli in stranded beaked whales. The fat embolic syndrome was the first pathology of this type identified in marine mammals, and was thought to possibly arise from the formation of bubbles in fat bodies, which subsequently resulted in the release of fat emboli into the blood stream. Recently, Dennison et al. (2011) reported on investigations of dolphins stranded in 2009–2010 and, using ultrasound, identified gas bubbles in kidneys of 21 of 22 live-stranded dolphins and in the liver of two of 22. The authors postulated that stranded animals are unable to recompress by diving, and thus may retain bubbles that are otherwise re-absorbed in animals that can continue to dive. The researchers concluded that the minor bubble formation observed can be tolerated since the majority of stranded dolphins released did not re-strand (Dennison et al. 2011). Recent modeling by Kvadsheim et al. (2012) determined that while behavioral and physiological responses to sonar have the potential to result in bubble formation, the actually observed behavioral responses of cetaceans to sonar did not imply any significantly increased risk of over what may otherwise occur normally in individual marine mammals.

As a result of these recent findings and for purposes of this analysis, the potential for acoustically mediated bubble growth and the potential for bubble formation as a result of behavioral altered dive profiles are not addressed further.

3.4.3.1.2.3 Hearing Loss

The most familiar effect of exposure to high intensity sound is hearing loss, meaning an increase in the hearing threshold. The meaning of the term "hearing loss" does not equate to "deafness." This phenomenon associated with hearing loss is called a noise-induced threshold shift, or simply a threshold shift (Miller 1974). If high-intensity sound overstimulates tissues in the ear, causing a threshold shift, the impacted area of the ear (associated with and limited by the sound's frequency band) no longer provides the same auditory impulses to the brain as before the exposure (Ketten 2012). The distinction between PTS and TTS is based on whether there is a complete recovery of a threshold shift following a sound exposure. If the threshold shift eventually returns to zero (i.e., the threshold returns to the pre-exposure value), the threshold shift is a TTS.

For TTS, full recovery of the hearing loss (to the pre-exposure threshold) has been determined from studies of marine mammals, and this recovery occurs within minutes to hours for the small amounts of TTS that have been experimentally induced (Finneran et al. 2005, Nachtigall et al. 2004). The time required for recovery is related to the exposure duration, Sound Exposure Level (SEL), and the magnitude of the threshold shift, with larger threshold shifts and longer exposure durations requiring longer recovery times (Finneran et al. 2005, Mooney et al. 2009). In some cases, threshold shifts as large as 50 dB (loss in sensitivity) have been temporary, although recovery sometimes required as much as 30 days (Ketten 2012). If the threshold shift does not return to zero but leaves some finite amount of threshold shift, then that remaining threshold shift is a PTS. Again for clarity, PTS as discussed in this document is not the loss of hearing, but instead is the loss of hearing sensitivity over a particular range of frequencies Figure 3.4-3 shows one hypothetical threshold shift that completely recovers, a TTS, and one that does not completely recover, leaving some PTS. The actual amount of threshold shift depends on the amplitude, duration, frequency, temporal pattern of the sound exposure, and on the susceptibility of the individual animal.

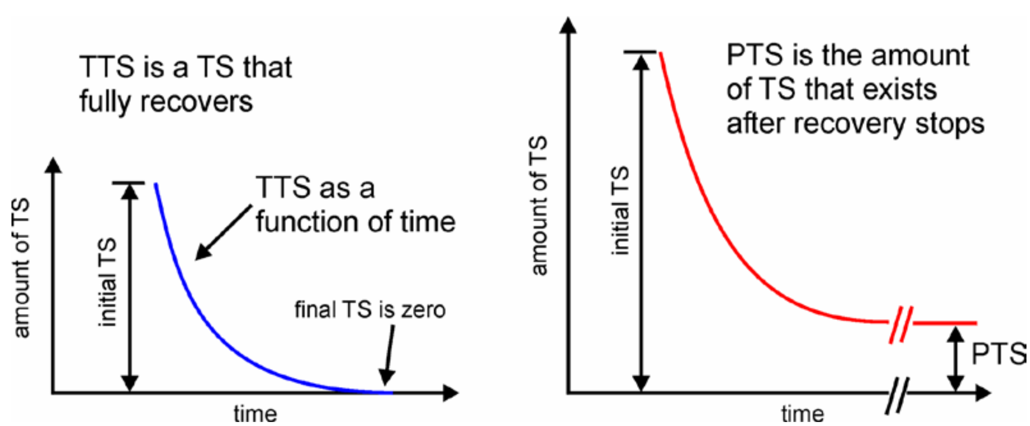


Figure 3.4-3: Two Hypothetical Threshold Shifts, Temporary and Permanent

Both auditory trauma and auditory fatigue may result in hearing loss. Many are familiar with hearing protection devices (i.e., ear plugs) required in many occupational settings where pervasive noise could otherwise cause auditory fatigue and possibly result in hearing loss. The mechanisms responsible for auditory fatigue differ from auditory trauma and would primarily consist of metabolic fatigue and exhaustion of the hair cells and cochlear tissues. Note that the term "auditory fatigue" is often used to mean "temporary threshold shift"; however, in this EIS/Overseas Environmental Impact Statement (OEIS) a more general meaning is used to differentiate fatigue mechanisms (e.g., metabolic exhaustion and distortion of tissues) from trauma mechanisms (e.g., physical destruction of cochlear tissues occurring at the time of exposure). The actual amount of threshold shift depends on the amplitude, duration, frequency, and temporal pattern of the sound exposure.

Hearing loss, or auditory fatigue, in marine mammals has been studied by a number of investigators (Schlundt et al. 2000; Finneran et al. 2000, 2002, 2005, 2007, 2010; Nachtigall et al. 2003, 2004; Mooney et al. 2009; Kastak et al. 2007; Lucke 2009). The studies of marine mammal auditory fatigue were all designed to determine relationships between TTS and exposure parameters such as level, duration, and frequency. In these studies, hearing thresholds were measured in trained marine mammals before and after exposure to intense sounds. The difference between the pre-exposure and post-exposure thresholds indicated the amount of TTS. Species studied include the bottlenose dolphin (total of 9 individuals), beluga (2), harbor porpoise (1), finless porpoise (2), California sea lion (3), harbor seal (1), and Northern elephant seal (1). Some of the more important data obtained from these studies are onset-TTS levels – exposure levels sufficient to cause a just-measurable amount of TTS, often defined as 6 dB of TTS (for example, (Schlundt et al. 2000).

The primary findings of the marine mammal TTS studies are:

- The growth and recovery of TTS are analogous to those in terrestrial mammals. This means that, as in terrestrial mammals, threshold shifts primarily depend on the amplitude, duration, frequency content, and temporal pattern of the sound exposure.
- The amount of TTS increases with exposure sound pressure level (SPL) and the exposure duration.
- For continuous sounds, exposures of equal energy lead to approximately equal effects (Ward 1997). For intermittent sounds, less hearing loss occurs than from a continuous exposure with the same energy (some recovery will occur during the quiet `period between exposures) (Kryter et al. 1965; Ward 1997).
- SEL is correlated with the amount of TTS and is a good predictor for onset-TTS from single, continuous exposures with similar durations. This agrees with human TTS data presented by Ward et al. (1958, 1959a). However, for longer duration sounds—beyond 16–32 seconds—the relationship between TTS and SEL breaks down and duration becomes a more important contributor to TTS (Finneran et al. 2010).
- The maximum TTS after tonal exposures occurs one-half to one octave above the exposure frequency (Finneran et al. 2007; Schlundt et al. 2000). TTS from tonal exposures can thus extend over a large (greater than one octave) frequency range.
- For bottlenose dolphins, non-impulsive sounds with frequencies above 10 kHz are more hazardous than those at lower frequencies (i.e., lower SELs required to affect hearing) (Finneran et al. 2010).
- The amount of observed TTS tends to decrease with increasing time following the exposure; however, the relationship is not monotonic. The amount of time required for complete recovery of hearing depends on the magnitude of the initial shift; for relatively small shifts recovery may be complete in a few minutes, while large shifts (e.g., 40 dB) require several days for recovery.
- TTS can accumulate across multiple intermittent exposures, but the resulting TTS will be less than the TTS from a single, continuous exposure with the same SEL. This means that predictions

based on total, cumulative SEL (such as the predictions made in this analysis) will overestimate the amount of TTS from intermittent exposures.

Although there have been no marine mammal studies designed to measure PTS, the potential for PTS in marine mammals can be estimated based on known similarities between the inner ears of marine and terrestrial mammals. Experiments with marine mammals have revealed their similarities with terrestrial mammals with respect to features such as TTS, age-related hearing loss (called Presbycusis), ototoxic drug-induced hearing loss, masking, and frequency selectivity. Therefore, in the absence of marine mammal PTS data, onset-PTS exposure levels may be estimated by assuming some upper limit of TTS that equates the onset of PTS, then using TTS growth relationships from marine and terrestrial mammals to determine the exposure levels capable of producing this amount of TTS.

Hearing loss resulting from auditory fatigue could effectively reduce the distance over which animals can communicate, detect biologically relevant sounds such as predators, and echolocate (for odontocetes). The costs to marine mammals with TTS, or even some degree of PTS have not been studied; however, it is likely that a relationship between the duration, magnitude, and frequency range of hearing loss could have consequences to biologically important activities (e.g., intraspecific communication, foraging, and predator detection) that affect survivability and reproduction.

3.4.3.1.2.4 Auditory Masking

As with hearing loss, auditory masking can effectively limit the distance over which a marine mammal can communicate, detect biologically relevant sounds, and echolocate (odontocetes). Unlike auditory fatigue, which always results in a localized stress response, behavioral changes resulting from auditory masking may or may not be coupled with a stress response. Another important distinction between masking and hearing loss is that masking only occurs in the presence of the sound stimulus, whereas hearing loss can persist after the stimulus is gone.

Critical ratios have been determined for pinnipeds (Southall et al. 2000; Southall et al. 2003) and detections of signals under varying masking conditions have been determined for active echolocation and passive listening tasks in odontocetes (Johnson 1971; Au and Pawloski 1989; Erbe 2000). These studies provide baseline information from which the probability of masking can be estimated.

Clark et al. (2009) developed a methodology for estimating masking effects on communication signals for low frequency cetaceans, including calculating the cumulative impact of multiple noise sources. For example, their technique calculates that in Stellwagen Bank National Marine Sanctuary, when two commercial vessels pass through a North Atlantic right whale’s optimal communication space (estimated as a sphere of water with a diameter of 20 km), that space is decreased by 84 percent. This methodology relies on empirical data on source levels of calls (which is unknown for many species), and requires many assumptions about ancient ambient noise conditions and simplifications of animal behavior, but it is an important step in determining the impact of anthropogenic noise on animal communication.

Vocal changes in response to anthropogenic noise can occur across the repertoire of sound production modes used by marine mammals, such as whistling, echolocation click production, calling, and singing. Changes to vocal behavior and call structure may result from a need to compensate for an increase in background noise. In cetaceans, vocalization changes have been reported from exposure to anthropogenic sources such as sonar, vessel noise, and seismic surveying.

In the presence of low frequency active sonar, humpback whales have been observed to increase the length of their 'songs' (Miller et al. 2000; Fristrup et al. 2003), possibly due to the overlap in frequencies between the whale song and the low frequency active sonar. North Atlantic right whales have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks et al. 2007) as well as increasing the amplitude (intensity) of their calls (Parks 2009). In contrast, both sperm and pilot whales potentially ceased sound production during the Heard Island feasibility test (Bowles et al. 1994), although it cannot be absolutely determined whether the inability to acoustically detect the animals was due to the cessation of sound production or the displacement of animals from the area.

Differential vocal responding in marine mammals has been documented in the presence of seismic survey sound. An overall decrease in vocalization during active surveying has been noted in large marine mammal groups (Potter et al. 2007), while detection of blue whale feeding/social calls increased when seismic exploration was underway (Di Iorio and Clark 2010), indicative of a potentially compensatory response to the increased sound level. Melcon et al. (2012) recently documented that blue whales decreased the proportion of time spent producing certain types of calls when mid-frequency sonar was present. At present it is not known if these changes in vocal behavior corresponded to changes in foraging or any other behaviors.

Evidence suggests that at least some marine mammals have the ability to acoustically identify potential predators. For example, harbor seals that reside in the coastal waters off British Columbia are frequently targeted by certain groups of killer whales, but not others. The seals discriminate between the calls of threatening and non-threatening killer whales (Deecke et al. 2002), a capability that should increase survivorship while reducing the energy required for attending to and responding to all killer whale calls. The occurrence of masking or hearing impairment provides a means by which marine mammals may be prevented from responding to the acoustic cues produced by their predators. Whether or not this is a possibility depends on the duration of the masking/hearing impairment and the likelihood of encountering a predator during the time that predator cues are impeded.

3.4.3.1.2.5 Physiological Stress

Marine mammals may exhibit a behavioral response or combinations of behavioral responses upon exposure to anthropogenic sounds. If a sound is detected by a marine mammal, a stress response (e.g., startle or annoyance) or a cueing response (based on a past stressful experience) can occur. Marine mammals naturally experience stressors within their environment and as part of their life histories. Changing weather and ocean conditions, exposure to diseases and naturally occurring toxins, lack of prey availability, social interactions with members of the same species, and interactions with predators all contribute to the stress a marine mammal experiences. In some cases, naturally occurring stressors can have profound impacts on marine mammals; for example, chronic stress, as observed in stranded animals with long-term debilitating conditions (e.g., disease), has been demonstrated to result in an increased size of the adrenal glands and an increase in the number of epinephrine-producing cells (Clark et al. 2006).

Anthropogenic activities have the potential to provide additional stressors above and beyond those that occur naturally. Various efforts have been undertaken to investigate the impact from vessels (both whale-watching and general vessel traffic noise), and demonstrated impacts do occur (Bain 2002; Erbe 2002; Williams et al. 2006, 2009; Noren et al. 2009). For example, in an analysis of energy costs to killer whales, Williams et al. (2009) suggested that whale-watching in Canada's Johnstone Strait resulted in lost feeding opportunities due to vessel disturbance, which could carry higher costs than other measures of behavioral change might suggest.

Although preliminary because of the small numbers of samples collected, different types of sounds have been shown to produce variable stress responses in marine mammals. Belugas demonstrated no catecholamine (hormones released in situations of stress) response to the playback of oil drilling sounds (Thomas et al. 1990a) but showed an increase in catecholamines following exposure to impulsive sounds produced from a seismic water gun (Romano et al., 2004). A bottlenose dolphin exposed to the same seismic water gun signals did not demonstrate a catecholamine response, but did demonstrate an elevation in aldosterone, a hormone that has been suggested as being a significant indicator of stress in odontocetes (St. Aubin and Geraci 1989; St. Aubin and Dierauf 2001). Increases in heart rate were observed in bottlenose dolphins to which conspecific calls were played, although no increase in heart rate was observed when tank noise was played back (Miksis et al. 2001). Collectively, these results suggest a variable response that depends on the characteristics of the received signal and prior experience with the received signal.

Other types of stressors include the presence of vessels, fishery interactions, acts of pursuit and capture, the act of stranding, and pollution. In contrast to the limited amount of work performed on stress responses resulting from sound exposure, a considerably larger body of work exists on stress responses associated with pursuit, capture, handling and stranding. Many cetaceans exhibit an apparent vulnerability in the face of these particular situations when taken to the extreme. A recent study compared pathological changes in organs/tissues of odontocetes stranded on beaches or captured in nets over a 40-year period (Cowan and Curry 2008). The type of changes observed indicate multisystemic harm caused in part by an overload of catecholamines into the system, as well as a restriction in blood supply capable of causing tissue damage and/or tissue death. This extreme response to a major stressor(s) is thought be mediated by the over activation of the animal's normal physiological adaptations to diving or escape. Pursuit, capture and short-term holding of belugas have been observed to result in a decrease in thyroid hormones (St. Aubin and Geraci 1988) and increases in epinephrine (St. Aubin and Dierauf, 2001). In dolphins, the trend is more complicated with the duration of the handling time potentially contributing to the magnitude of the stress response (St. Aubin et al. 1996; Ortiz and Worthy 2000; St. Aubin 2002). Male grey seals subjected to capture and short term restraint showed an increase in cortisol levels accompanied by an increase in testosterone (Lidgard et al. 2008). This result may be indicative of a compensatory response that enables the seal to maintain reproduction capability in spite of stress. Elephant seals demonstrate an acute cortisol response to handling, but do not demonstrate a chronic response; on the contrary, adult females demonstrate a reduction in the adrenocortical response following repetitive chemical immobilization (Engelhard et al. 2002). Similarly, no correlation between cortisol levels and heart/respiration rate changes were seen in harbor porpoises during handling for satellite tagging (Eskesen et al. 2009). Taken together, these studies illustrate the wide variations in the level of response that can occur when faced with these stressors.

Factors to consider when trying to predict a stress or cueing response include the mammal's life history stage and whether they are naïve or experienced with the sound. Prior experience with a stressor may be of particular importance as repeated experience with a stressor may dull the stress response via acclimation (St. Aubin and Dierauf 2001).

The sound characteristics that correlate with specific stress responses in marine mammals are poorly understood. Therefore, in practice, a stress response is assumed if a physiological reaction such as a hearing loss or trauma is predicted, or if a significant behavioral response is predicted.

3.4.3.1.2.6 Behavioral Reactions

The response of a marine mammal to an anthropogenic sound will depend on the frequency, duration, temporal pattern and amplitude of the sound as well as the animal's prior experience with the sound and the context in which the sound is encountered (i.e., what the animal is doing at the time of the exposure). The distance from the sound source and whether it is perceived as approaching or moving away can affect the way an animal responds to a sound (Wartzok et al. 2003). For marine mammals, a review of responses to anthropogenic sound was first conducted by Richardson and others (Richardson et al. 1995). More recent reviews (Nowacek 2007; Southall et al. 2007) address studies conducted since 1995 and focus on observations where the received sound level of the exposed marine mammal(s) was known or could be estimated.

Except for some vocalization changes that may be compensating for auditory masking, all behavioral reactions are assumed to occur due to a preceding stress or cueing response; however, stress responses cannot be predicted directly due to a lack of scientific data (see preceding section on Physiological Stress). Responses can overlap; for example, an increased respiration rate is likely to be coupled to a flight response. Differential responses between and within species are expected since hearing ranges vary across species and the behavioral ecology of individual species is unlikely to completely overlap.

Southall et al. (2007) synthesized data from many past behavioral studies and observations to determine the likelihood of behavioral reactions at specific sound levels. While in general, the louder the sound source the more intense the behavioral response, it was clear that the proximity of a sound source and the animal's experience, motivation, and conditioning were also critical factors influencing the response (Southall et al. 2007). After examining all of the available data, the authors felt that the derivation of thresholds for behavioral response based solely on exposure level was not supported because context of the animal at the time of sound exposure was an important factor in estimating response. Nonetheless, in some conditions consistent avoidance reactions were noted at higher sound levels dependent on the marine mammal species or group allowing conclusions to be drawn. Most low-frequency cetaceans (mysticetes) observed in studies usually avoided sound sources at levels of less than or equal to 160 dB re 1 µPa. Published studies of mid-frequency cetaceans analyzed include sperm whales, belugas, bottlenose dolphins, and river dolphins. These groups showed no clear tendency, but for non-impulsive sounds, captive animals tolerated levels in excess of 170 dB re 1 µPa before showing behavioral reactions, such as avoidance, erratic swimming, and attacking the test apparatus. High-frequency cetaceans (observed from studies with harbor porpoises) exhibited changes in respiration and avoidance behavior at levels between 90 and 140 dB re 1 µPa, with profound avoidance behavior noted for levels exceeding this. Phocid seals showed avoidance reactions at or below 190 dB re 1 µPa, thus seals may actually receive levels adequate to produce TTS before avoiding the source. Recent studies with beaked whales have shown them to be particularly sensitive to noise, with animals during 3 playbacks of sound breaking off foraging dives at levels below 142 dB re 1 µPa, although acoustic monitoring during actual sonar exercises revealed some beaked whales continuing to forage at levels up to 157 dB re 1 µPa (Tyack et al. 2011).

<u>Behavioral Reactions to Impulsive Sound Sources</u>

Mysticetes

Baleen whales have shown a variety of responses to impulsive sound sources, including avoidance, reduced surface intervals, altered swimming behavior, and changes in vocalization rates (Southall et al. 2007; Richardson et al. 1995; Gordon et al. 2003). While most bowhead whales did not show active avoidance until within 5 mi. (8 km) of seismic vessels (Richardson et al. 1995), some whales avoided vessels by more than 12 mi. (20 km) at received levels as low as 120 dB re 1 µPa root mean square

(RMS). Additionally, Malme et al. (1988) observed clear changes in diving and respiration patterns in bowheads at ranges up to 45 mi. (73 km) from seismic vessels, with received levels as low as 125 dB re: 1 µPa.

Gray whales migrating along the U.S. west coast showed avoidance responses to seismic vessels by 10 percent of animals at 164 dB re: 1 µPa, and by 90 percent of animals at 190 dB re: 1 µPa, with similar results for whales in the Bering Sea (Malme 1986, 1988). In contrast, sound from seismic surveys was not found to impact feeding behavior or exhalation rates while resting or diving in western gray whales off the coast of Russia (Yazvenko et al. 2007; Gailey et al. 2007).

Humpback whales showed avoidance behavior at ranges of 3–5 mi. (5–8 km) from a seismic array during observational studies and controlled exposure experiments in western Australia (McCauley 1998; Todd et al. 1996) found no clear short-term behavioral responses by foraging humpbacks to explosions associated with construction operations in Newfoundland, but did see a trend of increased rates of net entanglement and a shift to a higher incidence of net entanglement closer to the noise source.

Seismic pulses at average received levels of 131 dB re: 1 $\mu Pa^2 s$ caused blue whales to increase call production (Di Iorio 2010). In contrast, McDonald et al. (1995) tracked a blue whale with seafloor seismometers and reported that it stopped vocalizing and changed its travel direction at a range of 6 mi. (10 km) from the seismic vessel (estimated received level 143 dB re: 1 µPa peak-to-peak). These studies demonstrate that even low levels of sound received far from the sound source can induce behavioral responses.

Odontocetes

Madsen et al. (2006) and Miller et al. (2009) tagged and monitored eight sperm whales in the Gulf of Mexico exposed to seismic airgun surveys. Sound sources were from approximately 2 to 7 nm away from the whales and based on multipath propagation received levels were as high as 162 dB SPL re 1 µPa with energy content greatest between 0.3 to 3.0 kHz (Madsen et al. 2006). The whales showed no horizontal avoidance, although the whale that was approached most closely had an extended resting period and did not resume foraging until the airguns had ceased firing (Miller et al. 2009). The remaining whales continued to execute foraging dives throughout exposure, however swimming movements during foraging dives were 6 percent lower during exposure than control periods, suggesting subtle effects of sound on foraging behavior (Miller et al. 2009).

Captive bottlenose dolphins sometimes vocalized after an exposure to impulsive sound from a seismic watergun (Finneran et al. 2002).

Pinnipeds

A review of behavioral reactions by pinnipeds to impulsive noise can be found in Richardson et al. (1995) and Southall et al. (2007). Blackwell et al. (2004) observed that ringed seals exhibited little or no reaction to pipe-driving noise with mean underwater levels of 157 dB re 1 µPa RMS and in air levels of 112 dB re 20 µPa, suggesting that the seals had habituated to the noise. In contrast, captive California sea lions avoided sounds from an underwater impulsive source at levels of 165-170 dB re 1 µPa (Finneran et al. 2003).

Experimentally, Götz and Janik (2011) tested underwater startle responses to a startling sound (sound with a rapid rise time and a 93 dB sensation level [the level above the animal's threshold at that frequency]) and a non-startling sound (sound with the same level, but with a slower rise time) in wild-captured gray seals. The animals exposed to the startling treatment avoided a known food source, whereas animals exposed to the non-startling treatment did not react or habituated during the exposure period. The results of this study highlight the importance of the characteristics of the acoustic signal in an animal's response of habituation.

Behavioral Reactions to Sonar and other Active Acoustic Sources

Mysticetes

Specific to U.S. Navy systems using low frequency sound, studies were undertaken in 1997–98 pursuant to the Navy's Low Frequency Sound Scientific Research Program. These studies found only short term responses to low frequency sound by mysticetes (fin, blue, and humpback) including changes in vocal activity and avoidance of the source vessel (Clark 2001; Miller et al. 2000; Croll et al. 2001; Fristrup et al. 2003; Nowacek et al. 2007). Baleen whales exposed to moderate low-frequency signals demonstrated no variation in foraging activity (Croll et al. 2001). However, five out of six North Atlantic right whales exposed to an acoustic alarm interrupted their foraging dives, although the alarm signal was long in duration, lasting several minutes, and purposely designed to elicit a reaction from the animals as a prospective means to protect them from ship strikes (Nowacek et al. 2004). Although the animal's received sound pressure level was similar in the latter two studies (133–150 dB SPL), the frequency, duration, and temporal pattern of signal presentation were different. Additionally, the right whales did not respond to playbacks of either right whale social sounds or vessel noise, highlighting the importance of the sound characteristics, species differences, and individual sensitivity in producing a behavioral reaction. Low-frequency signals of the Acoustic Thermometry of Ocean Climate sound source were not found to affect dive times of humpback whales in Hawaiian waters (Frankel and Clark 2000).

Blue whales exposed to mid-frequency sonar in the Southern California Bight were less likely to produce low frequency calls usually associated with feeding behavior (Melcón et al. 2012). It is not known whether the lower rates of calling actually indicated a reduction in feeding behavior or social contact since the study used data from remotely deployed, passive acoustic monitoring buoys. In contrast, blue whales increased their likelihood of calling when ship noise was present, and decreased their likelihood of calling in the presence of explosive noise, although this result was not statistically significant (Melcón et al. 2012). Additionally, the likelihood of an animal calling decreased with the increased received level of mid-frequency sonar, beginning at a sound pressure level of approximately 110 to 120 dB re 1 µPa (Melcón et al. 2012). Blue whales responded to a mid-frequency sound source, with a source level between 160-210 dB re 1 µPa at 1 m and a received sound level up to 160 dB re 1 µPa, by exhibiting generalized avoidance responses and changes to dive behavior during controlled exposure experiments (Goldbogen et al. 2013). However, reactions were not consistent across individuals based on received sound levels alone, and likely were the result of a complex interaction between sound exposure factors such as proximity to sound source and sound type (mid-frequency sonar simulation vs. pseudo-random noise), environmental conditions, and behavioral state. Surface feeding whales did not show a change in behavior during controlled exposure experiments, but deep feeding and non-feeding whales showed temporary reactions that quickly abated after sound exposure. Distances of the sound source from the whales during controlled exposure experiments were sometimes less than a mile. These preliminary findings from Melcón et al. (2012) and Goldbogen et al. (2013) are consistent with the Navy's criteria and thresholds for predicting behavioral effects to mysticetes (including blue whales) from sonar and other active acoustic sources used in the quantitative acoustic effects analysis (Section 3.4.3.1.5, Behavioral Responses below). The behavioral response function predicts a probability of a substantive behavioral reaction for individuals exposed to a received sound pressure level of 120 dB re 1µPa or greater, with an increasing probability of reaction with increased received level as demonstrated in Melcón et al. (2012).

Odontocetes

From 2007-2011, behavioral response studies were conducted through the collaboration of various research organizations in the Bahamas, Southern California, the Mediterranean, Cape Hatteras, and Norwegian waters. These studies attempted to define and measure responses of beaked whales and other cetaceans to controlled exposures of sonar and other sounds to better understand their potential impacts. Results from the 2007–2008 study conducted near the Bahamas showed a change in diving behavior of an adult Blainville's beaked whale to playback of mid-frequency source and predator sounds (Boyd et al. 2008; Tyack et al. 2011). Reaction to mid-frequency sounds included premature cessation of clicking and termination of a foraging dive, and a slower ascent rate to the surface. Preliminary results from a similar behavioral response study in Southern California waters have been presented for the 2010–2011 field season. DeRuiter et al. (2013) presented results from two Cuvier’s beaked whales that were tagged and exposed to simulated mid-frequency active sonar during the 2010 and 2011 field seasons of the southern California behavioral response study. The 2011 whale was also incidentally exposed to mid-frequency active sonar from a distant naval exercise. Received levels from the mid-frequency active sonar signals from the controlled and incidental exposures were calculated as 84–144 and 78–106 dB re 1 µPa RMS, respectively. Both whales showed responses to the controlled exposures, ranging from initial orientation changes to avoidance responses characterized by energetic fluking and swimming away from the source. However, the authors did not detect similar responses to incidental exposure to distant naval sonar exercises at comparable received levels, indicating that context of the exposures (e.g., source proximity, controlled source ramp-up) may have been a significant factor. Cuvier's beaked whale responses suggested particular sensitivity to sound exposure as consistent with results for Blainville’s beaked whale. Similarly, beaked whales exposed to sonar during British training exercises stopped foraging (Defense Science and Technology Laboratory 2007) and preliminary results of controlled playback of sonar may indicate feeding/foraging disruption of killer whales and sperm whales (Miller et al. 2011).

In the 2007–2008 Bahamas study, playback sounds of a potential predator—a killer whale—resulted in a similar but more pronounced reaction, which included longer inter-dive intervals and a sustained straight-line departure of more than 20 km from the area. The authors noted, however, that the magnified reaction to the predator sounds could represent a cumulative effect of exposure to the two sound types since killer whale playback began approximately 2 hours after mid-frequency source playback. Pilot whales and killer whales off Norway also exhibited horizontal avoidance of a transducer with outputs in the mid-frequency range (signals in the 1 kHz–2 kHz and 6 kHz–7 kHz ranges) (Miller et al. 2011). Additionally, separation of a calf from its group during exposure to mid-frequency sonar playback was observed on one occasion (Miller et al. 2011). In contrast, preliminary analyses suggest that none of the pilot whales or false killer whales in the Bahamas showed an avoidance response to controlled exposure playbacks (Southall et al. 2009).

Through analysis of the behavioral response studies, a preliminary overarching effect of greater sensitivity to all anthropogenic exposures was seen in beaked whales compared to the other odontocetes studied (Southall et al. 2009b). Therefore, recent studies have focused specifically on beaked whale responses to active sonar transmissions or controlled exposure playback of simulated sonar on various military ranges (Defense Science and Technology Laboratory 2007; Claridge and Durban 2009; Moretti et al. 2009; McCarthy et al. 2011; Tyack et al. 2011.). In the Bahamas, Blainville’s beaked whales located on the range will move off-range during sonar use and return only after the sonar transmissions have stopped, sometimes taking several days to do so (Claridge and Durban 2009; Moretti et al. 2009; McCarthy et al. 2011; Tyack et al. 2011).

In May 2003, killer whales in Haro Strait, Washington were observed exhibiting what were believed by some observers to be aberrant behaviors while the USS SHOUP was in the vicinity and engaged in mid-frequency active sonar operations. Sound fields modeled for the USS SHOUP transmissions (National Marine Fisheries Service 2005; U.S. Department of the Navy 2003; Fromm 2004a, 2004b) estimated a mean received sound pressure level of approximately 169.3 dB re 1µPa at the location of the killer whales during the closest point of approach between the animals and the vessel (estimated sound pressure levels ranged from 150 to 180 dB re 1µPa).

In the Caribbean, research on sperm whales near the Grenadines in 1983 coincided with the U.S. intervention in Grenanda where sperm whales were observed to interrupt their activities by stopping echolocation and leaving the area in the presence of underwater sounds surmised to have originated from submarine sonar signals since the source was not visible (Watkins and Schevill 1975; Watkins et al. 1985). The authors did not provide any sound levels associated with these observations although they did note getting a similar reaction from banging on their boat hull. It was unclear if the sperm whales were reacting to the “sonar” signal itself or to a potentially new unknown sound in general as had been demonstrated previously on another occasion in which sperm whales in the Caribbean stopped vocalizing when presented with sounds from nearby acoustic pingers (Watkins and Schevill 1975).

Researchers at the Navy's Marine Mammal Program facility in San Diego, California have conducted a series of controlled experiments on bottlenose dolphins and beluga whales to study TTS (Schlundt et al. 2000; Finneran et al. 2001; Finneran et al. 2003; Finneran and Schlundt 2004; Finneran et al. 2005). Ancillary to the TTS studies, scientists evaluated whether the marine mammals performed their trained tasks when prompted, during and after exposure to mid-frequency tones. Altered behavior during experimental trials usually involved refusal of animals to return to the site of the sound stimulus. This refusal included what appeared to be deliberate attempts to avoid a sound exposure or to avoid the location of the exposure site during subsequent tests (Schlundt et al. 2000; Finneran et al. 2002). Bottlenose dolphins exposed to 1-second intense tones exhibited short-term changes in behavior above received sound levels of 178 to 193 dB re 1 µPa root mean square, and beluga whales did so at received levels of 180 to 196 dB re 1 µPa and above. In some instances, animals exhibited aggressive behavior toward the test apparatus (Ridgway et al. 1997; Schlundt et al. 2000). While these studies were generally not designed to test avoidance behavior and animals were commonly reinforced with food, the controlled environment and ability to measure received levels provide insight on received levels at which animals will behaviorally responds to sound sources.

Studies with captive harbor porpoises showed increased respiration rates upon introduction of acoustic alarms, such as those used on fishing nets to help deter marine mammals from becoming caught or entangled (Kastelein et al. 2001; Kastelein et al. 2006) and emissions for underwater data transmission (Kastelein et al. 2005b). However, exposure of the same acoustic alarm to a striped dolphin under the same conditions did not elicit a response (Kastelein et al. 2006), again highlighting the importance in understanding species differences in the tolerance of underwater noise.

Pinnipeds

Different responses displayed by captive and wild phocid seals to sound judged to be ‘unpleasant’ have been reported; captive seals habituated (did not avoid the sound), and wild seals showed avoidance behavior (Götz and Janik 2010). Captive seals received food (reinforcement) during sound playback, while wild seals were exposed opportunistically. These results indicate that motivational state (e.g., reinforcement via food acquisition) can be a factor in whether or not an animal habituates to novel or unpleasant sounds. Another study found that captive hooded seals reacted to 1-7 kHz sonar signals, in part with displacement to the areas of least sound pressure level, at levels between 160 and 170 dB re 1 μPa (Kvadsheim et al. 2010). Low-frequency signals from the Acoustic Thermometry of Ocean Climate sound source were not found to overtly affect elephant seal dives (Costa et al. 2003). However, they did produce subtle effects that varied in direction and degree among the individual seals, again illustrating the equivocal nature of behavioral effects and consequent difficulty in defining and predicting them.

Captive studies with other pinnipeds have shown a reduction in dive times when presented with qualitatively 'unpleasant' sounds. These studies indicated that the subjective interpretation of the pleasantness of a sound, minus the more commonly studied factors of received sound level and sounds associated with biological significance, can affect diving behavior (Götz and Janik 2010).

Behavioral Reactions to Vessels

Navy vessels are a small component of overall vessel traffic and vessel noise in areas where they operate. Figure 3.4-4 depicts the commercial vessel density provided by the automated identification system data along the west coast of North America and Baja Mexico in 2009. As evident from the graphic, commercial vessel use is highest in the U.S. Exclusive Economic Zone and around ports such as San Diego, Los Angeles, and San Francisco.

Data presented by Mintz and Filadelfo (2011) shows that Navy vessel-hours constitute approximately 6 percent of large vessel-hours in the U.S. Exclusive Economic Zone and small percentages even within Navy concentration areas such as the range complexes (i.e., Virginia Capes, HRC, SOCAL). In addition, Navy combatant vessels have been designed to generate minimal noise and use ship quieting technology to elude detection by enemy passive acoustic devices (Mintz and Filadelfo 2011; Southall et al. 2005). Navy vessels do not purposefully approach or follow marine mammals and are generally not expected to elicit avoidance or alarm behavior. The smaller Navy vessels that operate in inshore waters are expressly prohibited from approaching or following marine mammals.

Sound emitted from large vessels, such as shipping and cruise ships, is the principal source of low-frequency noise in the ocean today, and marine mammals are known to react to or be affected by that noise (Hatch and Wright 2007; Hildebrand 2005; Richardson et al. 1995). Limited evidence suggests that beaked whales respond to vessel noise, anthropogenic noise in general, and mid-frequency sonar at similar sound levels (Aguilar de Soto et al. 2006; Tyack et al. 2011; Tyack 2009). In short term studies, researchers have noted changes in resting and surface behavior states of cetaceans to whale watching vessels (Acevedo 1991, Aguilar de Soto et al. 2006, Arcangeli and Crosti 2009, Au and Green 2000, Christiansen et al. 2010, Erbe 2002, Williams et al. 2009, Noren et al. 2009, Stensland and Berggren 2007, Stockin et al. 2008).

Most studies of this type are opportunistic and have only examined the short-term response to vessel sound and vessel traffic (Magalhães et al. 2002, Richardson et al. 1995, Watkins 1981, Noren et al. 2009); however, the long-term and cumulative implications of ship sound on marine mammals is largely unknown (National Marine Fisheries Service 2012). Clark et al. (2009) provided a discussion on calculating the cumulative impacts of anthropogenic noise on baleen whales and estimated that in one Atlantic setting and with the noise from the passage of two vessels, the optimal communication space for the North Atlantic right whale could be decreased by 84 percent.

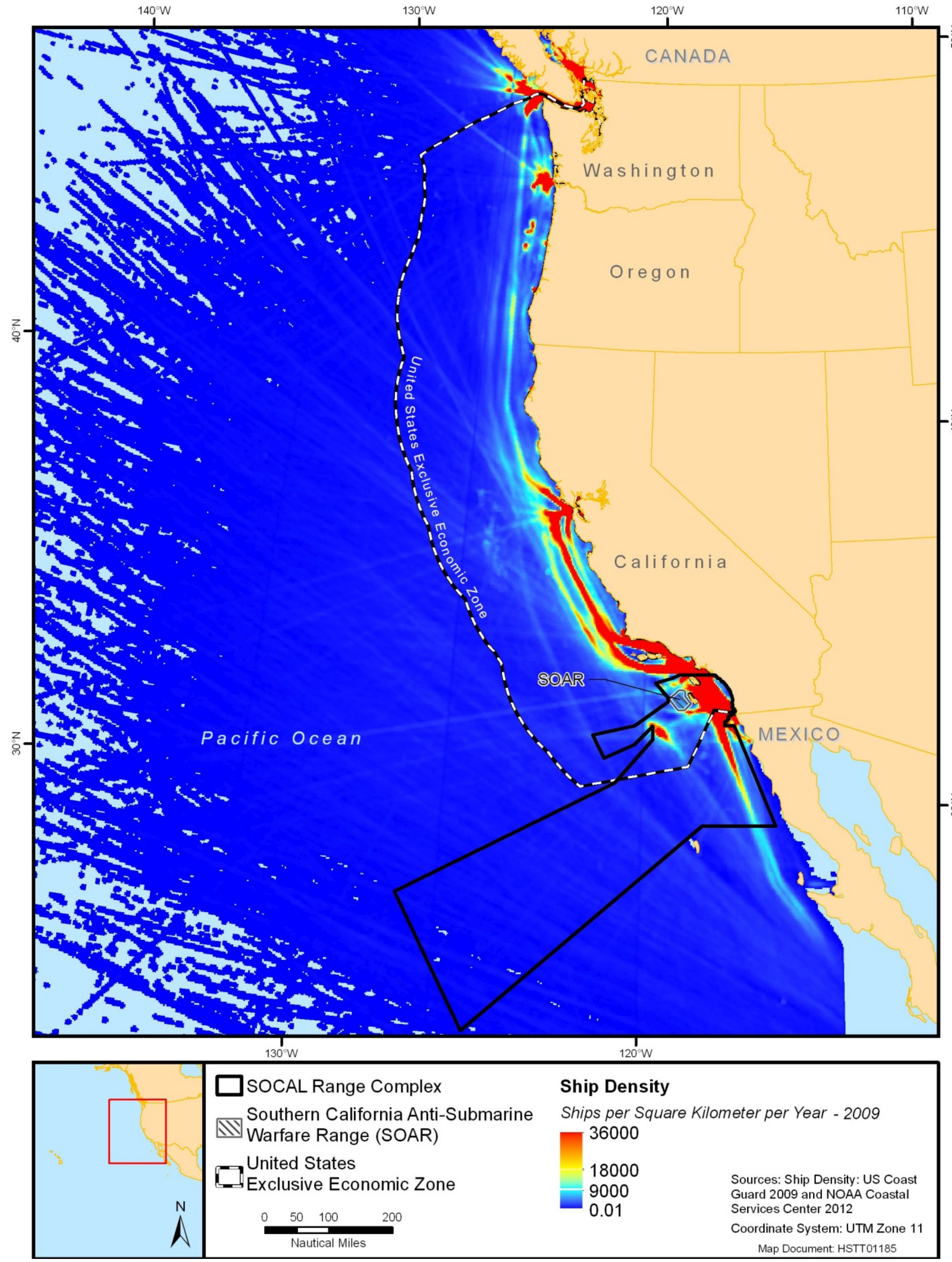


Figure 3.4-4: Commercial Vessel Density Along the West Coast of North America and Baja, Mexico in 2009

Mysticetes

Fin whales may alter their swimming patterns by increasing speed and heading away from the vessel, as well as changing their breathing patterns in response to a vessel approach (Jahoda et al. 2003). Vessels that remained 328 ft. (100 m) or farther from fin and humpback whales were largely ignored in one study in an area where whale watching activities are common (Watkins 1981). Only when vessels approached more closely did the fin whales in this study alter their behavior by increasing time at the surface and exhibiting avoidance behaviors. Other studies have shown when vessels are near, some but not all fin whales change their vocalizations, surface time, swimming speed, swimming angle or direction, respiration rates, dive times, feeding behavior, and social interactions (Au and Green 2000; Richter et al. 2003; Williams et al. 2002a).

Based on passive acoustic recordings and in the presence of sounds from passing vessels, Melcon et al. (2012) reported that blue whales had an increased likelihood of producing certain types of calls. At present it is not known if these changes in vocal behavior corresponded to changes in foraging or any other behaviors.

In the Watkins (1981) study, humpback whales did not exhibit any avoidance behavior but did react to vessel presence. In a study of regional vessel traffic, (Baker et al. 1983) found that when vessels were in the area, the respiration patterns of the humpback whales changed. The whales also exhibited two forms of behavioral avoidance: horizontal avoidance (changing direction or speed) when vessels were between 1.24 and 2.48 mi. (2,000 m and 4,000 m) away, and vertical avoidance (increased dive times and change in diving pattern) when vessels were within 1.24 mi. (2,000 m) away (Baker et al., 1983). Similar findings were documented for humpback whales when approached by whale watch vessels in Hawaii and having responses that including increased speed, changed direction to avoid, and staying submerged for longer periods of time (Au and Green 2000).

Recently, Gende et al. (2011) reported on observations of humpback whale in inland waters of Southeast Alaska subjected to frequent cruise ship transits (i.e., in excess of 400 transits in a 4-month season in 2009). The study was focused on determining if close encounter distance was a function of vessel speed. The reported observations, however, seem in conflict with other reports of avoidance at much greater distance so it may be that humpback whales in those waters are more tolerant of vessels (given their frequency) or are engaged in behaviors, such as feeding, that they are less willing to abandon. This example again highlights that context is critical for predicting and understanding behavioral reactions as concluded by Southall et al. (2007). Navy vessels avoid approaching large whales head on and maneuver to maintain a mitigation zone of 500 yd. (457 m) around observed large whales.

Sei whales have been observed ignoring the presence of vessels and passing close to the vessel (National Marine Fisheries Service 1998). In the presence of approaching vessels, blue whales perform shallower dives accompanied by more frequent surfacing, but otherwise do not exhibit strong reactions (Calambokidis et al. 2009a). Minke whales in the Antarctic did not show any apparent response to a survey vessel moving at normal cruising speeds (about 12 knots; 22 km/hr) at a distance of 5.5 nm; however, when the vessel drifted or moved at very slow speeds (about 1 knot; 1.8 km/hr), many whales approached it (Leatherwood et al. 1982).

Although not expected to be in the Study Area, North Atlantic right whales tend not to respond to the sounds of oncoming vessels (Nowacek et al. 2004). North Atlantic right whales continue to use habitats in high vessel traffic areas (Nowacek et al. 2004). Studies show that North Atlantic right whales demonstrate little if any reaction to sounds of vessels approaching or the presence of the vessels themselves (Nowacek et al. 2004, Terhune and Verboom 1999). Although this may minimize potential disturbance from passing ships, it does increase the whales' vulnerability to potential ship strike. The regulated approach distance for right whales is 500 yd. (460 m) (National Marine Fisheries Service 2001b).

Using historical records, Watkins (1986) showed that the reactions of four species of mysticetes to vessel traffic and whale watching activities in Cape Cod had changed over the 25-year period examined (1957–1982). Reactions of minke whales changed from initially more positive reactions, such as coming towards the boat or research equipment to investigate, to more 'uninterested' reactions towards the end of the study. Finback [fin] whales, the most numerous species in the area, showed a trend from initially more negative reactions, such as swimming away from the boat with limited surfacing, to more uninterested (ignoring) reactions allowing boats to approach within 98.4 ft. (30 m). Right whales showed little change over the study period, with a roughly equal number of reactions judged to be negative and uninterested; no right whales were noted as having positive reactions to vessels. Humpback whales showed a trend from negative to positive reactions with vessels during the study period. The author concluded that the whales had habituated to the human activities over time (Watkins 1986).

Mysticetes have been shown to both increase and decrease calling behavior in the presence of vessel noise. An increase in feeding call rates and repetition by humpback whales in Alaskan waters is associated with vessel noise (Doyle et al. 2008). Melcon et al. (2012) also recently documented that blue whales increased the proportion of time spent producing certain types of calls when vessels were present. Conversely, decreases in singing activity have been noted near Brazil due to boat traffic (Sousa-Lima and Clark 2008). The Central North Pacific stock of humpback whales is the focus of whale-watching activities in both its feeding grounds (Alaska) and breeding grounds (Hawaii). Regulations addressing minimum approach distances and vessel operating procedures are in place in Hawaii. However, there is still concern that whales may abandon preferred habitats if the disturbance is too high (Allen and Angliss 2010).

Odontocetes

Sperm whales generally react only to vessels approaching within several hundred meters; however, some individuals may display avoidance behavior, such as quick diving (Magalhães et al. 2002; Wursig et al. 1998). One study showed that after diving, sperm whales showed a reduced timeframe from when they emitted the first click than before vessel interaction (Richter et al. 2006). The smaller whale-watching and research vessels generate more noise in higher frequency bands and are more likely to approach odontocetes directly, and to spend more time near the individual whale. Reactions to Navy vessels are not well documented, but smaller whale-watching and research boats have been shown to cause these species to alter their breathing intervals and echolocation patterns.

Wursig et al. (1998) reported most *Kogia* species and beaked whales react negatively to vessels by quick diving and other avoidance maneuvers. Cox et al. (2006) noted very little information is available on the behavioral impacts of vessels or vessel noise on beaked whales. A single observation of vocal disruption of a foraging dive by a tagged Cuvier's beaked whale documented when a large noisy vessel was opportunistically present, suggests that vessel noise may disturb foraging beaked whales (Aguilar de Soto et al. 2006). Tyack et al. (2011) noted the result of a controlled exposure to pseudorandom noise suggests that beaked whales would respond to vessel noise and at similar received levels to those noted previously and for mid-frequency sonar.

Most delphinids react neutrally to vessels, although both avoidance and attraction behavior is known (Hewitt 1985; Wursig et al. 1998). Avoidance reactions include a decrease in resting behavior or change in travel direction (Bejder et al. 2006). Incidence of attraction includes harbor porpoises approaching a vessel and common, rough-toothed, and bottlenose dolphins bow riding and jumping in the wake of a vessel (Norris and Prescott 1961; Ritter 2002; Shane et al. 1986; Wursig et al. 1998). A study of vessel reactions by dolphin communities in the eastern tropical Pacific found that populations that were often the target of tuna purse-seine fisheries (spotted, spinner and common dolphins) show evasive behavior when approached; however populations that live closer to shore (within 100 nm; coastal spotted and bottlenose dolphins) that are not set on by purse-seine fisheries tend to be attracted to vessels (Archer et al. 2010a, b).

Killer whales, the largest of the delphinids, are targeted by numerous small whale-watching vessels in the Pacific Northwest and research suggests that whale-watching guideline distances may be insufficient to prevent behavioral disturbances (Noren et al. 2009). These vessels have measured source levels that ranged from 145 to 169 dB re 1 µPa at 1 m, and the sound they produce underwater has the potential to result in behavioral disturbance, interfere with communication, and affect the killer whales' hearing (Erbe 2002). Killer whales foraged significantly less and traveled significantly more when boats were within 328 ft. (100 m) of the whales (Kruse 1991, Lusseau et al. 2009, Noren et al. 2009, Trites and Bain 2000, Williams et al. 2002a, Williams et al. 2009). These short-term feeding activity disruptions may have important long-term population-level effects (Lusseau et al. 2009; Noren et al. 2009). The reaction of the killer whales to whale-watching vessels may be in response to the vessel pursuing them, rather than to the noise of the vessel itself, or to the number of vessels in their proximity. For inland waters of Washington State, regulations were promulgated in 2011, restricting approach to within 200 yd. (182.9 m) of "whales." The approach regulations do not apply to "government vessels," which includes the U.S. Navy. Although these regulations were specifically developed to protect the endangered southern resident killer whales, the regulation reads "whales" and does not specify if it applies to only killer whales, all cetaceas, or marine mammals with a common name including the word "whale" (National Oceanic and Atmospheric Administration 2011). Navy standard practice is to avoid approaching marine mammals head on and to maneuver to maintain a mitigation zone of 500 yd. around detected whales, which is therefore more protective than the distance provided by the regulation.

Similar behavioral changes (increases in traveling and other stress-related behaviors) have been documented in Indo-Pacific bottlenose dolphins in Zanzibar (Christiansen et al. 2010, Englund and Berggren 2002, Stensland and Berggren 2007). Short term displacement of dolphins due to tourist boat presence has been documented (Carrera et al. 2008), while longer term or repetitive/sustained displacement for some dolphin groups due to chronic vessel noise has been noted (Haviland-Howell et al. 2007; Miksis-Olds et al. 2007). Most studies of the behavioral reactions to vessel traffic of bottlenose dolphins have documented at least short-term changes in behavior, activities, or vocalization patterns when vessels are near, although the distinction between vessel noise and vessel movement has not been made clear (Acevedo 1991; Arcangeli and Crosti 2009; Berrow and Holmes 1999; Gregory and Rowden 2001; Janik and Thompson 1996; Lusseau 2004; Mattson et al. 2005; Scarpaci et al. 2000).

Both finless porpoise (Li et al., 2008) and harbor porpoise (Polacheck and Thorpe 1990) routinely avoid and swim away from large motorized vessels. The vaquita, which is closely related to the harbor porpoise in the Study Area, appears to avoid large vessels at about 2,995 ft. (913 m) (Jaramillo-Legorreta et al. 1999). The assumption is that the harbor porpoise would respond similarly to large Navy vessels.

Odontocetes have been shown to make short-term changes to vocal parameters such as intensity (Holt et al., 2008) as an immediate response to vessel noise, as well as increase the pitch, frequency modulation, and length of whistling (May-Collado and Wartzok 2008). Likewise, modification of multiple vocalization parameters has been shown in belugas residing in an area known for high levels of commercial traffic. These animals decreased their call rate, increased certain types of calls, and shifted upward in frequency content in the presence of small vessel noise (Lesage et al. 1999). Another study detected a measurable increase in the amplitude of their vocalizations when ships were present (Scheifele et al. 2005). Killer whales are also known to modify their calls during increased noise. For example, the source level of killer whale vocalizations was shown to increase with higher background noise levels associated with vessel traffic (the Lombard effect) (Holt et al. 2008). In addition, calls with a high-frequency component have higher source levels than other calls, which may be related to behavioral state, or may reflect a sustained increase in background noise levels (Holt et al. 2011).On the other hand, long-term modifications to vocalizations may be indicative of a learned response to chronic noise, or of a genetic or physiological shift in the populations. This type of change has been observed from killer whales off the northwestern coast of the United States between 1973 and 2003. This population increased the duration of primary calls once a threshold in observed vessel density (e.g., whale watching) was reached, which has been suggested as a long-term response to increased masking noise produced by the vessels (Foote et al. 2004).

Pinnipeds

Little is known about pinniped reactions to underwater non-impulsive sounds (Southall et al. 2007) including vessel noise. In a review of reports on reactions of pinnipeds to small craft and ships, Richardson et al. (1995) note that information on pinniped reactions is limited and most reports are based on anecdotal observations. Specific case reports in Richardson et al. (1995) vary based on factors such as routine anthropogenic activity, distance from the vessel, engine type, wind direction, and ongoing subsistence hunting. As with reactions to sound reviewed by Southall et al. (2007), pinniped responses to vessels are affected by the context of the situation and by the animal's experience. In summary, pinniped reactions to vessels are variable and reports include a wide entire spectrum of possibilities from avoidance and alert to cases where animals in the water are attracted and cases on land where there is lack of significant reaction suggesting "habituation" or "tolerance" of vessels (Richardson et al. 1995).

A study of reactions of harbor seal hauled out on ice to cruise ship approaches in Disenchantment Bay, Alaska, revealed that animals are more likely to flush and enter the water when cruise ships approach within 1,640 ft. (500 m) and four times more likely when the cruise ship approaches within 328 ft. (100 m) (Jansen et al. 2010). Navy vessels would generally not operate in vicinity of nearshore natural areas that are pinniped haul-out or rookery locations.

Sea Otter

Sea otters depend on visual acuity to forage, and their eyes are able to focus both in air and underwater (Reidman and Estes 1990). Davis et al. (1988) conducted the one identified study of southern sea otter reactions to various underwater and in-air acoustic stimuli. The purpose of the study was to identify a means to purposefully move sea otters from a location in the event of an oil spill. Anthropogenic sound sources used in this behavioral response study included truck air horns and an acoustic harassment device (10–20 kHz @190 dB; designed to keep dolphins and pinnipeds from being caught in fishing nets). The authors found that the sea otters often remained undisturbed, quickly became tolerant of the various sounds, and even when the desired response occurred (chased from a location) by the presence of a harassing sound, they generally moved only a short distance (110–220 yd. [100–200 m]) before resuming normal activity.

Behavioral Reactions to Aircraft and Missile Overflights

The following paragraphs summarize what is known about the reaction of various marine mammal species to overhead flights of many types of fixed-wing aircraft, helicopters, and missiles. Thorough reviews of the subject and available information are presented in Richardson et al. (1995), Efroymson et al. (2001), Luksenburg and Parsons (2009), and Holst et al. (2011). The most common responses of cetaceans to overflights were short surfacing durations, abrupt dives, and percussive behavior (breaching and tail slapping) (Nowacek et al. 2007). Other behavioral responses such as flushing and fleeing the area of the source of the noise have also been observed (Manci et al. 1988, Holst et al. 2011). Richardson et al. (1995) noted that marine mammal reactions to aircraft overflight largely consisted of opportunistic and anecdotal observations lacking clear distinction between reactions potentially caused by the noise of the aircraft and the visual cue an aircraft presents. In addition it was suggested that variations in the responses noted were due to generally other undocumented factors associated with overflight (Richardson et al. 1995). These factors could include aircraft type (single engine, multi-engine, jet turbine), flight path (centered on the animal, off to one side, circling, level and slow), environmental factors such as wind speed, sea state, cloud cover, and locations where native subsistence hunting continues.

Mysticetes

Mysticetes either ignore or occasionally dive in response to aircraft overflights (Koski et al. 1998; Efroymson et al. 2001). Richardson et al. (1995) reported that while data on the reactions of mysticetes is meager and largely anecdotal, there is no evidence that single or occasional aircraft flying above mysticetes causes long-term displacement of these mammals. In general, overflights above 1,000 ft. (305 m) do not cause a reaction and the National Oceanic and Atmospheric Administration has promulgated a regulation for Hawaiian Waters and the Hawaii Humpback Whale National Marine Sanctuary adopting this stand-off distance. For right whales, the stand-off distance for aircraft is 500 yd. (427 m) (National Marine Fisheries Service 2001b).

Bowhead whales in the Beaufort Sea exhibited a transient behavioral response to fixed-wing aircraft and vessels. Reactions were frequently observed at less than 1,000 ft. (305 m) above sea level, infrequently observed at 1,500 ft. (457 m), and not observed at 2,000 ft. (610 m) above sea level (Richardson et al. 1995). Bowhead whales reacted to helicopter overflights by diving, breaching, changing direction or behavior, and altering breathing patterns. Behavioral reactions decreased in frequency as the altitude of the helicopter increased to 492 ft. (150 m) or higher. It should be noted that bowhead whales may have more acute responses to anthropogenic activity than many other marine mammals since these animals are often presented with limited egress due to limited open water between ice floes. Additionally many of these animals may be hunted by Native Alaskans, which could lead to animals developing additional sensitivity to human noise and presence.

Odontocetes

Variable responses to aircraft have been observed in toothed whales, though overall little change in behavior has been observed during flyovers. Some toothed whales dove, slapped the water with their flukes or flippers, or swam away from the direction of the aircraft during overflights; others did not visibly react (Richardson et al. 1995).

During standard marine mammal surveys at an altitude of 750 ft. (229 m), some sperm whales remained on or near the surface the entire time the aircraft was in the vicinity, while others dove immediately or a few minutes after being sighted. Other authors have corroborated the variability in sperm whales' reactions to fixed-wing aircraft or helicopters (Green et al. 1992; Richter et al. 2006; Richter et al. 2003;

Smultea et al. 2008a; Wursig et al. 1998). In one study, sperm whales showed no reaction to a helicopter until they encountered the downdrafts from the rotors (Richardson et al. 1995). A group of sperm whales responded to a circling aircraft (altitude of 800 to 1,100 ft. [244 to 335 m]) by moving closer together and forming a defensive fan-shaped semicircle, with their heads facing outward. Several individuals in the group turned on their sides, apparently to look up toward the aircraft (Smultea et al. 2008a). Whale-watching aircraft apparently caused sperm whales to turn more sharply but did not affect blow interval, surface time, time to first click, or the frequency of aerial behavior (Richter et al. 2003). Navy aircraft do not fly at low altitude, hover over, or follow whales and so are not expected to evoke this type of response.

Smaller delphinids generally react to overflights either neutrally or with a startle response (Wursig et al. 1998). The same species that show strong avoidance behavior to vessel traffic (*Kogia* species and beaked whales) also react to aircraft (Wursig et al. 1998). Beluga whales reacted to helicopter overflights by diving, breaching, changing direction or behavior, and altering breathing patterns to a greater extent than mysticetes in the same area (Patenaude et al. 2002). These reactions increased in frequency as the altitude of the helicopter dropped below 492 ft. (150 m).

Pinnipeds

Richardson et al. (1995) noted that data on pinniped reactions to aircraft overflight largely consisted of opportunistic and anecdotal observations. Richardson et al.'s (1995) summary of this variable data note that responsiveness generally was dependent on the altitude of the aircraft, the abruptness of the associated aircraft sound, and life cycle stage (breeding, molting, etc.). Hauled out pinnipeds exposed to aircraft sight and/or sound often react by becoming alert and in many cases rushing into the water. Stampedes resulting in mortality to pups (by separation or crushing) have been noted in some cases although it is rare (Holst et al. 2011 provides an up-to-date review of this subject).

Helicopters are used in studies of several species of seals hauled out and are considered an effective means of observation (Gjertz and Børset 1992; Bester et al. 2002), although they have been known to elicit behavioral reactions such as fleeing (Hoover 1988). In other studies, harbor seals showed no reaction to helicopter overflights (Gjertz and Børset 1992).

Ringed seals near an oil production island in Alaska reacted to approaching Bell 212 helicopters generally by increasing vigilance, although one seal left their basking site for the water after a helicopter approached within approximately 328 ft. (100 m) (Blackwell et al. 2004). Seals in the study near an oil production platform were thought to be habituated and showed no reactions to industrial noise in water or in air, including impact pipe-driving, during the rest of the observations.

For California sea lions and Steller sea lions at a rocky haulout off Crescent City in northern California, helicopter approach to landing typically caused the most sever response (National Oceanic and Atmospheric Administration 2010). Responses were also dependent on the species with Steller sea lions being more "skittish" and California sea lions more tolerant. Depending on the spacing between subsequent approaches, animals hauled out in between and fewer animals reacted upon subsequent exposures (National Oceanic and Atmospheric Administration 2010).

Pinnipeds reactions to rocket launches and overflight at San Nicolas Island (California) are studied annually pursuant to the Navy's Incidential Harassment Authorization covering that testing. For the time period of August 2001 to October 2008 (and consistent with other reports), Holst et al. (2011) documented that behavioral reactions differed between species. California sea lions startled and increased vigilance for up to two minutes after a rocket overflight, with some individuals moving down the beach or returning to the water. Northern elephant seals showed little reaction to any overflight. Harbor seals had the most pronounced reactions of the three species observed with most animals within approximately 2.5 mi. (4 km) of the rocket trajectory leaving their haul-out sites for the water and not returning for several hours. The authors concluded that the effects of the rocket launches were minor with no effects on local populations evidenced by the increasing populations of pinnipeds on San Nicolas Island (Holst et al. 2011).

Sea Otter

There is no specific information available indicating that overflights of any kind have an impact on sea otters. Fixed-wing aerial surveys are often recommended as a means to monitor populations of sea otter. There has been no evidence that any aircraft or missile overflight has had adverse effects on the translocated colony of sea otters at San Nicolas Island or in the SOCAL portion of the Study Area (U.S. Department of the Navy 2002).

3.4.3.1.2.7 Repeated Exposures

Repeated exposures of an individual to multiple sound-producing activities over a season, year, or life stage could cause reactions with costs that can accumulate over time to cause long term consequences for the individual. Conversely, some animals habituate to or become tolerant of repeated exposures over time, learning to ignore a stimulus that in the past has not accompanied any overt threat.

Repeated exposure to acoustic and other anthropogenic stimuli has been studied in several cases, especially as related to vessel traffic and whale watching. Common dolphins in New Zealand responded to dolphin-watching vessels by interrupting foraging and resting bouts, and took longer to resume behaviors in the presence of the vessel (Stockin et al. 2008). The authors speculated that repeated interruptions of the dolphins foraging behaviors could lead to long-term implications for the population. Bejder et al. (2006) studied responses of bottlenose dolphins to vessel approaches and found stronger and longer lasting reactions in populations of animals that were exposed to lower levels of vessel traffic overall. The authors indicated that lesser reactions in populations of dolphins regularly subjected to high levels of vessel traffic could be a sign of habituation, or it could be that the more sensitive animals in this population previously abandoned the area of higher human activity.

Marine mammals exposed to high levels of human activities may leave the area, habituate to the activity, or tolerate the disturbance and remain in the area. Marine mammals that are more tolerant may stay in a disturbed area, whereas individuals that are more sensitive may leave for areas with less human disturbance. However, animals that remain in the area throughout the disturbance may be unable to leave the area for a variety of physiological or environmental reasons. Terrestrial examples of this abound as human disturbance and development displace more sensitive species, and tolerant animals move in to exploit the freed resources and fringe habitat. Longer-term displacement can lead to changes in abundance or distribution patterns of the species in the affected region if they do not become acclimated to the presence of the sound (Blackwell et al. 2004; Bejder et al. 2006; Teilmann et al. 2006). Gray whales in Baja California abandoned an historical breeding lagoon in the mid-1960s due to an increase in dredging and commercial shipping operations. Whales did repopulate the lagoon after shipping activities had ceased for several years (Bryant et al. 1984). Over a shorter time scale, studies on the Atlantic Undersea Test and Evaluation Center instrumented range in the Bahamas have shown that some Blaineville's beaked whales may be resident during all or part of the year in the area, and that individuals may move off of the range for several days during and following a sonar event. However animals are thought to continue feeding at short distances (a few kilometers) from the range out of the louder sound fields (less than 157 dB re 1 µPa) (McCarthy et al. 2011; Tyack et al. 2011). Mysticetes in the northeast tended to adjust to vessel traffic over a number of years, trending towards more neutral responses to passing vessels (Watkins 1986), indicating that some animals may habituate or otherwise learn to cope with high levels of human activity. Nevertheless, the long-term consequences of these habitat utilization changes are unknown, and likely vary depending on the species, geographic areas, and the degree of acoustic or other human disturbance.

Moore and Barlow (2013) have noted a decline in beaked whales in a broad area of the Pacific Ocean area out to 300 nm from the coast and extending from the Canadian-U.S. border to the tip of Baja Mexico. There are scientific caveats and limitations to the data used for that analysis, as well as oceanographic and species assemblage changes not thoroughly addressed in Moore and Barlow (2013) although the authors suggest Navy sonar as one possible explanation for the apparent decline in beaked whale numbers over that broad area. Interestingly, however, in the small portion of the Pacific coast overlapping the Navy's SOCAL Range Complex, long-term residency by individual Cuvier's beaked whales and documented higher densities of beaked whales provide indications that the proposed decline in numbers elsewhere along the Pacific coast is not apparent where the Navy has been intensively training and testing with sonar and other systems for decades. While it is possible that a downward trend in beaked whales may have gone unnoticed at the range complex (due to a lack of survey precision) or that beaked whale densities may have been higher before the Navy began using sonar earlier in 1900s, there is no data to suggest that beaked whale numbers have declined on the range where Navy sonar use has routinely occurred and, as Moore and Barlow (2013) point out, it remains clear that the Navy range in Southern California continues to support high densities of beaked whales.

3.4.3.1.2.8 Stranding

When a live or dead marine mammal swims or floats onto shore and becomes "beached" or incapable of returning to sea, the event is termed a "stranding" Geraci et al. 1999; Geraci and Lounsbury 2005). Animals outside of their "normal" habitat are also sometimes considered "stranded" even though they may not have beached themselves. Under the U.S. Law, a stranding is an event in the wild that: (A) a marine mammal is dead and is (i) on a beach or shore of the United States; or (ii) in waters under the jurisdiction of the United States (including any navigable waters); or (B) a marine mammal is alive and is (i) on a beach or shore of the United States and is unable to return to the water; (ii) on a beach or shore of the United States and, although able to return to the water, is in need of medical attention; or (iii) in the waters under the jurisdiction of the United States (including any navigable waters), but is unable to return to its natural habitat under its own power or without assistance" (16 United States Code [U.S.C.] section 1421h).

Marine mammals are subjected to a variety of natural and anthropogenic factors, acting alone or in combination, which may cause a marine mammal to strand on land or die at-sea (Geraci et al. 1999; Geraci and Lounsbury 2005). Even for the fractions of more thoroughly investigated strandings involving post-stranding data collection and necropsies, the cause (or causes) for the majority of strandings remain undetermined. Natural factors related to strandings include, for example, the availability of food, predation, disease, parasitism, climatic influences, and aging (Bradshaw et al. 2006; Culik 2002; Geraci et al. 1999; Geraci and Lounsbury 2005; Hoelzel 2003; National Research Council 2006; Perrin and Geraci 2002; Walker et al. 2005). Anthropogenic factors include, for example, pollution (Marine Mammal Commission 2010; Elfes et al. 2010; Hall et al. 2006a; Hall et al. 2006b; Jepson et al. 2005; Tabuchi et al. 2006), vessel strike (Berman-Kowalewski et al. 2010; de Stephanis and Urquiola 2006; Geraci and Lounsbury 2005; Jensen and Silber 2003; Laist et al. 2001), fisheries interactions (Look 2011; Read et al.

2006), entanglement (Baird and Gorgone 2005; Johnson and Allen 2005; Saez et al. 2012), and noise (Richardson et al. 1995, National Research Council 2003, Cox et al. 2006).

Along the coasts of the continental United States and Alaska between 2001 and 2009, there were on average approximately 1,400 cetacean strandings and 4,300 pinniped strandings (5,700 total) per year (National Marine Fisheries Service 2011a, b, c). Several "mass stranding" events—strandings that involve two or more individuals of the same species (excluding a single cow-calf pair)—that have occurred over the past two decades have been associated with naval operations, seismic surveys, and other anthropogenic activities that introduced sound into the marine environment. An in-depth discussion of strandings is presented in the Navy's *Marine Mammal Strandings Associated with U.S. Navy Sonar Activitie*s (U.S. Department of the Navy 2012a).

Sonar use during exercises involving U.S. Navy (most often in association with other nations' defense forces) has been identified as a contributing cause or factor in five specific mass stranding events: Greece in 1996; the Bahamas in March 2000; Madeira Island, Portugal in 2000; the Canary Islands in 2002, and Spain in 2006 (Marine Mammal Commission 2006). These five mass stranding events resulted in about 40 known stranding deaths among cetaceans, consisting mostly of beaked whales, with a potential causal link to sonar (International Council for the Exploration of the Sea 2005a, b). Although these events have served to focus attention on the issue of impacts resulting from the use of sonar, as Ketten (2012) recently pointed out, "ironically, to date, there has been no demonstrable evidence of acute, traumatic, disruptive, or profound auditory damage in any marine mammal as the result [of] anthropogenic noise exposures, including sonar." In these previous strandings, exposure to non-impulsive acoustic energy has been considered a potential indirect cause of the death of marine mammals (Cox et al. 2006). One hypothesis regarding a potential cause of the strandings is that tissue damage resulting from "gas and fat embolic syndrome" (Fernandez et al. 2005; Jepson et al. 2003; Jepson et al. 2005). Models of nitrogen saturation in diving marine mammals have been used to suggest that altered dive behavior might result in the accumulation of nitrogen gas such that the potential for nitrogen bubble formation is increased (Houser et al. 2001b; Houser et al. 2001a; Zimmer and Tyack 2007). If so, this mechanism might explain the findings of gas and bubble emboli in stranded beaked whales. It is also possible that stranding is a behavioral response to a sound under certain contextual conditions and that the subsequently observed physiological effects (e.g., overheating, decomposition, or internal hemorrhaging from being on shore) were the result of the stranding rather than direct physical impact from exposure to sonar (Cox et al. 2006).

As International Council for the Exploration of the Sea (2005b) noted, taken in context of marine mammal populations in general, sonar is not a major threat, or significant portion of the overall ocean noise budget. This has also been demonstrated by monitoring in areas where Navy operates (Bassett et al. 2010; Baumann-Pickering et al. 2010; Hildebrand et al. 2011; McDonald et al. 2006; Tyack et al. 2011). Regardless of the direct cause, Navy considers potential sonar related strandings important and continues to fund research and work with scientists to better understand circumstances that may result in strandings.

On 4 March 2011 at the Silver Strand Training Complex (San Diego, California), three long-beaked common dolphins were found dead immediately after an underwater detonation associated with a Navy training event[17]. In addition to the three dolphin mortalities at the detonation site, the remains of a

[17] During this underwater detonation training event, a pod of 100 to 150 dolphins were observed moving toward the explosive event's 700-yard (640 m) exclusion zone monitored by a personnel in a safety boat and participants in a dive boat. Within the exclusion zone, approximately 5 minutes remained on a timed fuse connected to a single 8.76 lb (3.97 kg) explosive charge

fourth dolphin were discovered 3 days later approximately 42 mi. (68 km) north of the training event location (Danil and St. Ledger 2011; approximately Oceanside, California). It is not known when this fourth dolphin died, but certainly sometime between the training event and the discovery at the stranding location. Location details, such as individual dolphins' depth and distance from the explosive at the time of detonation, could not be estimated from the 250 yd. (229 m) standoff point of the observers in the dive boat or the safety boat.

These dolphin mortalities are the only known occurrence of a U.S. Navy training event involving impulse energy (underwater detonation) that has resulted in injury to a marine mammal. Despite this being a rare occurrence, Navy has reviewed training requirements, safety procedures, and potential mitigation measures and, along with NMFS, is determining appropriate changes to implement to reduce the potential for this to occur in the future. Discussions of procedures associated with these and other training and testing events are presented in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring), which details all mitigations.

The potential for marine mammals to die as a result of Navy activities is very low and the numbers resulting from the modeling reflect a very conservative approach.[18] In comparison, there are many non-Navy human activities resulting in potential strandings, serious injury and death. These include commercial vessels ship strike (e.g., Berman-Kowalewski et al. 2010, Silber et al. 2010), impacts from urban pollution (e.g., O'Shea & Brownell 1997, Hooker et al. 2007, Murata et al. 2009), and annual fishery-related entanglement, bycatch, injury, and mortality to cetaceans and pinnipeds (e.g., Baird and Gorgone 2005; Forney and Kobayashi 2007; Saez et al.2012) that has been estimated worldwide to be orders of magnitude greater than the few potential injurious impacts that could be possible as a result of Navy activities (hundreds of thousands of animals versus tens of animals) (Culik 2002, International Council for the Exploration of the Sea 2005b, Read et al. 2006). This does not negate the potential influence of mortality or additional stressor to small, regionalized sub-populations which may be at greater risk from human related mortalities (fishing, vessel strike, sound) than populations with larger oceanic level distributions, but overall the Navy's impact in the oceans and inland water areas where training and testing occurs is small by comparison to other human activities.

3.4.3.1.3 Long-Term Consequences to the Individual and the Population

Long-term consequences to a population are determined by examining changes in the population growth rate. Individual effects that could lead to a reduction in the population growth rate include mortality or injury (that removes animals from the reproductive pool), hearing loss (which depending on severity could impact navigation, foraging, predator avoidance, or communication), chronic stress (which could make individuals more susceptible to disease), displacement of individuals (especially from preferred foraging or mating grounds), and disruption of social bonds (due to masking of conspecific signals or displacement) (see Section 3.0.5.7.1.1, Flowchart). However, the long-term consequences of any of these effects are difficult to predict because individual experience and time can create complex contingencies, especially for intelligent, long-lived animals like marine mammals. While a lost

weight (C-4 and detonation cord) set at a depth of 48 ft. (72.7 m), approximately 0.5–0.75 nm from shore. Although the dive boat was placed between the pod and the explosive in an effort to guide the dolphins away from the area, that effort was unsuccessful.

[18] Navy's metric for modeling and quantifying "mortality" provides a conservative overestimate of the mortalities likely to occur. The mortality criteria is based on an injury from impulse energy for which only 1% of the animals receiving that injury would die. All animals within the range to onset mortality are modeled as mortalities, although many would actually survive. With the exception of rare Navy vessel strikes to large whales, marine mammals are not expected to die as a result of future Navy training and testing activities.

reproductive opportunity could be a measureable cost to the individual, the outcome for the animal, and ultimately the population, can range from insignificant to significant. Any number of factors, such as maternal inexperience, years of poor food supply, or predator pressure, could produce a cost of a lost reproductive opportunity, but these events may be “made up” during the life of a normal healthy individual. The same holds true for exposure to human-generated sound sources. These biological realities must be taken into consideration when assessing risk, uncertainties about that risk, and the feasibility of preventing or recouping such risks. All too often, the long-term consequence of relatively trivial events like short-term masking of a conspecific’s social sounds, or a single lost feeding opportunity, is exaggerated beyond its actual importance by focus on the single event and not the important variable, which is the individual and its lifetime parameters of growth, reproduction and survival.

The linkage between a stressor such as sound and its immediate behavioral or physiological consequences for the individual, and then the subsequent effects on that individual’s vital rates (growth, survival and reproduction), and the consequences, in turn, for the population have been reviewed in National Research Council (2005). The Population Consequences of Acoustic Disturbance or PCAD model (see National Research Council 2005) proposed a quantitative methodology for determining how changes in the vital rates of individuals (i.e., a biologically significant consequence to the individual) translates into biologically significant consequences to the population. Population models are well known from many fields in biology including fisheries and wildlife management. These models accept inputs for the population size and changes in vital rates of the population such as the mean values for survival age, lifetime reproductive success, and recruitment of new individuals into the population. The time-scale of the inputs in a population model for long-lived animals such as marine mammals is on the order of seasons, years, or life stages (e.g., neonate, juvenile, reproductive adult), and are often concerned only with the success of individuals from one time period or stage to the next. Unfortunately, for acoustic and explosive impacts to marine mammal populations, many of the inputs required by population models are not known.

The best assessment of long-term consequences from training and testing activities will be to monitor the populations over time within the Study Area. A recent U.S. workshop on Marine Mammals and Sound (Fitch et al. 2011) indicated a critical need for baseline biological data on marine mammal abundance, distribution, habitat, and behavior over sufficient time and space to evaluate impacts from human-generated activities on long-term population survival. The Navy has developed monitoring plans for protected marine mammals and sea turtles occurring on Navy ranges with the goal of assessing the impacts of training and testing activities on marine species and the effectiveness of the Navy’s current mitigation practices. For example, results of intensive monitoring from 2009 to 2012 by independent scientists and Navy observers in SOCAL Range Complex and HRC have recorded an estimated 256,000 marine mammals with no evidence of distress or unusual behavior observed during Navy activities (see Section 3.4.5, Summary of Observations During Previous Navy Activities, for a broader discussion on this topic). Continued monitoring efforts over time will be necessary to begin to completely evaluate the long-term consequences of exposure to sound sources.

3.4.3.1.4 Thresholds and Criteria for Predicting Acoustic and Explosive Impacts on Marine Mammals

If proposed Navy activities introduce sound or explosive energy into the marine environment, an analysis of potential impacts to marine mammals is conducted. To do this, information about the numerical sound and energy levels that are likely to elicit certain types of physiological and behavioral reactions is needed.

3.4.3.1.4.1 Frequency Weighting

Frequency-weighting functions are used to adjust the received sound level based on the sensitivity of the animal to the frequency of the sound. The weighting functions de-emphasize sound exposures at frequencies to which marine mammals are not particularly sensitive. This effectively makes the acoustic thresholds frequency-dependent, which means they are applicable over a wide range of frequencies and therefore applicable for a wide range of sound sources. Frequency-weighting functions, deemed "M-weighting" functions by Southall et al. (2007) were proposed to account for the frequency bandwidth of hearing in marine mammals. These M-weighting functions were derived for each marine mammal hearing group based on an algorithm using the range of frequencies that are within 80 dB of an animal or group's best hearing sensitivity at any frequency (Southall et al. 2007). The Southall et al. (2007) M-weighting functions are nearly flat between the lower and upper cutoff frequencies, and thus were believed to represent a conservative approach to assessing the effects of sound (see Figure 3.4-5). For the purposes of this analysis, the Navy will refer to these as Type I auditory weighting functions.

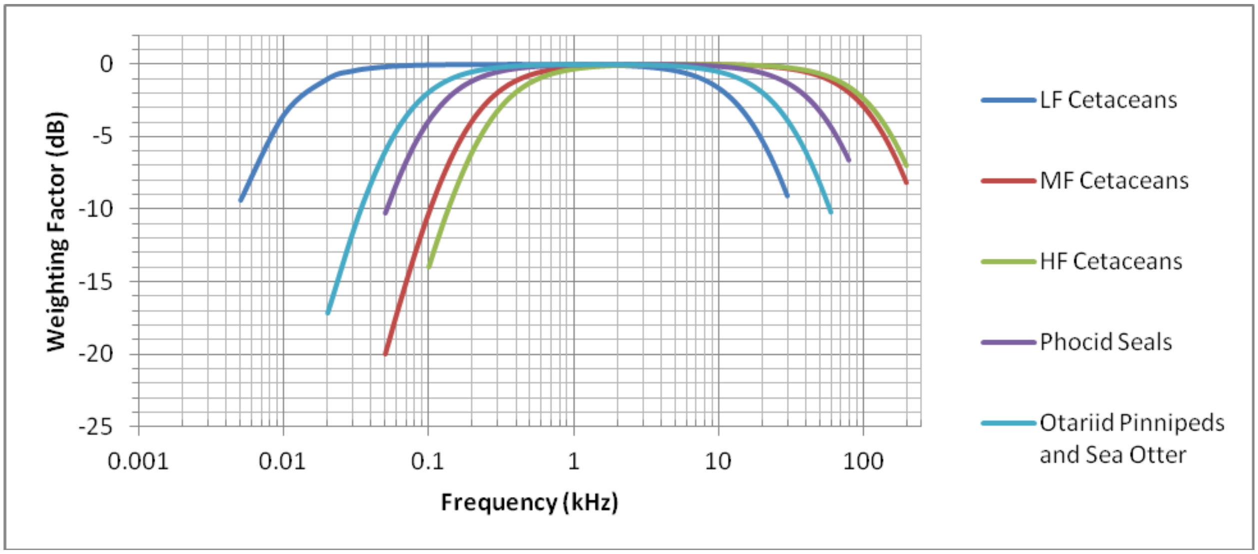


Figure 3.4-5: Type I Auditory Weighting Functions Modified from the Southall et al. (2007) M-Weighting Functions

While all data published since 2007 have been reviewed to determine if any adjustments to the weighting functions were required, only two published experiments suggested that modification of the mid-frequency cetacean auditory weighting function was necessary (see Finneran and Jenkins [2012] for more details on that modification not otherwise provided below). The first experiment measured TTS in a bottlenose dolphin after exposure to pure tones with frequencies from 3 to 28 kHz (Finneran et al. 2010). These data were used to derive onset-TTS values as a function of exposure frequency, and demonstrate that the use of a single numeric threshold for onset-TTS, regardless of frequency, is not correct. The second experiment examined how subjects perceived the loudness of sounds at different frequencies to derive equal loudness contours (Finneran and Schlundt 2011). These data are important because human auditory weighting functions are based on equal loudness contours. The dolphin equal loudness contours provide a means to generate auditory weighting functions in a manner directly analogous to the approach used to develop safe exposure guidelines for people working in noisy environments (National Institute for Occupational Safety and Health 1998).

Frequency Weighting Example:

A common dolphin, a mid-frequency cetacean (see 3.4.2.3.2), receives a 10 kHz ping from a sonar with a sound exposure level (SEL) of 180 dB re 1µPa^2-s. To discern if this animal may suffer a TTS, the received level must first be adjusted using the appropriate Type II auditory weighting function for mid-frequency cetaceans (see 3.4.2.3.2). At 10 kHz, the weighting factor for mid-frequency cetaceans is -3 dB, which is then added to the received level (180 dB re 1µPa^2-s + (-3 dB) = 177 dB re 1µPa^2-s) to yield the weighted received level. This is compared to the Non-Impulsive Mid-Frequency Cetacean TTS threshold (178 dB re 1µPa^2-s; see Table 3.4-3). Since the adjusted received level is less than the threshold, TTS is not likely for this animal from this exposure.

Taken together, the recent higher-frequency TTS data and equal loudness contours provide the underlying data necessary to develop new weighting functions, referred to as Type II auditory weighting functions, to improve accuracy and avoid underestimating the impacts on animals at higher frequencies as shown on Figure 3.4-6. To generate the new Type II weighting functions, Finneran and Schlundt (2011) substituted lower and upper frequency values which differ from the values used by Southall et al. (2007). The new Type II weighting curve predicts appreciably higher susceptibility for frequencies above 3 kHz. Since data below 3 kHz are not available, the original Type I weighting functions from Southall et al. (2007) were substituted below this frequency. Low- and high-frequency cetacean weighting functions were extrapolated from the dolphin data as well because of the suspected similarities of greatest susceptibility at best frequencies of hearing. Similar type II weighting curves were not developed for pinnipeds since their hearing is markedly different from cetaceans, and because they do not hear as well at higher frequencies and so their weighting curves did not require the same adjustment (see Finneran and Jenkins 2012 for additional details).

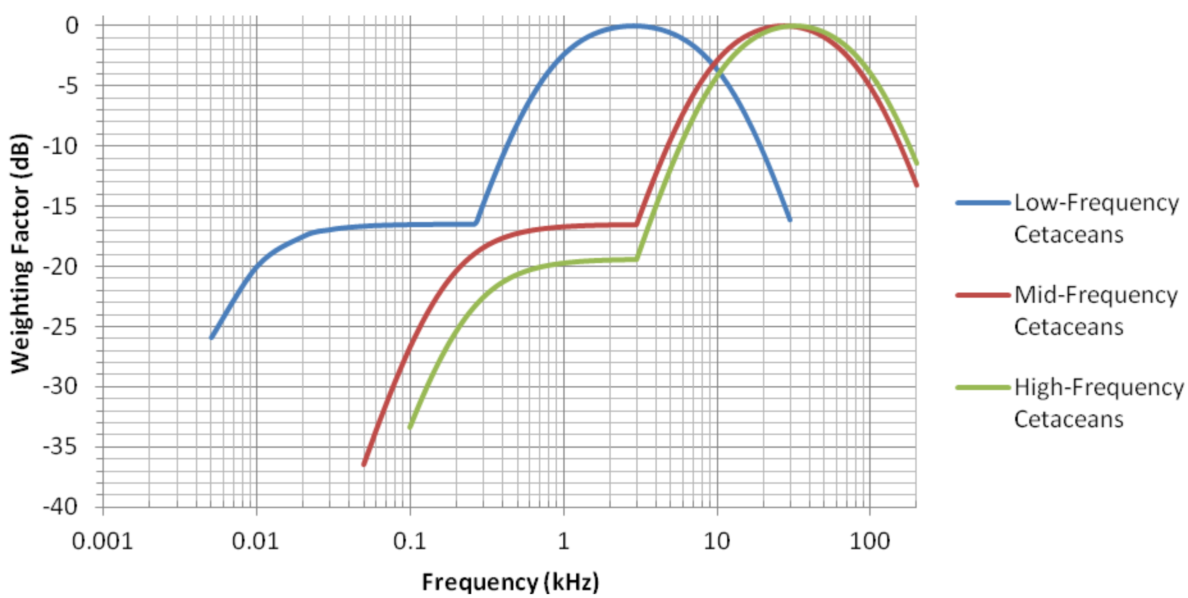


Figure 3.4-6: Type II Weighting Functions for Low-, Mid-, and High-Frequency Cetaceans

The Type II auditory cetacean weighting functions (Figure 3.4-6) are applied to the received sound level before comparing it to the appropriate SEL thresholds for TTS or PTS, or the impulsive behavioral response threshold (note that for pinniped and sea otter, the Southall et al. [2007] weighting functions [Figure 3.4-3] would be used in lieu of any new weighting functions). For some criteria, received levels are not weighted before being compared to the thresholds to predict effects. These include the peak pressure criteria for predicting impulsive TTS and PTS; the acoustic impulse metrics used to predict onset-mortality and slight lung injury; and the thresholds used to predict behavioral responses from harbor porpoises and beaked whales from non-impulsive sound.

3.4.3.1.4.2 Summation of Energy From Multiple Sources

In most cases, an animal's received level will be the result of exposure to a single sound source. In some scenarios, however, multiple sources will be operating simultaneously, or nearly so, creating the potential for accumulation of energy from multiple sources. Energy is summed for multiple exposures of similar source types. For sonar, including use of multiple systems within any scenario, energy will be summed for all exposures within a frequency band, with the cumulative frequency exposure bands defined as 0–1.0 kHz (low-frequency sources), 1.1–10.0 kHz (mid-frequency sources), 10.1–100.0 kHz (high-frequency sources), and 100.1–200.0 kHz (very high frequency sources). Sources operated at frequencies above 200 kHz are considered to be inaudible to all groups of marine mammals and are not analyzed in the quantitative modeling of exposure levels. After the energy has been summed within each frequency band, the band with the greatest amount of energy is used to evaluate the onset of PTS or TTS. For explosives, including use of multiple explosives in a single scenario, energy is summed across the entire frequency band.

3.4.3.1.4.3 Hearing Loss - Temporary and Permanent Threshold Shift

Criteria for physiological effects from non-impulsive sources are based on TTS and PTS with thresholds based on cumulative SELs (see Table 3.4-3). The onset of TTS or PTS from exposure to impulsive sources is predicted using a SEL-based threshold in conjunction with a peak pressure threshold. The horizontal ranges are then compared, with the threshold producing the longest range being the one used to predict effects. For multiple exposures within any 24-hour period, the received SEL for individual events are accumulated for each animal.

Table 3.4-3: Non-Impulsive Acoustic Criteria and Thresholds for Predicting Physiological Effects to Marine Mammals Underwater (Sonar and Other Acoustic Sources)

Hearing Group	Species	Onset TTS	Onset PTS
Low-Frequency Cetaceans	All mysticetes	178 dB re 1µPa^2-s SEL (Type II weighting)	198 dB re 1µPa^2-s SEL (Type II weighting)
Mid-Frequency Cetaceans	Dolphins, beaked whales, and medium and large toothed whales	178 dB re 1µPa^2-s SEL (Type II weighting)	198 dB re 1µPa^2-s SEL (Type II weighting)
High-Frequency Cetaceans	Porpoises and *Kogia* spp.	152 dB re 1µPa^2-s SEL (Type II weighting)	172 dB re 1µPa^2-s SEL (Type II weighting)
Phocid Seals	Hawaiian Monk, Northern Elephant & Harbor Seals	183 dB re 1µPa^2-s SEL (Type I weighting)	197 dB re 1µPa^2-s SEL (Type I weighting)
Otariidae	Sea Lion & Fur Seal	206 dB re 1µPa^2-s SEL (Type I weighting)	220 dB re 1µPa^2-s SEL (Type I weighting)
Mustelidae	Sea Otter		

Note: SEL = Sound Exposure Level, TTS = Temporary Threshold Shift, PTS = Permanent Threshold Shift

Since no studies have been designed to intentionally induce PTS in marine mammals due to the moral and ethical issues inherent in such a study, onset-PTS levels have been estimated using empirical TTS data obtained from marine mammals and relationships between TTS and PTS established in terrestrial mammals.

TTS and PTS thresholds are based on TTS onset values for impulsive and non-impulsive sounds obtained from representative species of mid- and high-frequency cetaceans and pinnipeds. This data is then extended to the other marine mammals for which data is not available. The Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis technical report (Finneran and Jenkins 2012) provides a detailed explanation of the selection of criteria and derivation of thresholds for temporary and permanent hearing loss for marine mammals. Section 3.4.3.1.2.3 (Hearing Loss) provided the specific meanings of TTS and PTS as used in this EIS/OEIS. Table 3.4-3 and Table 3.4-4 provide a summary of acoustic thresholds for TTS and PTS for marine mammals.

3.4.3.1.4.4 Temporary Threshold Shift for Sonar and Other Active Acoustic Sources

TTS involves no tissue damage, is by definition temporary, and therefore is not considered injury. TTS values for mid-frequency cetaceans exposed to non-impulse sound are derived from multiple studies (Finneran et al. 2005; Schlundt et al. 2000; Mooney et al. 2009; Finneran et al. 2010; Finneran and Schlundt 2010) from two species, bottlenose dolphins and beluga whales. Especially notable are data for frequencies above 3 kHz, where bottlenose dolphins have exhibited lower TTS onset thresholds than at 3 kHz (Finneran and Schlundt 2010; Finneran and Schlundt 2011). This difference in TTS onset at higher frequencies is incorporated into the weighting functions.

Previously, there were no direct measurements of TTS from non-impulse sound in high frequency cetaceans. Lucke et al. (2009) measured TTS in a harbor porpoise exposed to a small seismic air gun and those results are reflected in the current impulse sound TTS thresholds described below. The beluga whale, which had been the only species for which both impulsive and non-impulsive TTS data existed, has a non-impulsive TTS onset value about 6 dB above the (weighted) impulsive threshold (Schlundt et al. 2000; Finneran et al. 2002). Therefore, 6 dB was added to the harbor porpoise impulsive temporary thresholds shift threshold demonstrated by Lucke et al. (2009) to derive the non-impulse TTS threshold used in the current Navy modeling for high frequency cetaceans. Report on the first direct measurements of TTS from non-impulse sound has been recently presented by Kastelein et al.(2012b) for harbor porpoise. This new data is consistent with the current harbor porpoise thresholds used in the modeling of effects from non-impulse sources.

There are no direct measurements of TTS or hearing abilities for low-frequency cetaceans. The Navy uses mid-frequency cetacean thresholds to assess PTS and TTS for low-frequency cetaceans, since mid-frequency cetaceans are the most similar to the low-frequency cetacean group.

Pinniped TTS criteria are based on data provided by Kastak et al. (2005) for representative species of both of the pinniped hearing groups: harbor seals (Phocidae) and California sea lions (Otariidae). Kastak et al. (2005) used octave band noise centered at 2.5 kHz to extrapolate an onset TTS threshold. For sea otter, the otariid TTS threshold and weighting function are applied due to similarities in taxonomy and auditory performance. Recent research using sound at 4 kHz on harbor seal (Kastelein et al. 2012a) has findings consistent with the Navy's current criteria and thresholds.

The appropriate frequency weighting function for each species group is applied when using the SEL-based thresholds to predict TTS.

3.4.3.1.4.5 Temporary Threshold Shift for Explosives

The TTS SEL thresholds for cetaceans are consistent with thresholds approved by NMFS for the USS MESA VERDE ship shock trial (73 FR 143: 43130-43138, 24 July 2008) and are more representative of TTS induced from impulses (Finneran et al. 2002) rather than pure tones (Schlundt et al. 2000). In most cases, a total weighted SEL is more conservative than greatest SEL in 1/3-octave bands, which was used prior to the USS MESA VERDE ship shock trials. There are no data on TTS obtained directly from low-frequency cetaceans, so mid-frequency cetacean impulse threshold criteria from Finneran et al. (2002) have been used. High-frequency cetacean TTS thresholds are based on research by Lucke et al. (2009), who exposed harbor porpoises to pulses from a single air gun.

Pinniped criteria were not included for prior ship shock trials, as pinnipeds were not expected to occur at the shock trial sites, and TTS criteria for previous Navy EIS/Overseas EISs (OEISs) also were not differentiated between cetaceans and pinnipeds (National Marine Fisheries Service 2008b). TTS data to develop impulse sound criteria have not been obtained for pinnipeds, but there are TTS data for octave band sound from representative species of both major pinniped hearing groups (Kastak et al. 2005). Impulse sound TTS criteria for pinnipeds were estimated by applying the difference between mid-frequency cetacean TTS onset for impulse and non-impulse sounds to the pinniped non-impulse TTS data (Kastak et al. 2005), a methodology originally developed by Southall et al. (2007). Therefore, the TTS criteria for impulsive sounds from explosions for pinnipeds is 6 dB less than the non-impulsive onset-TTS criteria derived from Kastak et al. (2005).

For sea otters, the otariid TTS and PTS criteria and weighting function would be applied due to similarities in taxonomy and the likely hearing ability of sea otter when underwater (Finneran and Jenkins 2012).

The appropriate frequency weighting function for each species group is applied when using the SEL-based thresholds to predict TTS.

3.4.3.1.4.6 Permanent Threshold Shift for Sonar and Other Active Acoustic Sources

There are no direct measurements of PTS onset in marine mammals. Well understood relationships between TTS and PTS in terrestrial mammals have been applied to marine mammals. Threshold shifts up to 40–50 dB have been induced in terrestrial mammals without resultant PTS (Miller et al. 1963; Ward et al. 1958; 1959a). These data would suggest that a PTS criteria of 40 dB would be reasonable for conservatively predicting (overestimating) PTS in marine mammals. Data from terrestrial mammal testing (Ward et al. 1958; 1959a, b) show growth of TTS by 1.5 to 1.6 dB for every 1 dB increase in exposure level (EL). The difference between measureable TTS onset (6 dB) and the selected 40 dB upper safe limit of TTS yields a difference in TTS of 34 dB which, when divided by a TTS growth function of 1.6 indicates that an increase in exposure of 21 dB would result in 40 dB of TTS. For simplicity and additional conservatism we have rounded that number down to 20 dB (Southall et al. 2007).

Therefore, exposures to sonar and other active acoustic sources with levels 20 dB above those producing TTS are used to predict the threshold at which a PTS exposure would occur. For example, an onset-TTS criteria of 195 dB re 1 μPa^2-s would have a corresponding onset-PTS criteria of 215 dB re 1 μPa^2-s. This extrapolation process is identical to that recently proposed by Southall et al. (2007). The method overestimates or predicts greater effects than have actually been observed in tests on a bottlenose dolphin (Schlundt et al. 2006; Finneran et al. 2010).

Kastak et al. (2007) obtained different TTS growth rates for pinnipeds than Finneran and colleagues obtained for mid-frequency cetaceans. NMFS recommended reducing the estimated PTS criteria for both groups of pinnipeds, based on the difference in TTS growth rate reported by Kastak et al. (2007) (14 dB instead of 20 dB).

The appropriate frequency weighting function for each species group is applied when using the SEL-based thresholds to predict PTS.

3.4.3.1.4.7 Permanent Threshold Shift for Explosives

Since marine mammal PTS data from impulsive exposures do not exist, onset-permanent threshold shift levels for these animals are estimated by adding 15 dB to the SEL-based TTS criteria and by adding 6 dB to the peak pressure based thresholds. These relationships were derived by Southall et al. (2007) from impulse noise TTS growth rates in chinchillas. The appropriate frequency weighting function for each species group is applied using the resulting SEL-based thresholds, as shown on Table 3.4-4, to predict PTS.

3.4.3.1.4.8 Mortality and Injury from Explosives

There is a considerable body of laboratory data on actual injury for impulse sound, usually from explosive pulses, obtained from tests with a variety of lab animals (mice, rats, dogs, pigs, sheep, and other species). Onset Slight Gastrointestinal (GI) Tract Injury, Onset Slight Lung Injury, and Onset Mortality (a 50 percent lung injury with mortality occurring in 1 percent of those having this injury) represent a series of effects with increasing likelihood of serious injury or lethality. Primary impulse injuries from explosive blasts are the result of differential compression and rapid re-expansion of adjacent tissues of different acoustic properties (e.g., between gas-filled and fluid-filled tissues or between bone and soft tissues). These injuries usually manifest themselves in the gas-containing organs (lung and gut) and auditory structures (e.g., rupture of the eardrum across the gas-filled spaces of the outer and inner ear) (Craig and Hearn 1998, Craig Jr. 2001).

Criteria and thresholds for predicting injury and mortality to marine mammals from impulse sources were initially developed for the U.S. Navy ship shock trials of the SEAWOLF submarine (Craig and Hearn 1998) and USS WINSTON S. CHURCHILL surface ship (Craig Jr. 2001). These criteria and thresholds were also adopted by NMFS in several Final Rules issued under the MMPA (63 FR 230, 66 FR 87, 73 FR 121, 73 FR 199). These criteria and thresholds were revised as necessary based on new science and used for the ship shock trial of the U.S. Navy amphibious transport dock ship MESA VERDE (Finneran and Jenkins 2012), and were subsequently adopted by NMFS in their MMPA Final Rule authorizing the MESA VERDE shock trial (73 FR 143). Upper and lower frequency limits of hearing are not applied for lethal and injurious exposures. These criteria and their origins are explained in greater detail in Finneran and Jenkins (2012), who covered the development of the thresholds and criteria for assessment of impacts.

Onset of Gastrointestinal Tract Injury

Evidence indicates that gas-containing internal organs, such as lungs and intestines, are the principal damage sites from shock waves in submerged terrestrial mammals (Clark and Ward 1943; Greaves et al. 1943; Richmond et al. 1973; Yelverton et al. 1973). Furthermore, slight injury to the gastrointestinal tract may be related to the magnitude of the peak shock wave pressure over the hydrostatic pressure and would be independent of the animal’s size and mass (Goertner 1982).

Table 3.4-4: Criteria and Thresholds for Physiological Effects to Marine Mammals Underwater for Explosives

<table>
<tr><th>Group</th><th>Species</th><th>Onset TTS</th><th>Onset PTS</th><th>Onset Slight GI Tract Injury</th><th>Onset Slight Lung Injury[1]</th><th>Onset Mortality[1]</th></tr>
<tr><td>Low Frequency Cetaceans</td><td>All mysticetes</td><td>172 dB re 1 µPa²-s SEL (Type II weighting) or 224 dB re 1 µPa Peak SPL (unweighted)</td><td>187 dB re 1 µPa²-s SEL (Type II weighting) or 230 dB re 1 µPa Peak SPL (unweighted)</td><td rowspan="6">237 dB re 1 µPa (unweighted)</td><td rowspan="6">Note 1</td><td rowspan="6">Note 2</td></tr>
<tr><td>Mid-Frequency Cetaceans</td><td>Most delphinids, medium and large toothed whales</td><td>172 dB re 1 µPa²-s SEL (Type II weighting) or 224 dB re 1 µPa Peak SPL (unweighted)</td><td>187 dB re 1 µPa²-s SEL (Type II weighting) or 230 dB re 1 µPa Peak SPL (unweighted)</td></tr>
<tr><td>High Frequency Cetaceans</td><td>Porpoises and Kogia spp.</td><td>146 dB re 1 µPa²-s SEL (Type II weighting) or 195 dB re 1 µPa Peak SPL (unweighted)</td><td>161 dB re 1 µPa²-s SEL (Type II weighting) or 201 dB re 1 µPa Peak SPL (unweighted)</td></tr>
<tr><td>Phocidae</td><td>Hawaiian monk, elephant, and harbor seal</td><td>177 dB re 1µPa²-s (Type I weighting) or 212 dB re 1 µPa Peak SPL (unweighted)</td><td>192 dB re 1µPa²-s (Type I weighting) or 218 dB re 1 µPa Peak SPL (unweighted)</td></tr>
<tr><td>Otariidae</td><td>Sea lions and Fur seals</td><td rowspan="2">200 dB re 1µPa²-s (Type I weighting) or 212 dB re 1 µPa Peak SPL (unweighted)</td><td rowspan="2">215 dB re 1µPa²-s (Type I weighting) or 218 dB re 1 µPa Peak SPL (unweighted)</td></tr>
<tr><td>Mustelidae</td><td>Sea Otters</td></tr>
<tr><td colspan="7">Note 1 $= 39.1M^{1/3}\left(1+\frac{D_{Rm}}{10.081}\right)^{1/2} Pa-\sec$ Note 2 $= 91.4M^{1/3}\left(1+\frac{D_{Rm}}{10.081}\right)^{1/2} Pa-\sec$</td></tr>
</table>

Notes: M = mass of animals in kg, D_{Rm} = depth of receiver (animal) in meters, SEL = Sound Exposure Level, SPL = Sound Pressure Level (re 1µPa)
[1] Impulse calculated over a delivery time that is the lesser of the initial positive pressure duration or 20 percent of the natural period of the assumed-spherical lung adjusted for animal size and depth.

There are instances where injury to the gastrointestinal tract could occur at a greater distance from the source than slight lung injury, especially for animals near the surface. Gastrointestinal tract injury from small test charges (described as “slight contusions”) was observed at peak pressure levels as low as 104 pounds per square inch (psi), equivalent to a sound pressure level of 237 dB re 1 µPa (Richmond et al. 1973). This criterion was previously used by the Navy and NMFS for ship shock trials (U.S. Department of the Navy 2008a; 63 FR 230, 66 FR 87, 73 FR 143).

Slight Lung Injury and Mortality

The most commonly reported internal bodily injury from impulse energy is hemorrhaging in the fine structure of the lungs. Biological damage is governed by the impulse of the underwater blast (pressure integrated over time), not peak pressure or energy (Richmond et al. 1973,Yelverton and Richmond 1981, Yelverton et al. 1973, Yelverton et al. 1975). Therefore, impulse was used as a metric upon which internal organ injury could be predicted.

Species-specific minimal animal masses are used for determining impulse-based thresholds of slight lung injury and mortality. The Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis technical report (Finneran and Jenkins 2012) provides a nominal conservative body mass for each species based on newborn weights. In some cases body masses were extrapolated from similar species rather than the listed species. The scaling of lung volume to depth is conducted for all species since data is from experiments with terrestrial animals held near the water's surface.

Because the thresholds for onset of mortality and onset of slight lung injury are proportional to the cube root of body mass, the use of all newborn, or calf, weights rather than representative adult weights results in an over-estimate of effects to animals near an explosion. The range to onset mortality for a newborn compared to an adult animal of the same species can range from less than twice to over four times as far from an explosion, depending on the differences in calf versus adult sizes for a given species and the size of the explosion. Considering that injurious high pressures due to explosions propagate away from detonations in a roughly spherical manner, the volumes of water in which the threshold for onset mortality may be exceeded are generally less than a fifth for an adult animal versus a calf.

The use of onset mortality and onset slight lung injury is a conservative method to estimate potential mortality and recoverable (non-mortal, non-PTS) injuries. When analyzing impulse-based effects, all animals within the range to these thresholds are assumed to experience the effect. The onset mortality and onset slight lung injury criteria is based on the impulse at which these effects are predicted for 1 percent of animals; the portion of animals affected would increase closer to the explosion. As discussed above, according to the Navy’s analysis all animals receive the effect vice a percentage; therefore, these criteria conservatively over-estimate the number of animals that could be killed or injured.

Impulse thresholds for onset mortality and slight injury are indexed to 75 and 93 lb. (34 and 42 kg) for mammals, respectively (Richmond et al. 1973). The regression curves based on these experiments were plotted such that a prediction of mortality to larger animals could be determined as a function of positive impulse and mass (Craig Jr. 2001). After correction for atmospheric and hydrostatic pressures and based on the cube root scaling of body mass, as used in the Goertner injury model (Goertner 1982), the minimum impulse for predicting onset of extensive (50 percent) lung injury for “1 percent Mortality” (defined as most survivors had moderate blast injuries and should survive on their own) and slight lung injury for “zero percent Mortality” (defined as no mortality, slight blast injuries) (Yelverton and Richmond 1981) were derived for each species. As the mortality threshold, the Navy chose to use the minimum impulse level predictive of 50 percent lung injury, even though this injury is likely to result in mortality to only 1 percent of exposed animals. Because the mortality criteria represents a threshold at which 99 percent of exposed animals would be expected to recover, this analysis overestimates the impact on individuals and populations from exposure to impulse sources.

3.4.3.1.5 Behavioral Responses

The behavioral response criteria are used to estimate the number of animals that may exhibit a behavioral response. In this analysis, animals may be behaviorally harassed in each modeled scenario (using the Navy Acoustic Effects Model) or within each 24-hour period, whichever is shorter. Therefore, the same animal could have a behavioral reaction multiple times over the course of a year.

3.4.3.1.5.1 Sonar and Other Active Acoustic Sources

Potential behavioral effects to marine mammals from non-impulse sound sources underwater were predicted using a behavioral response function for most animals. The received sound level is weighted with Type I auditory weighting functions (Southall et al. 2007; see Figure 3.4-5) before the behavioral response function is applied. There are exceptions made for harbor porpoise and beaked whales, which have unique behavioral criteria based on specific data that shows these animals to be especially sensitive to sound. Harbor porpoise and beaked whale non-impulsive behavioral criteria are unweighted, without weighting the received level before comparing it to the threshold (see Finneran and Jenkins 2012).

Behavioral Response Functions

The Navy worked with NMFS to define a mathematical function used to predict potential behavioral effects to mysticetes (Figure 3.4-7) and odontocetes (Figure 3.4-8) from mid-frequency sonar (National Marine Fisheries Service 2008a). This effects analysis assumes that the potential consequences of exposure to non-impulsive sound on individual animals would be a function of the received sound pressure level (SPL; dB re 1 µPa). The behavioral response function applied to mysticetes differs from that used for odontocetes in having a shallower slope, which results in the inclusion of more behavioral events at lower amplitudes, consistent with observational data from North Atlantic right whales (Nowacek et al. 2007). Although the response functions differ, the intercepts on each figure highlight that each function has a 50 percent probability of harassment at a received level of 165 dB SPL. These analyses assume that sound poses a negligible risk to marine mammals if they are exposed to sound pressure levels below a certain basement value.

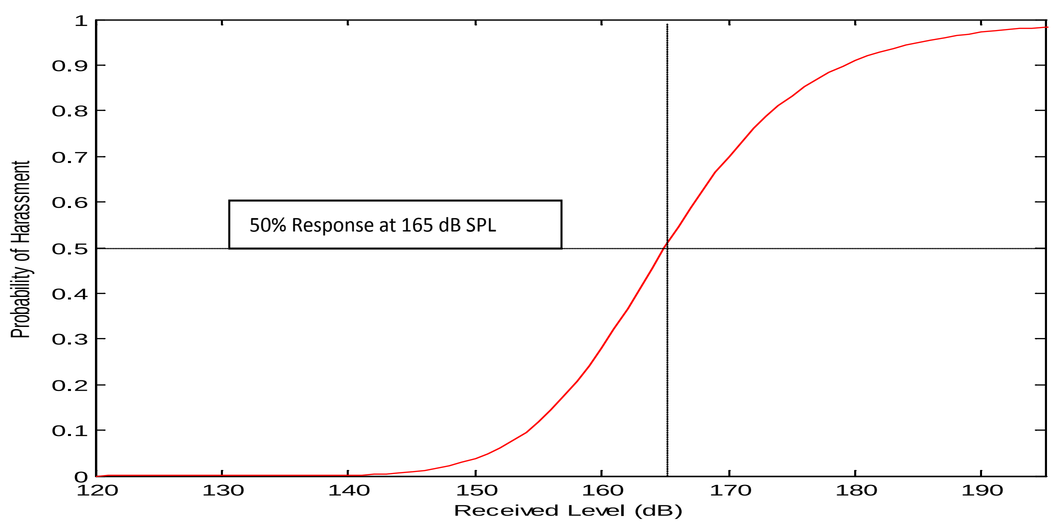


Figure 3.4-7: Behavioral Response Function Applied to Mysticetes

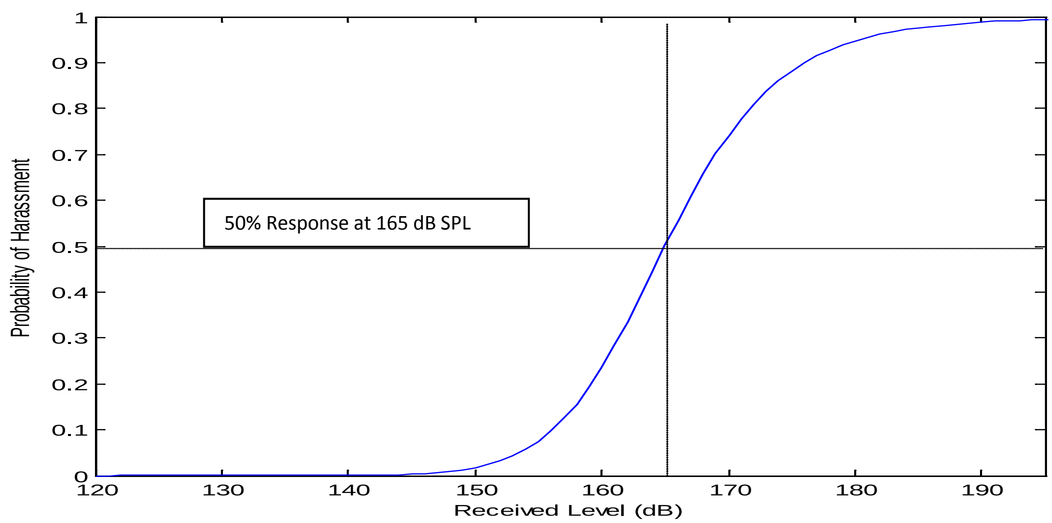


Figure 3.4-8: Behavioral Response Function Applied to Odontocetes, Pinnipeds, and Sea Otters

The values used in this analysis are based on three sources of data: behavioral observations during TTS experiments conducted at the Navy Marine Mammal Program and documented in Finneran et al. (2001, 2003, and 2005; Finneran and Schlundt 2004), reconstruction of sound fields produced by the USS SHOUP associated with the behavioral responses of killer whales observed in Haro Strait (Fromm 2004a, b; National Marine Fisheries Service 2005; U.S. Department of the Navy 2004), and observations of the behavioral response of North Atlantic right whales exposed to alert stimuli containing mid-frequency components documented in Nowacek et al. (2004). The behavioral response function is used to estimate the percentage of an exposed population that is likely to exhibit behaviors that would qualify as harassment (as that term is defined by the MMPA applicable to military readiness activities, such as the Navy's testing and training and testing with mid-frequency active sonar) at a given received level of sound. For example, at 165 dB sound pressure level (dB re 1µPa root mean square), the risk (or probability) of harassment is defined according to this function as 50 percent. This means that 50 percent of the individuals exposed at that received level would be predicted to exhibit a significant behavioral response. The response function is not applied to individual animals, only to exposed populations.

In some circumstances, some individuals will continue normal behavioral activities in the presence of high levels of human-made noise. In other circumstances, the same individual or other individuals may avoid an acoustic source at much lower received levels (Richardson et al. 1995; Wartzok et al. 2003; Southall et al. 2007). These differences within and between individuals appear to result from a complex interaction of experience, motivation, and learning that are difficult to quantify and predict. Therefore, the behavioral response functions represent a relationship that is deemed to be generally accurate, but may not be true in specific circumstances.

Specifically, the behavioral response function treats the received level as the only variable that is relevant to a marine mammal's behavioral response. However, many other variables, such as the marine mammal's gender, age, and prior experience; the activity it is engaged in during a sound exposure; its distance from a sound source; the number of sound sources; and whether the sound sources are approaching or moving away from the animal can be critically important in determining whether and how a marine mammal will respond to a sound source (Southall et al. 2007). Currently available data do not allow for incorporation of these other variables in the current behavioral response functions; however, the response function represents the best use of the data that are available. Furthermore, the behavioral response functions do not differentiate between different types of behavioral reactions (i.e. area avoidance, diving avoidance, or alteration of natural behavior) or provide information regarding the predicted consequences of the reaction.

The behavioral response function is used to estimate the percentage of an exposed population that is likely to exhibit behaviors that would qualify as harassment (as that term is defined by the MMPA applicable to military readiness activities, such as the Navy's testing and training with mid-frequency active sonar) at a given received level of sound (Table 3.4-5). For example, at 165 dB SPL (dB re 1µPa RMS), the risk (or probability) of harassment is defined according to this function as 50 percent. This means that 50 percent of the individuals exposed at that received level would be predicted to exhibit a significant behavioral response.

Harbor Porpoises

The information currently available regarding this species suggests a very low threshold level of response for both captive and wild animals. Threshold levels at which both captive (Kastelein et al. 2005b; Kastelein et al. 2000) and wild harbor porpoises (Johnston 2002) responded to sound (e.g., acoustic harassment devices, acoustic deterrent devices, or other non-impulsive sound sources) are very low (e.g., approximately 120 dB re 1µPa), Therefore, a sound pressure level of 120 dB re 1µPa is used in this analysis as a threshold for predicting behavioral responses in harbor porpoises (Table 3.4-5).

Table 3.4-5: Summary of Behavioral Thresholds for Marine Mammals

Group	Behavioral Thresholds for Sonar and Other Active Acoustic Sources	Behavioral Thresholds for Explosives
Low-Frequency Cetaceans	SPL: BRF (Type I Weighting)	167 dB re 1µPa^2-s SEL (Type II Weighting)
Mid-Frequency Cetaceans	SPL: BRF (Type I Weighting)	167 dB re 1µPa^2-s SEL (Type II Weighting)
High-Frequency Cetaceans	SPL: BRF (Type I Weighting)	141 dB re 1µPa^2-s SEL (Type II Weighting)
Phocid Seals (underwater)	SPL: BRF (Type I Weighting)	172 dB re 1µPa^2-s SEL (Type I Weighting)
Otariid and Mustelid (underwater)	SPL: BRF (Type I Weighting)	172 dB re 1µPa^2-s SEL (Type I Weighting)
Beaked Whales	(Unweighted) SPL 140 dB re 1µPa	167 dB re 1µPa^2-s SEL (Type II Weighting)
Harbor Porpoises	(Unweighted) SPL 120 dB re 1µPa	141 dB re 1µPa^2-s SEL (Type II Weighting)

BRF: Behavioral Response Function, SPL: Sound Pressure Level, SEL: Sound Exposure Level

Beaked Whales

The inclusion of a special behavioral response criterion for beaked whales of the family Ziphiidae is new to these Phase II criteria. It has been speculated for some time that beaked whales might have unusual sensitivities to sound due to strandings which occurred in conjunction with mid-frequency sonar use, even in areas where other species were more abundant (D'Amico et al. 2009), but there were not sufficient data to support a separate treatment for beaked whales until recently. With the recent publication of results from beaked whale monitoring and experimental exposure studies on the Navy's instrumented range in the Bahamas (McCarthy et al. 2011; Tyack et al. 2011), there are now statistically strong data demonstrating that beaked whales tend to avoid both actual naval mid-frequency sonar in real anti-submarine training scenarios as well as playbacks of killer whale vocalizations, and other anthropogenic sounds. Tyack et al. (2011) report that, in reaction to sonar playbacks, most beaked whales stopped echolocation, made long slow ascent, and moved away from the sound. During an exercise using mid-frequency sonar, beaked whales avoided the area at a distance from the sonar where the received level was "around 140 dB" (SPL) and once the exercise ended, beaked whales re-inhabited the center of exercise area within 2-3 days (Tyack et al. 2011). The Navy has therefore adopted a 140 dB re 1µPa sound pressure level threshold for behavioral effects for all beaked whales (see Table 3.4-5).

Since the development of the criterion, analysis of the data from the 2010 and 2011 field seasons of the southern California Behavioral Responses Study have been published. The study, DeRuiter et al. (2013), provides similar evidence of Cuvier's beaked whale sensitivities to sound based on two controlled exposures. Two whales, one in each season, were tagged and exposed to simulated mid-frequency active sonar at distances of 3.4 – 9.5 km. The 2011 whale was also incidentally exposed to mid-frequency active sonar from a distant naval exercise (approximately 118 km away). Received levels from the mid-frequency active sonar signals during the controlled and incidental exposures were calculated as 84-144 and 78-106 dB re 1 µPa RMS, respectively. Both whales showed responses to the controlled exposures, ranging from initial orientation changes to avoidance responses characterized by energetic fluking and swimming away from the source. However, the authors did not detect similar responses to incidental exposure to distant naval sonar exercises at comparable received levels, indicating that context of the exposures (e.g., source proximity, controlled source ramp-up) may have been a significant factor. Because the sample size was limited (controlled exposures during a single dive in both 2010 and 2011) and baseline behavioral data was obtained from different stocks and geographic areas (i.e., Hawaii and Mediterranean Sea), the Navy relied on the studies at the Atlantic Undersea Test and Evaluation Center that analyzed beaked whale responses to actual naval exercises using mid-frequency active sonar to evaluate potential behavioral responses by beaked whales to proposed training and testing activities using sonar and other active acoustic sources.

3.4.3.1.5.2 Explosives

If more than one explosive event occurs within any given 24-hour period within a training or testing activity, criteria are applied to predict the number of animals that may have a behavioral reactions. For events with multiple explosions, the behavioral threshold used in this analysis is 5 dB less than the TTS onset threshold (in SEL) (see Table 3.4-5). This value is derived from observed onsets of behavioral response by test subjects (bottlenose dolphins) during non-impulse TTS testing (Schlundt et al. 2000).

Some multiple explosion events, such as certain gunnery exercises, may be treated as a single impulsive event because a few explosions occur closely spaced within a very short time (a few seconds). For single explosions at received sound levels below hearing loss thresholds, the most likely behavioral response is a brief alerting or orienting response. Since no further sounds follow the initial brief impulse, significant behavioral reactions would not be expected to occur. This reasoning was applied to ship shock trials (63 FR 230; 66 FR 87; 73 FR 143) and is extended to the criteria used in this analysis.

Since impulse events can be quite short, it may be possible to accumulate multiple received impulses at sound pressure levels considerably above the energy-based criterion and still not be considered a behavioral take. The Navy treats all individual received impulses as if they were 1 second long for the purposes of calculating cumulative SEL for multiple impulse events. For example, five air gun impulses, each 0.1 second long, received at 178 dB sound pressure level would equal a 175 dB SEL and would not be predicted as leading to a significant behavioral response. However, if the five 0.1 second pulses are treated as a 5-second exposure, it would yield an adjusted value of approximately 180 dB, exceeding the threshold. For impulses associated with explosions that have durations of a few microseconds, this assumption greatly overestimates effects based on SEL metrics such as TTS and PTS and behavioral responses.

Appropriate weighting values will be applied to the received impulse in one-third octave bands and the energy summed to produce a total weighted SEL value. For impulsive behavioral criteria, the new weighting functions (Figure 3.4-5) are applied to the received sound level before being compared to the threshold.

Pile Driving and Airgun Criteria and Thresholds

In this analysis, existing NMFS risk criteria (Table 3.4-6; see FR 73(53):14447) are applied to the unique impulsive sounds generated by pile driving, vibratory pile installation and removal, and airguns.

Table 3.4-6: Pile Driving and Airgun Thresholds Used in this Analysis to Predict Effects to Marine Mammals

Species Groups	Underwater Vibratory Pile Driving Criteria		Underwater Impact Pile Driving and Airgun Criteria	
	Level B Disturbance Threshold	Level A Injury Threshold	Level B Disturbance Threshold	Level A Injury Threshold
Cetaceans (whales, dolphins, porpoises)	120 dB RMS	180 dB RMS	160 dB RMS	180 dB RMS
Pinnipeds (seals, sea lions) & Sea Otter	120 dB RMS	190 dB RMS	160 dB RMS	190 dB RMS

Note: RMS = Root Mean Square and refers to 90 percent of the energy under the envelope in a 10 second sound pressure level (dB re 1 µPa) averaging window.

Pile Driving

Impulses from the impact hammer are broadband and carry most of their energy in the lower frequencies. The impulses are within the hearing range of most marine mammals and can produce a shock wave that is transmitted to the sediment and water column (Reinhall and Dahl 2011). The available scientific literature suggest that pile driving could result in short term behavioral and/or physiological marine mammal impacts such as: altered headings; increased swimming rates; changes in dive, surfacing, respiration, feeding, and vocalization patterns; masking, and hormonal stress production (Southall et al., 2007); however some field studies also suggest marine mammals may or may not observably respond to construction type sounds such as drilling and pile driving (e.g., Richardson et al, 1995, California Department of Transportation 2001, Moulton et al. 2005). Individual animal responses are likely to be highly variable depending on situational state, and prior experience or habituation. Southall et al. 2007 point out that careful distinction must be made of brief minor, biologically unimportant reactions as compared to profound, sustained or biologically meaningful responses related to growth, survival, and reproduction.

Predictive Modeling for Pile Driving and Removal

The methodology for quantifying sound exposures from events involving impact pile driving is similar to that of other impulsive sources such as underwater explosives. Vibratory pile driving is treated as a special class of non-impulse sound. Criteria used in the present analysis are consistent with other NMFS regulatory rulemakings for pile driving. No frequency weighting functions are applied. The modeling for pile driving includes two steps used to calculate potential exposures:

1. Estimate the zone of influence for Level A injurious and Level B behavioral exposures for both impact pile driving and vibratory pile removal using the practical spreading loss equation (California Department of Transportation 2009).
2. Estimate the number of species exposed using species density estimates and estimated zones of influence.

The practical spreading loss equation is typically used to estimate the attenuation of underwater sound over distance (Urick 1983). The National Oceanographic and Atmospheric Administration and U.S. Fish and Wildlife Service have accepted the use of the practical spreading loss equation to estimate transmission loss of sound through water for past pile driving calculations (California Department of Transportation 2009).

The formula for this propagation loss can be expressed as:

$$TL = F * \log (D1/D2)$$

Where:

TL = transmission loss (the sound pressure level at D1 minus the sound pressure level at D2, in RMS (Root Mean Square), dB re 1µPa)
F = attenuation constant
D1 = distance at which the targeted transmission loss occurs
D2 = distance from which the transmission loss is calculated

The attenuation constant (F) is a site-specific factor based on several conditions, including water depth, pile type, pile length, substrate type, and other factors. Measurements conducted by the California Department of Transportation and other consultants (Greeneridge Science) indicate that the attenuation constant (F) can vary from 5 to 30. For pile driving sounds, large piles produce lower frequency sounds that can propagate further than smaller piles which produce higher frequency sound. Small-diameter steel H-type piles have been found to have high F values in the range of 20 to 30 near the pile (i.e., between 30-60 ft.) (California Department of Transportation 2009). In the absence of empirically measured values within the SOCAL portion of the Study Area at the Silver Strand Training Complex (SSTC) or Camp Pendleton where the events would occur, the Navy set the (F) value as F=15 to conservatively over-predict sound propagation and the resulting zones of influence for those locations.

Zones of Influence for Pile Driving and Removal

Actual underwater noise levels of pile driving depend on the type of hammer used, the size and material of the pile, and the substrate the piles are being driven into. Using known equipment, installation procedures, and applying certain constants derived from other comparative west coast measured pile driving, predicted underwater sound levels from Navy pile driving training activity can be calculated. The proposed training event (elevated causeway) uses 24-inch diameter hollow steel piles, installed using a diesel impact hammer to drive the piles into the sandy on-shore and near-shore substrate at SSTC or Camp Pendleton. For a dock repair project in Rodeo, California in San Francisco Bay, the RMS underwater sound level for a 24-inch steel pipe pile driven with a diesel impact hammer in less than 15 ft. (4.6 m) of water depth was measured at 189 dB re 1µPa from approximately 11 yd. (10 m) away. The RMS sound level for the same type and size pile also driven with a diesel impact hammer, but in greater than 36 ft. (11 m) of water depth, was measured to be 190 to 194 dB RMS during the Amoco Wharf repair project in Carquinez Straits, Martinez, California (California Department of Transportation 2009). The areas where these projects were conducted have a silty sand bottom with an underlying hard clay layer, which because of the extra effort required to drive piles into clay, would make these measured sound levels louder than would expected if driven into sandy substrate like that which is present at SSTC and Camp Pendleton. Given the local bathymetry and smooth sloping sandy bottom at the locations where pile driving activity would occur, elevated causeway piles will generally be driven in water depths of 36 ft. (11 m) or less.

Therefore, for the purposes of the Navy's pile driving analysis, both the Rodeo repair project (189 db RMS) and the low end of the measured values of the Amoco Wharf repair projects (190 dB RMS) are considered to be reasonably representative of sound levels that would be expected during pile driving at SSTC and Camp Pendleton. Measurement of underwater sound was made for hollow steel piles in Washington State and California pile driving projects that are of similar size (<24-inch diameter) to those proposed for the Navy's training event. The broadband frequency range of those measures underwater sounds was between 50 Hz to 10.5 kHz with highest energy at frequencies <1 kHz to 3 kHz (California Department of Transportation 2009). Although frequencies over 10.5 kHz are likely present during these pile driving projects, they are generally not typically measured since field data has shown a decrease in RMS to less than 120 dB at frequencies greater than 10.5 kHz (Laughlin 2005, 2007). It is reasonable to assume that pile driving for the proposed Navy activities would generate similar sound spectra to that measured by California Department of Transportation.

The use of previously derived non-region data to generate attenuation constants ("F" values) for the SSTC and Camp Pendleton will be reviewed and compared to empirically measure elevated causeway pile driving at the next oceanside elevated causeway training event within the region as agreed in previously consultation with NMFS regarding conducting elevated causeway events.

For pile driving using an estimated RMS measurement of 190 dB re 1µPa at 11 yd. (10 m) as described above, the circular zone of influence (ZOI) surrounding a 24-inch steel diesel-driven pile can be estimated via the practical spreading loss equation to have a radius of:

- 11 yd. (10 m) for Level A injurious harassment for pinnipeds (190 dB RMS);
- 46 yd. (42 m) for Level A injurious harassment for cetaceans (180 dB RMS), and
- 1,094 yd. (1,000 m) for the Level B behavioral harassment (160 dB RMS).

It should be noted that the proposed Navy training involving construction of an elevated causeway starts with piles being driven near the shore first and then working to extend the causeway in an offshore direction. Near the shore, the area of influence would be a semi-circle and towards the end of the causeway (approximately 400 yd. or 366 m from the shore) would be a full circle. The calculated area of influence conservatively assumes that all piles driven would produce a circular zone of influence, and discounts the limited propagation from piles driven closer to shore (which would have a semicircular propagation).

For pile removal (as occur at the end of the training event), underwater noise levels derived from piles removed via vibratory extractor are different than those driven with an impact hammer. Steel pilings and a vibratory driver were used for pile driving at the Port of Oakland, California (California Department of Transportation 2009). Underwater sound levels during this project for a 24-inch steel pile in 36 ft. (11 m) of water depth was field measured to be 160 dB RMS. The area where this project was conducted in Oakland has a harder substrate than is present where the Navy activities are proposed, which because of the extra effort required to drive and remove the pile, would make these measured pile driving sound levels louder than should occur when driving into and removing from SSTC's and Camp Pendleton's sandy bottom substrate. Use of the measured data from Oakland will therefore provide an overestimate erring on the side of being conservative. Using the RMS measurement from Oakland, the ZOI for a 24-inch steel pile removed via a vibratory extractor out to the 120 dB RMS Level B behavioral harassment threshold can be estimated via the practical spreading loss equation to be:

- < 1 yd. (< 1 m) for Level A injurious harassment for pinnipeds (190 dB RMS);
- One (1) yd. (1 m) for Level A injurious harassment for cetaceans (180 dB RMS), and
- 5,076 yd. (4,642 m) for the Level B behavioral harassment (120 dB RMS).

As discussed above, the calculated area of influence conservatively assumes that all piles are driven and subsequently removed produce a circular zone of influence. Table 3.4-7 tabulates the maximum estimated zones of influence for HSTT elevated causeway pile driving and removal.

Table 3.4-7: Maximum Zones of Effect for Elevated Causeway System Pile Driving and Removal

Activity	Level B		Level A	
	120 dB RMS	160 dB RMS	180 dB RMS	190 dB RMS
Impact Pile Driving	n/a	1,094 yd. (1,000 m)	46 yd. (42 m)	11 yd. (10 m)
Vibratory Pile Removal	5,076 yd. (4,642 m)	n/a	< 1 yd. (<1 m)	< 1 yd. (<1 m)

Notes: RMS = Root Mean Square and refers to 90 percent of the energy under the envelope in a 10 second sound pressure level (dB re 1 μPa) averaging window, m = meters, yd. = yards, n/a = not applicable

Estimating Exposures from Pile Driving and Removal

Using the marine mammal densities derived for the Study Area, the number of animals exposed to annual Level B harassment from pile driving can be estimated. Assumptions used in this determination are:

- Pile driving is estimated to occur 10 days per elevated causeway training event, with up to four training exercises being conducted per year (40 days per year). Given likely variable training schedules, an assumption was made that approximately 20 of these 40 days would occur during the warm water season, and 20 of the 40 days would occur during the cold water season.
- Pile removal is estimated to occur an average of 3 days per training exercise, up to four training exercises being conducted per year (12 days per year). Given likely variable training schedules, an assumption was made that approximately 6 of these 12 days would occur during the warm water season, and 6 of the 12 days would occur during the cold water season.
- Any calculated area of influence is based on a semi-circle area around each pile to account for elevated causeway pile driving and removal that occurs from the beach only out to a maximum of 1,000 ft. from shore.

- There can be no "fractional" exposures of marine mammals. In other words, there is no exposure to 0.3, 0.5, 0.6, etc. of an animal, but that each instance of exposure gets rounded up to the nearest whole number for the annual summation.

Pile Driving - The Navy used the expression below to estimate potential elevated causeway pile driving exposures:

[(Area of Influence (π x AOI^2)/2) x warm season marine mammal density x warm season pile driving days] + [Area of Influence (π x AOI^2)/2) x cold season marine mammal density x cold season pile driving days] = annual exposures

With area of influence defined as: π *x* AOI^2 *= (3.14 x 1,000* m^2*)/2 = 1.57* km^2

Pile Removal - The Navy used the expression below to estimate potential elevated causeway pile removal exposures:

([Area of Influence (π x AOI^2) x warm season marine mammal density x warm season pile driving days] + [Area of Influence (π x AOI^2) x cold season marine mammal density x cold season pile driving days] = annual exposures

*with: * area of influence defined as:* π *x* ZOI^2 *= (3.14 x 4,642 m)/*2^2 *= 33.8* km^2

The exposures predicted from elevated causeway assessment rely on many factors but are influenced greatly by assumptions, methods, and criteria used. The following list of assumptions, caveats, and limitations is not exhaustive but reveals several features of the technical approach that influence exposure prediction:

- Significant scientific uncertainties are implied and carried forward in any analysis using marine mammal density data as a predictor for animal occurrence within a given geographic area. Marine mammal presence in the near shore waters of SSTC or Camp Pendleton is known to be patchy and infrequent.
- Marine mammals are assumed to be uniformly distributed within the ocean waters adjacent the proposed event locations, when as discussed previously, marine mammal distribution is patchy and occasional at the small scales represented by proposed locations and the zone of influence being considered.
- The tempo of training events was divided evenly throughout the year with two oceanographic seasons, defined as warm and cold at this location, each having one-half of total events for simulated purposes.
- Some of the data supporting the analysis was derived from other projects with different environmental and project conditions (pile driving source levels, and transmission loss parameters).

The pile driving exposure assessment methodology will be an estimate of the numbers of individuals potentially exposed to the effects of elevated causeway pile driving and removal using thresholds that exceed NMFS established thresholds.

3.4.3.1.6 Quantitative Analysis

The Navy performed a quantitative analysis to estimate the number of marine mammals that could be affected by acoustic sources or explosives used during Navy training and testing activities. Inputs to the quantitative analysis included marine mammal density estimates; marine mammal depth occurrence distributions; oceanographic and environmental data; marine mammal hearing data; and criteria and thresholds for levels of potential effects. The quantitative analysis consists of computer modeled estimates and a post-model analysis to determine the number of potential mortalities and harassments. The model calculates sound energy propagation from sonar, other active acoustic sources, and explosives during naval activities; the sound or impulse received by animat dosimeters representing marine mammals distributed in the area around the modeled activity; and whether the sound or impulse received by a marine mammal exceeds the thresholds for effects. The model estimates are then further analyzed to consider animal avoidance and implementation of mitigation measures, resulting in final estimates of potential effects due to Navy training and testing.

A number of computer models and mathematical equations can be used to predict how energy spreads from a sound source (e.g., sonar or underwater detonation) to a receiver (e.g., dolphin or sea turtle). See the Acoustics and Explosives Primer (Section 3.0.4) for background information about how sound travels through the water. Basic underwater sound models calculate the overlap of energy and marine life using assumptions that account for the many, variable, and often unknown factors that can influence the result. Assumptions in previous and current Navy models have intentionally erred on the side of overestimation when there are unknowns or when the addition of other variables was not likely to substantively change the final analysis. For example, because the ocean environment is extremely dynamic and information is often limited to a synthesis of data gathered over wide areas and requiring many years of research, known information tends to be an average of a seasonal or annual variation. El Niño Southern Oscillation events of the ocean-atmosphere system are an example of dynamic change where unusually warm or cold ocean temperatures are likely to redistribute marine life and alter the propagation of underwater sound energy. Previous Navy modeling therefore made some assumptions indicative of a maximum theoretical propagation for sound energy (such as a perfectly reflective ocean surface and a flat seafloor). More complex computer models build upon basic modeling by factoring in additional variables in an effort to be more accurate by accounting for such things as variable bathymetry and an animal's likely presence at various depths.

- The Navy Acoustic Effects Model accounts for the variability of the sound propagation data in both distance and depth when computing the received sound level on the animals. Previous models captured the variability in sound propagation over range and used a conservative approach to account for only the maximum received sound level within the water column.
- The Navy Acoustic Effects Model bases the distribution of animats (virtual representation of an animal) over the operational area on density maps which provides a more natural distribution of animals. Previous models assumed a uniform distribution of animals over the operational area.
- The Navy Acoustic Effects Model distributes animats throughout the three dimensional water space proportional to the known time that animals of that species spend at varying depths. Previous models assumed animals were placed at the depth where the maximum sound received level occurred for each distance from a source.
- The Navy Acoustic Effects Model conducts a statistical analysis to compute the estimated effects on animals. Previous models assumed all animals within a defined distance would be affected by the sound.

The Navy has developed a set of data and new software tools for quantification of estimated marine mammal acoustic effects from Navy activities. This new approach is the resulting evolution of the basic model previously used by Navy (e.g., U.S. Department of the Navy 2006, 2008a, 2008b) and reflects a more complex modeling approach as described below. Although this new computer modeling approach (the Navy Acoustic Effects Model) accounts for various environmental factors affecting acoustic propagation in more detail than previously considered, the current modeling (like all previous modeling) and resulting preliminary exposure numbers do not factor in: (1) the likelihood that a marine mammal would attempt to avoid repeated exposures to a sounds or explosions underwater, (2) that a marine mammal would avoid an area of intense activity where a training or testing event may be focused, and (3) implementation of Navy mitigation (e.g., stopping sonar transmissions when a detected marine mammal is within a certain distance of a ship; see Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring, for details). In short, naval activities are modeled as though an activity would occur regardless of proximity to detected marine mammals and without any horizontal movement by the animal away from the sound source or human activities (e.g., without accounting for likely animal avoidance) because the science necessary to support that level of modeling complexity is beyond what is currently available. Therefore, the final step of the quantitative analysis of acoustic effects is to consider the implementation of mitigation and the possibility that marine mammals would avoid continued or repeated sound exposures.

The quantified results of the marine mammal acoustic effects analysis presented in the Final EIS/OEIS for HSTT differ from the quantified results presented in the Draft EIS/OEIS for HSTT (Marine Mammal Modeling Team 2012). Presentation of the results in this new manner for MMPA, ESA, and other regulatory analyses is well within the framework of the previous National Environmental Policy Act analyses presented in the HSTT Draft EIS/OEIS. The differences resulted from clarification developed in direct response to public comments received on the HSTT Draft EIS/OEIS with regard to a general misunderstanding and belief that the model exposure numbers reflected the final expected acoustic effects (summarized as modeled Level B, Level A, and Mortality takes and in tables as modeled exposure summaries under various criteria). Comments received both written and verbally at Navy public information meetings in Hawaii and California indicated that many readers believed the modeling exposure numbers presented in the HSTT Draft EIS/OEIS tables were representative of the actual expected effects, although the HSTT Draft EIS/OEIS did not account for animal avoidance of an area prior to commencing sound-producing activities, animal avoidance of repeated explosive noise exposures, and the protections due to standard Navy mitigations. In response to these comments, the numbers presented in this Final EIS/OEIS have been refined to incorporate into the quantification of acoustic effects, factors of animal avoidance, movement, and implementation of standard Navy mitigation measures.

Numeric differences between the HSTT Draft EIS/OEIS and this Final EIS/OEIS quantification of marine mammals acoustic effects are due to three main factors: (1) refinement to the modeling inputs for training and testing; (2) use of an emergent and more accurate winter season density for the species (short-beaked common dolphins) having the highest abundance of any marine mammal in the Study Area; and (3) additional post-model quantification to further refine the numerical presentation of acoustic effects so as to include animal avoidance of repeated sound sources, avoidance of areas of activity before use of a sound source or explosive, and implementation of mitigation. In summary, the final analysis regarding marine mammal impacts has not changed between the HSTT Draft EIS/OEIS and this Final EIS/OEIS and the conclusions remain the same.

Additional details regarding the Navy Acoustic Effects Model (see Marine Species Modeling Team 2012) and the incorporation of avoidance and mitigation into the analysis of acoustic stressors are presented below.

3.4.3.1.6.1 Marine Species Density Data

A quantitative analysis of impacts on a species requires data on the abundance and distribution of the species population in the potentially impacted area. The most appropriate unit of metric for this type of analysis is density, which is described as the number of animals present per unit area.

There is no single source of density data for every area, species, and season because of the fiscal costs, resources, and effort involved in providing enough survey coverage to sufficiently estimate density. Therefore, to characterize the marine species density for large areas such as the Study Area, the Navy needed to compile data from multiple sources. To develop a database of marine species density estimates, the Navy, in consultation with NMFS experts at the two science centers (Southwest Fisheries Science Center and Pacific Islands Fisheries Science Center) overlapping the HSTT, adopted a protocol to select the best available data sources based on species, area, and season (see Navy's Pacific Marine Species Density Database Technical Report; U.S. Department of the Navy et al. 2012b). The resulting Geographic Information System (GIS) database includes one single spatial and seasonal density value for every marine mammal and sea turtle species present within the Study Area.

The Navy Marine Species Density Database includes a compilation of the best available density data from several primary sources and published works including survey data from NMFS within the U.S. Economic Exclusion Zone. NMFS is the primary agency responsible for estimating marine mammal and sea turtle density within the United States exclusive economic zone. NMFS publishes annual Stock Assessment Reports or various regions of U.S. waters and covers all stocks of marine mammals within those waters. The majority of species that occur in the Study Area are covered by the Pacific Region Stock Assessment Report (Carretta et al., 2011), with a few species (e.g., gray whale) covered by the Alaska Region Stock Assessment Report (Allen and Angliss 2011). Other independent researchers often publish density data or research covering a particular marine mammal species, which is integrated into the NMFS Stock Assessment Reports.

For most cetacean species, abundance is estimated using line-transect methods that employ a standard equation to derive densities based on sighting data collected from systematic ship or aerial surveys. More recently, habitat-based density models have been used effectively to model cetacean density as a function of environmental variables (e.g., Barlow et al. 2009). Habitat-based density models allow predictions of cetacean densities on a finer spatial scale than traditional line-transect analyses because cetacean densities are estimated as a continuous function of habitat variables (e.g., sea surface temperature, water depth, etc.). Within most of the world's oceans, however there have not been enough systematic surveys to allow for line-transect density estimation or the development of habitat models. To get an approximation of the cetacean species distribution and abundance for unsurveyed areas, in some cases it is appropriate to extrapolate data from areas with similar oceanic conditions where extensive survey data exist. Habitat Suitability Index or Relative Environmental Suitability have also been used in data-limited areas to estimate occurrence based on existing observations about a given species' presence and relationships between basic environmental conditions (Kaschner et al. 2006).

Methods used to estimate pinniped at-sea density are generally quite different than those described above for cetaceans. Pinniped abundance is generally estimated via shore counts of animals at known rookeries and haul-out sites. For example, for species such as California sea lion, population estimates are based on counts of pups at the breeding sites (Carretta et al. 2011). However, this method is not appropriate for other species such as harbor seals, whose pups enter the water shortly after birth. Population estimates for these species are typically made by counting the number of seals ashore and applying correction factors based on the proportion of animals estimated to be in the water (Carretta et al. 2011). Population estimates for pinniped species that occur in the Study Area are provided in the Pacific Region Stock Assessment Report (Carretta et al. 2013). Translating these population estimates to in-water densities presents challenges because the percentage of seals or sea lions at sea compared to those on shore is species-specific and depends on gender, age class, time of year (molt and breeding/pupping seasons), foraging range, and for species such as harbor seal, time of day and tide level. These parameters were identified from the literature and used to establish correction factors which were then applied to estimate the proportion of pinnipeds that would be at sea within the Study Area for a given season.

3.4.3.1.6.2 Upper and Lower Frequency Limits

The Navy adopted a single frequency cutoff at each end of a functional hearing group's frequency range, based on the most liberal interpretations of their composite hearing abilities (see Finneran and Jenkins (2012) for details involving derivation of these values). These are not the same as the values used to calculate weighting curves, but instead exceed the demonstrated or anatomy-based hypothetical upper and lower limits of hearing within each group. Table 3.4-8 provides the lower and upper frequency limits for each species group. Sounds with frequencies below the lower frequency limit, or above the upper frequency limit, are not analyzed with respect to auditory effects for a particular group.

Table 3.4-8: Lower and Upper Cutoff Frequencies for Marine Mammal Functional Hearing Groups Used in this Acoustic Analysis.

Functional Hearing Group	Limit (Hz)	
	Lower	Upper
Low-Frequency Cetaceans	5	30,000
Mid-Frequency Cetaceans	50	200,000
High-Frequency Cetaceans	100	200,000
Phocid seals (underwater)	50	80,000
Otariid pinniped & Sea otter (underwater)	50	60,000

3.4.3.1.6.3 Navy Acoustic Effects Model

For this analysis of Navy training and testing activities at sea, the Navy developed a set of software tools and compiled data for the quantification of predicted acoustic impacts to marine mammals. These databases and tools collectively form the Navy Acoustic Effects Model. Details of this model's processes and the description and derivation of the inputs are presented in the Navy's Determination of Acoustic Effects Technical Report (Marine Species Modeling Team 2012).

The Navy Acoustic Effects Model improves upon previous modeling efforts (e.g., U.S. Department of the Navy 2008a; 2008b) in several ways. First, unlike earlier methods that modeled sources individually, the Navy Acoustic Effects Model has the capability to run all sources within a scenario simultaneously, providing a more realistic depiction of the potential effects of an activity. Second, previous models calculated sound received levels within set volumes of water and spread animals uniformly across the volumes; in the Navy Acoustic Effects Model, animats (virtual animals) are distributed nonuniformly based on higher resolution species-specific density, depth distribution, and group size information, and animats serve as dosimeters, recording energy received at their location in the water column. Third, a fully three-dimensional environment is used for calculating sound propagation and animat exposure in the Navy Acoustic Effects Model, rather than a two-dimensional environment where the worst case sound pressure level across the water column is always encountered. Finally, current efforts incorporate site-specific bathymetry, sound speed profiles, wind speed, and bottom properties into the propagation modeling process rather than the flat-bottomed provinces used during earlier modeling (Marine Species Modeling Team 2013). The following paragraphs provide an overview of the Navy Acoustic Effects Model process and its more critical data inputs.

Using information on the likely density of marine mammals in the area being modeled, Navy Acoustic Effects Model derives an abundance (total number of individuals) and distributes the resulting number of animats into an area bounded by the maximum distance that energy propagates out to a criterion threshold value (energy footprint). For example, for non-impulsive sources, all animats that are predicted to occur within a range that could receive sound pressure levels greater than or equal to 120 dB re 1 µPa are distributed. These animats are distributed based on density differences across the area, the group (pod) size, and known depth distributions (dive profiles). Animats change depths every four minutes but do not otherwise mimic actual animal behaviors, such as avoidance or attraction to a stimulus (horizontal movement), or foraging, social, or traveling behaviors.

Schecklman et al. (2011) argue that static distributions underestimate acoustic exposure compared to a model with fully three-dimensionally moving animals. However, their static method is different from the Navy Acoustic Effects Model in several ways. First, they distribute the entire population at depth with respect to the species-typical depth distribution histogram, and those animats remain static at that position throughout the entire simulation. In the Navy Acoustic Effects Model, animats are placed horizontally dependent on nonuniform density information, and then move up and down over time within the water column by integrating species-typical depth distribution information. Second, for the static method, they calculate acoustic received level for designated volumes of the ocean and then sum the animats that occur within that volume, rather than using the animats themselves as dosimeters, as in the Navy Acoustic Effects Model. Third, Schecklman et al. (2011) ran 50 iterations of the moving distribution to arrive at an average number of exposures, but because they rely on uniform horizontal density (and static depth density), only a single iteration of the static distribution is realized. In addition to moving the animats vertically, the Navy Acoustic Effects Model overpopulates the animats over a nonuniform density and then resamples the population a number of times to arrive at an average number of exposures as well. Tests comparing fully moving distributions and static distributions with vertical position changes at varying rates were compared during development of the Navy Acoustic Effects Model. For position updates occurring more frequently than every 5 minutes, the number of estimated exposures were similar between the Navy Acoustic Effects Model and the fully moving distribution; however, computational time was much longer for the fully moving distribution.

The Navy Acoustic Effects Model calculates the likely propagation for various levels of energy (sound or pressure) resulting from each non-impulse or impulse source used during a training or testing event. This is done taking into account the actual bathymetric relief and bottom types (e.g., reflective), and estimated sound speeds and sea surface roughness at an event's location. Platforms (such as a ship using one or more sound sources) are modeled as moving across an area whose size is representative of what would normally occur during a training or testing scenario. The model uses typical platform speeds and event durations. Moving source platforms either travel along a predefined track or move along straight-line tracks from a random initial course, reflecting at the edges of a predefined boundary. Static sound sources are stationary in a fixed location for the duration of a scenario. Modeling locations were chosen based on historical data where activities have been ongoing and in an effort to include all the environmental variation within the Study Area where similar events might occur in the future.

The Navy Acoustic Effects Model then tracks the energy received by each animat within the energy footprint of the event and calculates the number of animats having received levels of energy exposures that fall within defined impact thresholds. Predicted effects to the animats are then converted using actual marine mammal densities, and the highest order effect predicted for a given animal is assumed. Each scenario or each 24-hour period for scenarios lasting greater than 24 hours is independent of all others, and therefore, the same individual marine mammal could be impacted during each independent scenario or 24-hour period. In few instances, although the activities themselves all occur within the Study Area, sound may propagate beyond the boundary of the Study Area. Any exposures occurring outside the boundary of the Study Area are included in the model-estimated impacts for each alternative. The Navy Acoustic Effects Model provides the initial predicted impacts to marine species (based on application of multiple conservative assumptions which are assumed to overestimate impacts), which are then further analyzed to produce final estimates used in the Navy's MMPA application for Letter of Authorization and ESA risk analyses (Section 3.4.3.2.1.2, Avoidance Behavior and Mitigation Measures as Applied to Sonar and Other Active Acoustic Sources, for further information on additional analyses).

3.4.3.1.6.4 Model Assumptions and Limitations

There are limitations to the data used in the Navy Acoustic Effects Model, and the results must be interpreted within these contexts. While the most accurate data and input assumptions have been used in the modeling, when there is a lack of definitive data to support an aspect of the modeling, modeling assumptions believed to overestimate the number of exposures were chosen:

- Marine mammals (animats) are modeled as being underwater and facing the source and therefore always predicted to receive the maximum sound level (e.g., the model does not account for conditions such as body shading, porpoising out of the water, or an animal raising its head above water). Some odontocetes have been shown to have directional hearing, with best hearing sensitivity facing a sound source and higher hearing thresholds for sounds propagating toward the rear or side of an animal (Kastelein et al. 2005a; Mooney et al. 2008; Popov and Supin 2009).
- Animats do not move horizontally (but change their position vertically within the water column), which may overestimate physiological effects such as hearing loss, especially for slow moving or stationary sound sources in the model.
- Animats are stationary horizontally and therefore do not avoid the sound source, unlike in the wild where animals would most often avoid exposures at higher sound levels, especially approaching those exposures that may result in temporary hearing impairment (PTS).
- Animats are assumed to receive the full impulse of the initial positive pressure wave due to an explosion, although the impulse-based thresholds (onset mortality and onset slight lung injury) assume an impulse delivery time adjusted for animal size and depth. Therefore, these impacts are overestimated at farther distances and increased depths.
- Multiple exposures within any 24-hour period are considered one continuous exposure for the purposes of calculating the temporary or permanent hearing loss, because there are not sufficient data to estimate a hearing recovery function for the time between exposures.
- Mitigation measures which are implemented during many training and testing activities were not factored into the initial model output (see Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring).

Because of these inherent model limitations and simplifications, initial model-estimated results must be further analyzed, considering such factors as the range to specific effects, animal avoidance, and the likelihood of successfully implementing mitigation measures. This analysis uses a number of factors in addition to the acoustic model results to predict acoustic effects to marine mammals as presented in the following section.

3.4.3.1.7 Marine Mammal Avoidance of Sound Exposures

Marine mammals may avoid sound exposures by either avoiding areas with high levels of anthropogenic activity or moving away from a sound source. Because the Navy Acoustic Effects Model does not consider horizontal movement of animats, including avoidance of human activity or sounds, it overestimates the number of marine mammals that would be exposed to sound sources that could cause injury. Therefore, the potential for avoidance is considered in the post-model analysis. The consideration of avoidance during use of sonar and other active acoustic sources and during use of explosives is described below and discussed in more detail in Section 3.4.3.1.2 (Analysis Background and Framework).

3.4.3.1.7.1 Avoidance of Human Activity

Cues preceding the commencement of an event (e.g., multiple vessel presence and movement, aircraft overflight) may result in some animals departing the immediate area, even before active sound sources begin transmitting. Beaked whales have been observed to be especially sensitive to human activity (Tyack et al. 2011; Pirotta et al. 2012), which is accounted for by using a low threshold for behavioral disturbance due to exposure to sonar and other active acoustic sources (see Section 3.4.3.1.2, Analysis Background and Framework).

Therefore, for certain naval activities preceded by high levels of vessel activity (multiple vessels) or hovering aircraft, beaked whales are assumed to avoid the activity area prior to the start of a sound-producing activity. Model-estimated effects during these types of activities are adjusted so that high level sound impacts to beaked whales (those causing PTS during use of sonar and other active acoustic sources and those causing mortality due to explosives) are considered to be TTS and injury, respectively, due to animals moving away from the activity and into a lower effect range.

3.4.3.1.7.2 Avoidance of Repeated Exposures

Marine mammals would likely avoid repeated high level exposures to a sound source that could result in injuries (i.e., PTS). Therefore, the model-estimated effects are adjusted to account for marine mammals swimming away from a sonar or other active source and away from multiple explosions to avoid repeated high level sound exposures. Avoidance of repeated sonar exposures is discussed further in Section 3.4.3.1.7 (Marine Mammal Avoidance of Sound Exposures).

3.4.3.1.8 Implementing Mitigation to Reduce Sound Exposures

The Navy implements mitigation measures (described in Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring) during sound-producing activities, including halting or delaying use of a sound source or explosives when marine mammals are observed in the mitigation zone. The Navy Acoustic Effects Model estimates acoustic effects without taking into account any shutdown or delay of the activity when marine mammals are detected; therefore, the model overestimates impacts to marine mammals within mitigation zones. The post-model analysis considers the potential for mitigation to reduce the likelihood or risk of PTS due to exposure to sonar and other active acoustic sources and injuries and mortalities due to explosives.

Two factors are considered when quantifying the effectiveness of mitigation: (1) the sightability of each species that may be present in the mitigation zone, which is affected by species-specific characteristics, and (2) the extent to which the type of mitigation proposed for a sound-producing activity (e.g., active sonar) allows for observation of the mitigation zone prior to and during the activity. The mitigation zones proposed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) encompass the estimated ranges to injury (including the range to mortality for explosives) for a given source.

Mitigation is considered in the acoustic effects analysis when the mitigation zone can be fully or mostly observed up to and during a sound-producing activity. Mitigation for each activity is considered in its entirety, taking into account the different scenarios that may take place as part of that activity (some scenarios involve different mitigation zones, platforms, or number of Lookouts). The ability to observe the range to mortality (for explosive activities only) and the range to potential injury (for all sound-producing activities) was estimated for each training or testing event. Mitigation was considered in the acoustic analysis as follows:

- If the entire mitigation zone can be continuously visually observed based on the surveillance platform(s), number of Lookouts, and size of the range to effects zone, the mitigation is considered fully effective (Effectiveness = 1).
- If over half of the mitigation zone can be continuously visually observed or if there is one or more of the scenarios within the activity for which the mitigation zone cannot be continuously visually observed (but the range to effects zone can be visually observed for the majority of the scenarios), the mitigation is considered mostly effective (Effectiveness = 0.5).
- If less than half of the mitigation zone can be continuously visually observed or if the mitigation zone cannot be continuously visually observed during most of the scenarios within the activity due to the type of surveillance platform(s), number of Lookouts, and size of the mitigation zone, the mitigation is not considered in the acoustic effects analysis.

Integral to the ability of Lookouts to detect marine mammals in or approaching the mitigation zone is the animal's presence at the surface and the characteristics of the animal that influence its sightability. The Navy considered what applicable data was available to numerically approximate the sightability of marine mammals and determined that the standard "detection probability" referred to as g(0) was most appropriate. The abundance of marine mammals is typically estimated using line-transect analyses (Buckland et al. 2001), in which g(0) is the probability of detecting an animal or group of animals on the transect line (the straight-line course of the survey ship or aircraft). This detection probability is derived from systematic line-transect marine mammal surveys based on species-specific estimates for vessel and aerial platforms. Estimates of g(0) are available from peer-reviewed marine mammal line-transect survey reports, generally provided through research conducted by the NMFS Science Centers.

There are two separate components of g(0): perception bias and availability bias (Marsh and Sinclair 1989). Perception bias accounts for marine mammals that are on the transect line and detectable, but were simply missed by the observer. Various factors influence the perception bias component of g(0), including species-specific characteristics (e.g., behavior and appearance, group size, and blow characteristics), viewing conditions during the survey (e.g., sea state, wind speed, wind direction, wave height, and glare), observer characteristics (e.g., experience, fatigue, and concentration), and platform characteristics (e.g., pitch, roll, speed, and height above water). To derive estimates of perception bias, typically an independent observer is present who looks for marine mammals missed by the primary observers. Mark-recapture methods are then used to estimate the probability that animals are missed by the primary observers. Availability bias accounts for animals that are missed because they are not at the surface at the time the survey platform passes by, which generally occurs more often with deep diving whales (e.g., sperm whale and beaked whale). The availability bias portion of g(0) is independent of prior marine mammal detection experience since it only reflects the probability of an animal being at the surface within the survey track and therefore available for detection.

Some g(0) values are estimates of perception bias only, some are estimates of availability bias only, and some reflect both, depending on the species and data that are currently available. The Navy used g(0) values with both perception and availability bias components if that data was available. If both components were not available for a particular species, the Navy determined that g(0) values reflecting perception bias or availability bias, but not both, still represent the best statistically-derived factor for assessing the likelihood of marine mammal detection by Navy Lookouts.

As noted above, line-transect surveys and subsequent analyses are typically used to estimate cetacean abundance. To systematically sample portions of an ocean area (such as the coastal waters off California or the east coast), marine mammal surveys are designed to uniformly cover the survey area and are conducted at a constant speed (generally 10 knots for ships and 100 knots for aircraft). Survey transect lines typically follow a pattern of straight lines or grids. Generally there are two primary observers searching for marine mammals. Each primary observer looks for marine mammals in the forward 90-degree quadrant on their side of the survey platform. Based on data collected during the survey, scientists determine the factors that affected the detection of an animal or group of animals directly along the transect line.

Visual marine mammal surveys (used to derive g(0)) are conducted during daylight.[19] Marine mammal surveys are typically scheduled for a season when weather at sea is more likely to be good, however, observers on marine mammal surveys will generally collect data in sea state conditions up to Beaufort 6 and do encounter rain and fog at sea which may also reduce marine mammal detections (see Barlow 2006). For most species, g(0) values are based on the detection probability in conditions from Beaufort 0 to Beaufort 5, which reflects the fact that marine mammal surveys are often conducted in less than ideal conditions (see Barlow 2003; Barlow and Forney 2007). The ability to detect some species (e.g., beaked whales, *Kogia* spp., and Dall's porpoise) decreases dramatically with increasing sea states, so g(0) estimates for these species are usually restricted to observations in sea state conditions of Beaufort 0 to 2 (Barlow 2003).

Navy training and testing events differ from systematic line-transect marine mammal surveys in several respects. These differences suggest the use of g(0), as a sightability factor to quantitatively adjust model-predicted effects based on mitigation is likely to result in an underestimate of the protection afforded by the implementation of mitigation as follows:

- Mitigation zones for Navy training and testing events are significantly smaller (typically less than 1,000 yd. radius) than the area typically searched during line-transect surveys, which includes the maximum viewable distance out to the horizon.
- In some cases, Navy events can involve more than one vessel or aircraft (or both) operating in proximity to each other or otherwise covering the same general area. Additional vessels and aircraft can result in additional watch personnel observing the mitigation zone (e.g., ship shock

[19] At night, passive acoustic data may still be collected during a marine mammal survey.

trials). This would result in more observation platforms and observers looking at the mitigation zone than the two primary observers used in marine mammal surveys upon which g(0) is based.

- A systematic marine mammal line-transect survey is designed to sample broad areas of the ocean, and generally does not retrace the same area during a given survey. Therefore, in terms of g(0), the two primary observers have only a limited opportunity to detect marine mammals that may be present during a single pass along the trackline (i.e., deep diving species may not be present at the surface as the survey transits the area). In contrast, many Navy training and testing activities involve area-focused events (e.g., anti-submarine warfare tracking exercise), where participants are likely to remain in the same general area during an event. In other cases Navy training or testing activities are stationary (i.e., pierside sonar testing or use of dipping sonar), which allows Lookouts to focus on the same area throughout the activity. Both of these circumstances result in a longer observation period of a focused area with more opportunities for detecting marine mammals than are offered by a systematic marine mammal line-transect survey that only passes through an area once.

Although Navy Lookouts on ships have hand-held binoculars and, on some ships, pedestal mounted binoculars very similar to those used in marine mammal surveys, there are differences between the scope and purpose of marine mammal detections during research surveys along a trackline and Navy Lookouts observing the water proximate to a Navy training or testing activity to facilitate implementation of mitigation. The distinctions required careful consideration when comparing the Navy Lookouts to marine mammal surveys.[20]

- A marine mammal observer is responsible for detecting marine mammals in their quadrant of the trackline out to the limit of the available optics. Although Navy Lookouts are responsible for observing the water for safety of ships and aircraft, during specific training and testing activities, they need only detect marine mammals in the relatively small area that surrounds the mitigation zone (in most cases less than 1,000 yd. from the ship) for mitigation to be implemented.

---

[20] Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and *Mesoplodon* beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel).

- Navy Lookouts, personnel aboard aircraft and on watch onboard vessels at the surface will have less experience detecting marine mammals than marine mammal observers used for line-transit survey. However, Navy personnel responsible for observing the water for safety of ships and aircraft do have significant experience looking for objects (including marine mammals) on the water's surface and Lookouts are trained using the NMFS approved Marine Species Awareness Training.

Although there are distinct differences between marine mammal surveys and Navy training and testing, the use of g(0) as an approximate sightability factor for quantitatively adjusting model-predicted impacts due to mitigation (mitigation effectiveness x g(0)) is an appropriate use of the best available science based on the way it has been applied. Consistent with the Navy's impact assessment processes, the Navy applied g(0) in a conservative manner (erring on the side of overestimating the number of impacts) to quantitatively adjust model-predicted effects to marine mammals within the applicable mitigation zones during Navy training and testing activities. Conservative application of g(0) include:

- In addition to a sightability factor (based on g(0)), the Navy also applied a mitigation effectiveness factor to acknowledge the uncertainty associated with applying the g(0) values derived from marine mammal surveys to specific Navy training and testing activities where the ability to observe the whole mitigation zone is less than optimal (generally due to the size of the mitigation zone).

- For activities that can be conducted at night, the Navy assigned a lower value to the mitigation effectiveness factor. For example, if an activity can take place at night half the time, then the mitigation effectiveness factor was only given a value of 0.5.

- The Navy did not quantitatively adjust model-predicted effects for activities that were given a mitigation effectiveness factor of zero. A mitigation effectiveness factor of zero was given to activities where less than half of the mitigation zone can be continuously visually observed or if the mitigation zone cannot be continuously visually observed during most of the scenarios within the activity due to the type of surveillance platform(s), number of Lookouts, and size of the mitigation zone. In reality, however, some protection from applied mitigation measures would be afforded even during these activities, even though it is not accounted for in the quantitative reduction of model-predicted impacts.

- The Navy did not quantitatively adjust model-predicted effects based on detections made by other personnel that may be involved with an event (such as range support personnel aboard a torpedo retrieval boat or support aircraft), even though in reality information about marine mammal sightings are shared amongst the units participating in the training or testing activity. In other words, the Navy only quantitatively adjusted the model-predicted effects based on the required number of Lookouts.

- The Navy only quantitatively adjusted model-predicted effects within the range to mortality (explosives only) and injury (all sound-producing activities), and not for the range to TTS or other behavioral effects (see Table 5.3-2 for a comparison of the range to effects for PTS, TTS, and the recommended mitigation zone). Despite employing the required mitigation measures during an activity that will also reduce some TTS exposures, the Navy did not quantitatively adjust the model-predicted TTS effects as a result of implemented mitigation.

- The total model-predicted number of animals affected is not reduced by the post-model mitigation analysis, since all reductions in mortality and injury effects are then added to and counted as TTS effects.

- Mitigation involving a power-down or cessation of sonar, or delay in use of explosives, as a result of a marine mammal detection, protects the observed animal and all unobserved (below the surface) animals in the vicinity. The quantitative adjustments of model-predicted impacts, however, assumes that only animals on the water surface, approximated by considering the species-specific g(0) and activity-specific mitigation effectiveness factor, would be protected by the applied mitigation (i.e., a power down or cessation of sonar or delaying the event). The quantitative post-model mitigation analysis, therefore, does not capture the protection afforded to all marine mammals that may be near or within the mitigation zone.

The Navy recognizes that g(0) values are estimated specifically for line-transect analyses; however, g(0) is still the best statistically-derived factor for assessing the likely marine mammal detection abilities of Navy Lookouts. Based on the points summarized above, as a factor used in accounting for the implementation of mitigation, g(0) is therefore considered to be the best available scientific basis for Navy's representation of the sightability of a marine mammal as used in this analysis.

The g(0) value used in the mitigation analysis is based on the platform(s) with Lookouts utilized in the activity. In the case of multiple platforms, the higher g(0) value for either the aerial or vessel platform is selected. For species for which there is only a single published value for each platform, that individual value is used. For species for which there is a range of published g(0) values, an average of the values, calculated separately for each platform, is used. A g(0) of zero is assigned to species for which there is no data available, unless a g(0) estimate can be extrapolated from similar species/guilds based on the published g(0) values. The g(0) values used in this analysis are provided in Table 3.4-9. The post-model acoustic effects quantification process is summarized in Table 3.4-10.

3.4.3.1.9 Marine Mammal Monitoring During Navy Training

The current behavioral exposure criteria under the response function also assumes there will be a range of reactions from minor or inconsequential to severe. Section 3.0.2.2 (Navy Integrated Comprehensive Monitoring Program) summarizes the monitoring data that has been collected thus far within the Study Area. Results of monitoring may provide indications that the severity of reactions has also been overestimated.

3.4.3.1.10 Application of the Marine Mammal Protection Act to Potential Acoustic Effects

The MMPA prohibits the unauthorized harassment of marine mammals and provides the regulatory processes for authorization for any such incidental harassment that might occur during an otherwise lawful activity. Harassment that may result from Navy training and testing activities described in this EIS/OEIS is unintentional and incidental to those activities.

For military readiness activities, MMPA Level A harassment includes any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild. Injury, as defined in this EIS/OEIS, is the destruction or loss of biological tissue from a marine mammal. The destruction or loss of biological tissue will result in an alteration of physiological function that exceeds the normal daily physiological variation of the intact tissue. For example, increased localized histamine production, edema, production of scar tissue, activation of clotting factors, white blood cell response, etc., may be expected following injury. Therefore, this EIS/OEIS assumes that all injury is qualified as a physiological effect and, to be consistent with prior actions and rulings (National Marine Fisheries Service 2001b, 2008b, 2008c) all injuries (except those serious enough to be expected to result in mortality) are considered MMPA Level A harassment.

Table 3.4-9: Sightability Based on g(0) Values for Marine Mammal Species in the Study Area

Species/Stocks	Family	Vessel Sightability	Aircraft Sightability
Baird's Beaked Whale	Ziphiidae	0.96	0.18
Blainville's Beaked Whale	Ziphiidae	0.40	0.074
Blue Whale, Fin Whale; Sei Whale	Balaenopteridae	0.921	0.407
Bottlenose Dolphin, Fraser's Dolphin	Delphinidae	0.808	0.96
Bryde's Whale	Balaenopteridae	0.91	0.407
Cuvier's Beaked Whale	Ziphiidae	0.23	0.074
Dall's Porpoise	Phocoenidae	0.822	0.221
Dwarf Sperm Whale, Pygmy Sperm Whale, *Kogia* spp.	Kogiidae	0.35	0.074
False Killer Whale, Melon-headed Whale	Delphinidae	0.76	0.96
Gray Whale	Eschrichtiidae	0.921	0.482
Humpback Whale	Balaenopteridae	0.921	0.495
Killer Whale	Delphinidae	0.91	0.96
Long-Beaked/ Short-Beaked Common Dolphin	Delphinidae	0.97	0.99
Longman's Beaked Whale, Pygmy Killer Whale	Ziphiidae, Delphinidae	0.76	0.074
Mesoplodon spp.	Ziphiidae	0.34	0.11
Minke Whale	Balaenopteridae	0.856	0.386
Northern Right Whale Dolphin	Delphinidae	0.856	0.96
Pacific White-Sided Dolphin	Delphinidae	0.856	0.96
Pantropical Spotted/Risso's/Rough Toothed/Spinner/Striped Dolphin	Delphinidae	0.76	0.96
Short-finned Pilot Whale	Delphinidae	0.76	0.96
Sperm Whale	Physeteridae	0.87	0.495

Note: For species having no data, the g(0) for Cuvier's aircraft value (where g(0)=0.074) was used; or in cases where there was no value for vessels, the g(0) for aircraft was used as a conservative underestimate of sightability following the assumption that the availability bias from a slower moving vessel should result in a higher g(0). Some g(0) values in the table above are perception bias and others represent availability bias depending on the species and data that is currently available.
References: Barlow (2010); Barlow and Forney (2007); Barlow et al. (2006); Carretta et al.(2000); Laake et al. (1997).

PTS is non-recoverable and, by definition, results from the irreversible impacts to auditory sensory cells, supporting tissues, or neural structures within the auditory system. PTS therefore qualifies as an injury and is classified as Level A harassment under the wording of the MMPA. The smallest amount of PTS (onset- PTS) is taken to be the indicator for the smallest degree of injury that can be measured. The acoustic exposure associated with onset-PTS is used to define the outer limit of the MMPA Level A exposure zone. Model predicted slight lung injury, gastrointestinal tract injuries, and mortalities are also considered MMPA Level A harassment in this analysis.

Table 3.4-10: Post-model Acoustic Effects Quantification Process

Sonar or other active acoustic source	Explosives
S-1. Is the activity preceded by multiple vessel activity or hovering helicopter?	***E-1. Is the activity preceded by multiple vessel activity or hovering helicopter?***
Species sensitive to human activity (i.e., beaked whales) are assumed to avoid the activity area, putting them out of the range to Level A harassment. Model-estimated PTS to these species during these activities are unlikely to actually occur and, therefore, are considered to be TTS (animal is assumed to move into the range of potential TTS). The activities preceded by multiple vessel movements or hovering helicopters are listed in Table 3.4-15 and Table 3.4-16.	Species sensitive to human activity (i.e., beaked whales) are assumed to avoid the activity area, putting them out of the range to mortality. Model-estimated mortalities to these species during these activities are unlikely to actually occur and, therefore, are considered to be injuries (animal is assumed to move into the range of potential injury). The activities that are preceded by multiple vessel movements or hovering helicopters are listed in Table 3.4-15 and Table 3.4-16.
S-2. Is the range to effects for PTS very small?	
Marine mammals in the mid-frequency hearing group would have to be close to the most powerful moving source (less than 10 m) to experience PTS. These model-estimated PTS of mid-frequency cetaceans are unlikely to actually occur and, therefore, are considered to be TTS (animal is assumed to move into the range of TTS).	
S-3. Can Lookouts observe the activity-specific mitigation zone (see Chapter 5) up to and during the sound-producing activity?	***E-2. Can Lookouts observe the activity-specific mitigation zone (see Chapter 5) up to and during the sound-producing activity?***
If Lookouts are able to observe the mitigation zone up to and during a sound-producing activity, the sound-producing activity would be halted or delayed if a marine mammal is observed and would not resume until the animal is thought to be out of the mitigation zone. Therefore, model-estimated PTS are reduced by the portion of animals that are likely to be seen [Mitigation Effectiveness (1, 0.5, or 0) x Sightability, g(0)]. Any animals removed from the model-estimated PTS are instead assumed to be TTS (animal is assumed to move into the range of TTS). The g(0) value is associated with the platform (vessel or aircraft) with the Lookout(s). For activities with Lookouts on both platforms, the higher g(0) is used for analysis. The g(0) values are provided in Table 3.4-9. The Mitigation Effectiveness values are provided in Table 3.4-17.	If Lookouts are able to observe the mitigation zone up to and during an explosion, the explosive activity would be halted or delayed if a marine mammal is observed and would not resume until the animal is thought to be out of the mitigation zone. Therefore, model-estimated mortalities and injuries are reduced by the portion of animals that are likely to be seen [Mitigation Effectiveness (1, 0.5, or 0) x Sightability, g(0)]. Any animals removed from the model-estimated mortalities or injuries are instead assumed to be injuries or behavioral disturbances, respectively (animals are assumed to move into the range of a lower effect). The g(0) value is associated with the platform (vessel or aircraft) with the Lookout(s). For activities with Lookouts on both platforms, the higher g(0) is used for analysis. The g(0) values are provided in Table 3.4-9. The Mitigation Effectiveness values for explosive activities are provided in Table 3.4-17.
S-4. Does the activity cause repeated sound exposures which an animal would likely avoid?	***E-3. Does the activity cause repeated sound exposures which an animal would likely avoid?***
The Navy Acoustic Effects Model assumes that animals do not move away from a sound source and receive a maximum SEL. In reality, an animal would likely avoid repeated sound exposures that would cause PTS by moving away from the sound source. Therefore, only the initial exposures resulting in model-estimated PTS to high-frequency cetaceans, low frequency cetaceans, and phocids are expected to actually occur (after accounting for mitigation in step S-3). Model estimates of PTS beyond the initial pings are considered to actually be behavioral disturbances, as the animal is assumed to move out of the range to PTS and into the range of TTS. Activities with multiple explosions are listed in Table 3.4-21.	The Navy Acoustic Effects Model assumes that animals do not move away from multiple explosions and receive a maximum SEL. In reality, an animal would likely avoid repeated sound exposures that would cause PTS by moving away from the site of multiple explosions. Therefore, only the initial exposures resulting in model-estimated PTS are expected to actually occur (after accounting for mitigation in step E-2). Model estimates of PTS are reduced to account for animals moving away from an area with multiple explosions, out of the range to PTS, and into the range of TTS. Activities with multiple explosions are listed in Table 3.4-21.

Public Law 108-136 (2004) amended the MMPA definitions of, Level B harassment for military readiness activities to be "any act that disturbs or is likely to disturb a marine mammal or marine mammal stock by causing disruption of natural behavioral patterns including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behaviors are abandoned or significantly altered." Unlike MMPA Level A harassment, which is solely associated with physiological effects, both physiological and behavioral effects may cause MMPA Level B harassment.

TTS is recoverable and is considered to result from the temporary, non-injurious fatigue of hearing-related tissues. The smallest measurable amount of TTS (onset-TTS) is taken as the best indicator for slight temporary sensory impairment. Because it is considered non-injurious, the acoustic exposure associated with onset-TTS is used to define the outer limit of the portion of the MMPA Level B exposure zone attributable to physiological effects. Short term reduction in hearing acuity could be considered a temporary decrement, similar in scope to a period of hearing masking or behavioral disturbance. As such, it is considered by the Navy and NMFS as a Level B effect overlapping the range of sounds producing behavioral effects.

The harassment status of slight behavior disruption has been addressed in workshops, previous actions, and rulings (National Marine Fisheries Service 2001b, 2008b, 2008c; U.S. Department of Defense 2001). The conclusion is that a momentary behavioral reaction of an animal to a brief, time-isolated acoustic event does not qualify as MMPA Level B harassment. This analysis uses behavioral criteria to predict the number of animals likely to experience a significant behavioral reaction, and therefore a MMPA Level B harassment.

NMFS also includes mortality, or serious injury likely to result in mortality, as a possible outcome to consider in addition to MMPA Level A and MMPA Level B harassment. An individual animal predicted to experience simultaneous multiple injuries, multiple disruptions, or both, is typically counted as a single take (National Marine Fisheries Service 2001b, 2006; National Oceanic and Atmospheric Administration 2009). There are many possible temporal and spatial combinations of activities, stressors, and responses, for which multiple reasonable methods can be used to quantify take by Level B harassment on a case-specific basis. NMFS generally considers it appropriate for applicants to consider multiple modeled exposures of an individual animal to levels above the behavioral harassment threshold within one 24-hour period as a single MMPA take. Behavioral harassment, under the response function presented in this request, uses received sound pressure level over a 24-hour period as the metric for determining the probability of harassment.

3.4.3.1.11 Application of the Endangered Species Act to Marine Mammals

Generalized information on definitions and the application of the ESA are presented in Chapter 3 (Affected Environment and Environmental Consequences) along with the acoustic conceptual framework used in this analysis. Consistent with NMFS analysis for Section 7 consultation under the ESA (e.g., see National Marine Fisheries Service 2013), the spatial and temporal overlap of activities with the presence of listed species is assessed in this EIS/OEIS. The definitions used by the Navy in making the determination of effect under Section 7 of the ESA are based on the U.S. Fish and Wildlife Service and NMFS *Endangered Species Consultation Handbook* (United States Fish and Wildlife Service and National Marine Fisheries Service 1998), and recent NMFS Biological Opinions involving many of the same activities and species.

- "No effect" is the appropriate conclusion when a listed species or its designated critical habitat will not be affected, either because the species will not be present or because the project does not have any elements with the potential to affect the species or modify designated critical habitat. “No effect” does not include a small effect or an effect that is unlikely to occur.

- If effects are insignificant (in size) or discountable (extremely unlikely), a “may affect” determination is still appropriate. "May affect" is appropriate when animals are within a range where they could potentially detect or otherwise be affected by the sound (e.g., the sound is above background ambient levels).
  - Insignificant effects relate to the size of the impact and should never reach the scale where take occurs.
  - Discountable effects are those extremely unlikely to occur and based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur.
- If a stressor and species presence overlap, and a predicted effect is not insignificant, discountable, or beneficial, a “may affect, likely to adversely affect” determination is appropriate.

There are no harassment or injury criteria established for marine mammals under the ESA because the ESA requires an assessment starting with mere exposure potential. Acoustic modeling is used to predict the number of ESA-listed marine mammals exposed to sound resulting from Navy training and testing activities, without any behavioral or physiological criteria applied. In order to determine if adverse effects may result pursuant to the ESA, the Navy assumed that any exposures that resulted in MMPA harassment equated to ‘may affect, likely to adversely affect’ when the definition of ‘take’ under both statutes were taken into consideration.

3.4.3.2 Analysis of Effects on Marine Mammals

3.4.3.2.1 Impacts from Sonar and Other Active Acoustic Sources

Sonar and other active acoustic sources proposed for use are transient in most locations as active sonar activities move throughout the Study Area. Sonar and other active acoustic sound sources emit sound waves into the water to detect objects, safely navigate, and communicate. General categories of sonar systems are described in Section 2.3.7.2 (Source Classes Qualitatively Analyzed).

Exposure of marine mammals to non-impulsive sources such as active sonar is not likely to result in primary blast injuries or barotraumas given the power output of the sources and the proximity to the source that would be required. Sonar induced acoustic resonance and bubble formation phenomena are also unlikely to occur under realistic conditions in the ocean environment, as discussed in Section 3.4.3.1.2.1 (Direct Injury). Direct injury from sonar and other active acoustic sources would not occur under conditions present in the natural environment and therefore is not considered further in this analysis.

Research and observations of auditory masking in marine mammals is discussed in Section 3.4.3.1.2.4 (Auditory Masking). Anti-submarine warfare sonar can produce intense underwater sounds in the Study Area associated with the Proposed Action. These sounds are likely within the audible range of most cetaceans but are normally very limited in the temporal, frequency, and spatial domains. The duration of individual sounds is short; sonar pulses can last up to a few seconds each, but most are shorter than 1 second. The duty cycle is low, with most tactical anti-submarine warfare sonar typically transmitting about once per minute. Furthermore, events are geographically and temporally dispersed, and most events are limited to a few hours. Tactical sonar has a narrow frequency band (typically less than one-third octave). These factors reduce the likelihood of sources causing significant auditory masking in marine mammals.

Some object-detecting sonar (i.e., mine warfare sonar) has a high duty cycle producing up to a few pings per second. Such sonar typically employs high frequencies (above 10 kHz) that attenuate rapidly in the water, thus producing only a small area of potential auditory masking. Higher-frequency mine warfare sonar systems are typically outside the hearing and vocalization ranges of mysticetes (Section 3.4.2.3, Vocalization and Hearing of Marine Mammals); therefore, mysticetes are unlikely to be able to detect the higher frequency mine warfare sonar, and these systems would not interfere with their communication or detection of biologically relevant sounds. Odontocetes may experience some limited masking at closer ranges as the frequency band of many mine warfare sonar overlaps the hearing and vocalization abilities of some odontocetes; however, the frequency band of the sonar is narrow, limiting the likelihood of auditory masking. With any of these activities, the limited duration and dispersion of the activities in space and time reduce the potential for auditory masking effects from proposed activities on marine mammals.

The most probable effects from exposure to sonar and other active acoustic sources are PTS, TTS, and behavioral harassment (Section 3.4.3.1.2.3, Hearing Loss, and Section 3.4.3.1.2.6, Behavioral Reactions). The Navy Acoustic Effects Model is used to produce initial estimates of the number of animals that may experience these effects; these estimates are further refined by considering animal avoidance of sound-producing activities and implementation of mitigation. These are discussed below in the following sections.

Another concern is the number of times an individual marine mammal is exposed and potentially reacts to a sonar or other active acoustic source over the course of a year or within a specific geographic area. Animals that are resident during all or part of the year near Navy ports or on fixed Navy ranges are the most likely to experience multiple exposures. Repeated and chronic noise exposures to marine mammals and their observed reactions are discussed in this analysis where applicable.

3.4.3.2.1.1 Range to Effects

The following section provides range (distance) over which specific physiological or behavioral effects are expected to occur based on the acoustic criteria (see Finneran and Jenkins 2012) and the acoustic propagation calculations from the Navy Acoustic Effects Model (see Section 3.4.3.1.6.3, Navy Acoustic Effects Model). The range to specific effects are used to assess model results and determine adequate mitigation ranges to avoid higher level effects, especially physiological effects. Additionally, these data can be used to analyze the likelihood of an animal being able to avoid an oncoming sound source by simply moving a short distance (i.e., within a few hundred meters). Figure 3.4-9 shows a representation of effects with distance from a hypothetical sonar source; notice the proportion of animals that are likely to have a behavioral response (yellow block; “response-function”) decreases with increasing distance from the source.

Although the Navy uses a number of sonar and other non-impulse sources, the three source class bins provided below (MF1, MF4, and MF5) represent three of the most powerful sources (See Section 2.3.7, Classification of Acoustic and Explosive Sources, for a discussion of sonar and other non-impulse source bins included in this analysis). The sources in these three bins are often the dominant source in an activity in which they are included, especially for smaller unit level training exercises and many testing activities. Therefore, these ranges provide realistic maximum distances over which the specific effects would be possible.

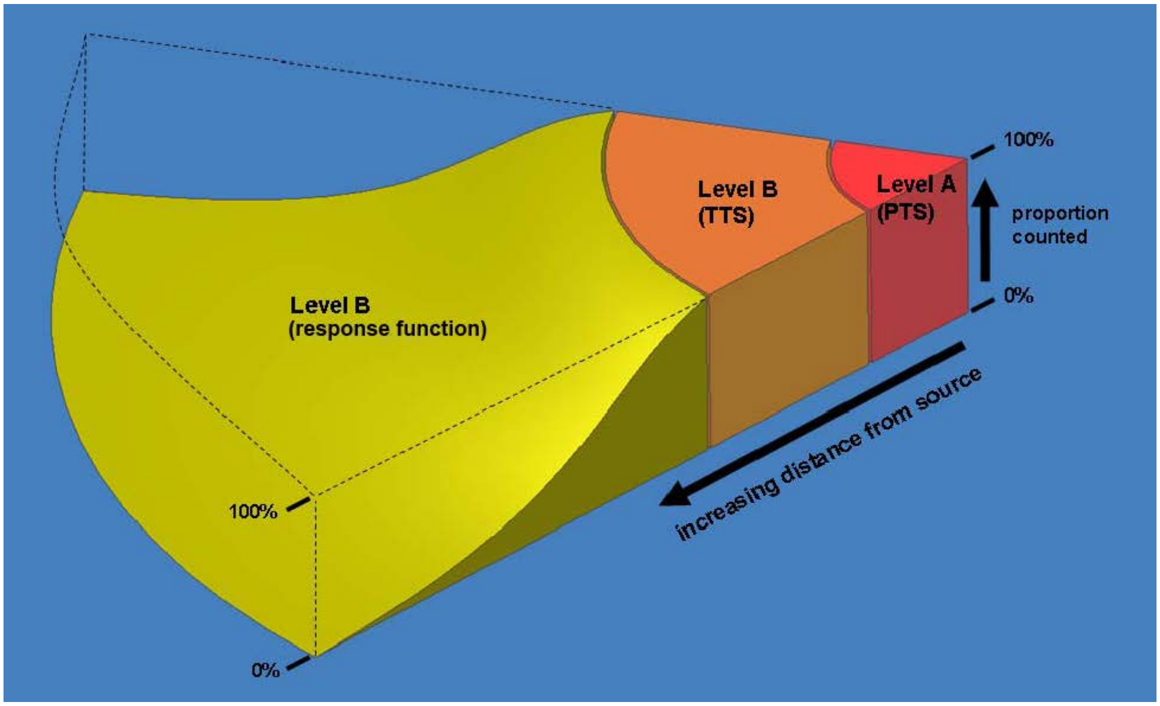


Figure 3.4-9: Hypothetical Range to Specified Effects for a Sonar Source

PTS: The ranges to the PTS threshold are shown in Table 3.4-11 relative to the marine mammal's functional hearing group (Navy's high frequency sources have a lower source level and more energy loss over distance than these mid-frequency examples and therefore have a shorter range to effects). For a SQS-53C sonar transmitting for one second at 3 kHz and a source level of 235 dB re 1 μPa^2-s at 1 m, the range to PTS for the most sensitive species (the high-frequency cetaceans) extends from the source to a range of approximately 100 m (109 yd.).

Since any surface vessel using hull mounted anti-submarine warfare sonar, such as the SQS-53, engaged in anti-submarine warfare training and testing would be moving at between 10 and 15 knots (5.1 and 7.7 m/second) and nominally pinging every 50 seconds, the vessel will have traveled a minimum distance of approximately 280 yd. (257 m) during the time between those pings (note: 10 knots is the speed used in the Navy Acoustic Effects Model). As a result of the vessel moving forward, there is little overlap of PTS footprints from successive pings, indicating that in most cases, an animal predicted to receive PTS would do so from a single exposure (i.e., ping). For all other functional hearing groups (low-frequency cetaceans and mid-frequency cetaceans, pinniped, and mustelid) single-ping PTS zones are within 110 yd. (100 m) of the sound source. A scenario could be imagined where an animal does not leave the vicinity of a ship or travels a course parallel to the ship within the PTS zone, however, as indicated in Table 3.4-11, the sustained proximity to the ship required make it unlikely there would be exposures resulting in PTS from any subsequent pings. For a Navy vessel moving at a nominal 10 knots, it is unlikely a marine mammal could maintain the speed to parallel the ship and receive adequate energy over successive pings to result in a PTS exposure. For all sources except hull-mounted sonar (e.g., SQS-53 and BQQ-10) ranges to PTS are well within 55 yd. (50 m), even for multiple pings (up to five pings examined) and the most sensitive functional hearing group (high-frequency cetaceans).

Table 3.4-11: Approximate Ranges to Permanent Threshold Shift Criteria for Each Functional Hearing Group for a Single Ping from Three of the Most Powerful Sonar Systems within Representative Ocean Acoustic Environments

Functional Hearing Group	Ranges to the Onset of PTS for One Ping (meters)[1]		
	Sonar Bin MF1 (e.g., SQS-53; Anti-Submarine Warfare Hull Mounted Sonar)	Sonar Bin MF4 (e.g., AQS-22; Anti-Submarine Warfare Dipping Sonar)	Sonar Bin MF5 (e.g., SSQ-62; Anti-Submarine Warfare Sonobuoy)
Low-Frequency Cetaceans	70	10	<2
Mid-Frequency Cetaceans	10	<2	<2
High-Frequency Cetaceans	100	20	10
Phocid Seals	80	10	<2
Otariid Seals & Sea Lion, & Mustelid (Sea Otter)	10	<2	<2

Notes: PTS = permanent threshold shift.
[1] PTS ranges extend from the sonar or other active acoustic sound source to the indicated approximate distance. These approximate ranges are based on spherical spreading (Transmission Loss = 20 log R, where R = range in meters)

Under average environmental conditions for the most powerful active acoustic sources, hull-mounted anti-submarine warfare sonar (e.g., bin MF1; SQS-53C), for a single ping the range to the onset of PTS for otariid seals and sea lions and sea otter does not exceed 2 yd. (2 m); for mid-frequency cetaceans (the majority of species present) it does not exceed 11 yd. (10 m); for low-frequency cetaceans does not exceed 77 yd. (70 m); for phocid seals does not exceed and 87 yd. (80 m); and for high-frequency cetaceans does not exceed 109 yd. (100 m). In the Study Area the high-frequency cetaceans include three species, Dall's porpoise, dwarf sperm whale, and pygmy sperm whale. These species are known to avoid areas of human activity and underwater noise. Likewise, all other species are assumed to avoid the area immediately around an active sound source, beyond the ranges where PTS would be possible.

TTS: Table 3.4-12 illustrates the ranges to the onset of TTS (i.e., the maximum distances to which TTS would be expected) for one, five, and ten pings from four representative source bins and sonar systems. Due to the lower acoustic thresholds for TTS versus PTS, ranges to TTS are longer; this can also be thought of as a larger volume acoustic footprint for TTS effects. Because the effects threshold is total summed sound energy and because of the longer distances, successive pings can add together, further increasing the range to onset-TTS.

Behavioral: The distances over which the sound pressure level from four representative sonar sources is within the indicated 6-dB bins, and the percentage of animals that may exhibit a significant behavioral response under the mysticete and odontocete behavioral response function, are shown in Table 3.4-13 and Table 3.4-14, respectively. See Section 3.4.3.1.2 (Analysis Background and Framework) for details on the derivation and use of the behavioral response function as well as the step function thresholds for beaked whales of 140 dB re 1 µPa.

Table 3.4-12: Approximate Maximum Ranges to the Onset of Temporary Threshold Shift for Four Representative Sonar Over a Representative Range of Ocean Environments

Functional Hearing Group	Approximate Ranges to the Onset of TTS (meters)[1]											
	Sonar Bin MF1 (e.g., SQS-53; ASW Hull Mounted Sonar)			Sonar Bin MF4 (e.g., AQS-22; ASW Dipping Sonar)			Sonar Bin MF5 (e.g., SSQ-62; ASW Sonobuoy)			Sonar Bin HF4 (e.g., SQQ-32; MIW Sonar)		
	One Ping	Five Pings	Ten Pings	One Ping	Five Pings	Ten Pings	One Ping	Five Pings	Ten Pings	One Ping	Five Pings	Ten Pings
Low-frequency cetaceans	560-2,280	1,230-6,250	1,620-8,860	220-240	490-1,910	750-2,700	110-120	240-310	340-1,560	100-160	150-730	150-820
Mid-frequency cetaceans	150-180	340-440	510-1,750	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
High-frequency cetaceans	2,170-7,570	4,050-15,350	5,430-19,500	90	180-190	260-950	< 50	< 50	< 50	< 50	< 50	< 50
Otariid seals, sea lion, & Mustelid (sea otter)	230-570	1,240-1,300	1,760-1,780	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Phocid seals & Manatees	70-1,720	200-3,570	350-4,850	< 50	100	150	< 50	< 50	< 50	< 50	< 50	< 50

Notes: ASW: anti-submarine warfare; MIW: mine warfare; TTS: temporary threshold shift

[1]Ranges to TTS represent the model predictions in different areas and seasons within the Study Area. The zone in which animals could receive an exposure resulting in TTS begins immediately beyond onset-PTS to the distance indicated.

Table 3.4-13: Range to Received Sound Pressure Level (SPL) in 6-dB Increments and Percentage of Behavioral Harassments for Low-Frequency Cetaceans under the Mysticete Behavioral Response Function for Four Representative Source Bins for the Study Area

Received Level in 6-dB Increments	Source Bin MF1 (e.g., SQS-53; Anti-Submarine Warfare Hull Mounted Sonar)		Source Bin MF4 (e.g., AQS-22; Anti-Submarine Warfare Dipping Sonar)		Source Bin MF5 (e.g., SSQ-62; Anti-Submarine Warfare Sonobuoy)		Source Bin HF4 (e.g., SQQ-32; Mine Integrated Warfare Sonar)	
	Approximate Distance (m)	Behavioral Harassment % from SPL Increment	Approximate Distance (m)	Behavioral Harassment % from SPL Increment	Approximate Distance (m)	Behavioral Harassment % from SPL Increment	Approximate Distance (m)	Behavioral Harassment % from SPL Increment
120 <= SPL <126	172,558 – 162,925	0.00%	40,000 – 40,000	0.00%	23,880 – 17,330	0.00%	3,100 – 2,683	0.00%
126 <= SPL <132	162,925 – 117,783	0.00%	40,000 – 40,000	0.00%	17,330 – 12,255	0.10%	2,683 – 2,150	0.01%
132 <= SPL <138	117,783 – 108,733	0.04%	40,000 – 12,975	3.03%	12,255 – 7,072	4.12%	2,150 – 1,600	0.48%
138 <= SPL <144	108,733 – 77,850	1.57%	12,975 – 12,800	0.14%	7,072 – 3,297	23.69%	1,600 – 1,150	4.20%
144 <= SPL <150	77,850 – 58,400	5.32%	12,800 – 6,525	27.86%	3,297 – 1,113	42.90%	1,150 - 575	24.79%
150 <= SPL <156	58,400 – 53,942	4.70%	6,525 – 2,875	36.83%	1,113 - 255	24.45%	575 - 300	28.10%
156 <= SPL <162	53,942 – 8,733	83.14%	2,875 – 1,088	23.78%	255 - 105	3.52%	300 - 150	24.66%
162 <= SPL <168	8,733 – 4,308	3.51%	1,088 - 205	7.94%	105 - <50	1.08%	150 - 100	9.46%
168 <= SPL <174	4,308 – 1,950	1.31%	205 - 105	0.32%	<50	0.00%	100 - <50	8.30%
174 <= SPL <180	1,950 – 850	0.33%	105 - <50	0.10%	<50	0.00%	<50	0.00%
180 <= SPL <186	850 – 400	0.06%	<50	0.01%	<50	0.13%	<50	0.00%
186 <= SPL <192	400 – 200	0.01%	<50	0.00%	<50	0.00%	<50	0.00%
192 <= SPL <198	200 – 100	0.00%	<50	0.00%	<50	0.00%	<50	0.00%

Notes: m = meter, SPL = sound pressure level (dB re 1 μPa)

Table 3.4-14: Range to Received Sound Pressure Level (SPL) in 6-dB Increments and Percentage of Behavioral Harassments for Mid-Frequency and High Frequency Cetaceans under the Odontocete Response Function for Four Representative Source Bins

Received Level in 6-dB Increments	Source Bin MF1 (e.g., SQS-53; Anti-Submarine Warfare Hull Mounted Sonar)		Source Bin MF4 (e.g., AQS-22; Anti-Submarine Warfare Dipping Sonar)		Source Bin MF5 (e.g., SSQ-62; Anti-Submarine Warfare Sonobuoy)		Source Bin HF4 (e.g., SQQ-32; Mine Integrated Warfare Sonar)	
	Approximate Distance (m)	Behavioral Harassment % from SPL Increment	Approximate Distance (m)	Behavioral Harassment % from SPL Increment	Approximate Distance (m)	Behavioral Harassment % from SPL Increment	Approximate Distance (m)	Behavioral Harassment % from SPL Increment
120 <= SPL <126	172,592 – 162,933	0.00%	40,000 – 40,000	0.00%	24,205 – 18,872	0.00%	4,133 – 3,600	0.00%
126 <= SPL <132	162,933 – 124,867	0.00%	40,000 – 40,000	0.00%	18,872 – 12,697	0.10%	3,600 – 3,075	0.00%
132 <= SPL <138	124,867 – 108,742	0.07%	40,000 – 12,975	2.88%	12,697 – 7,605	3.03%	3,075 – 2,525	0.01%
138 <= SPL <144	108,742 – 78,433	1.54%	12,975 – 12,950	0.02%	7,605 – 4,080	17.79%	2,525 – 1,988	0.33%
144 <= SPL <150	78,433 – 58,650	5.41%	12,950 – 6,725	26.73%	4,080 – 1,383	46.83%	1,988 – 1,500	2.83%
150 <= SPL <156	58,650 – 53,950	4.94%	6,725 – 3,038	36.71%	1,383 - 300	27.08%	1,500 – 1,000	14.92%
156 <= SPL <162	53,950 – 8,925	82.62%	3,038 – 1,088	25.65%	300 - 155	3.06%	1,000 - 500	40.11%
162 <= SPL <168	8,925 – 4,375	3.66%	1,088 - 255	7.39%	155 - 55	2.02%	500 - 300	22.18%
168 <= SPL <174	4,375 – 1,992	1.34%	255 - 105	0.52%	55 - <50	0.00%	300 - 150	14.55%
174 <= SPL <180	1,992 – 858	0.34%	105 - <50	0.09%	<50	0.00%	150 - <50	5.07%
180 <= SPL <186	858 – 408	0.06%	<50	0.01%	<50	0.09%	<50	0.00%
186 <= SPL <192	408 – 200	0.01%	<50	0.00%	<50	0.00%	<50	0.00%
192 <= SPL <198	200 – 100	0.00%	<50	0.00%	<50	0.00%	<50	0.00%

Notes: m = meter, SPL = sound pressure level (dB re 1 μPa)

Range to 120 dB re 1 µPa varies by system, but can exceed 107 mi. (172 km) for the most powerful hull mounted sonar; however, only a very small percentage of animals would be predicted to react at received levels between 120 and 130 dB re 1 µPa. Beaked whales would be predicted to have behavioral reactions at distances out to approximately 68 mi. (109 km).

3.4.3.2.1.2 Avoidance Behavior and Mitigation Measures as Applied to Sonar and Other Active Acoustic Sources

As discussed above, within the Navy Acoustic Effects Model, animats (virtual animals representing individual marine mammals) do not move horizontally or react in any way to avoid sound or any other disturbance. In reality, various researchers have demonstrated that cetaceans can perceive the movement of a sound source (e.g., vessel, seismic source, etc.) relative to their own location and react with responsive movement away from the source, often at distances of a kilometer or more (Au and Perryman 1982; Jansen et al. 2010; Palka and Hammond 2001; Richardson et al. 1995; Tyack et al. 2011; Watkins 1986; Wursig et al. 1998; Tyack 2009). See Section 3.4.3.1.5 (Behavioral Responses), for a review of research and observations of marine mammals' reactions to sound sources including sonar, ships, and aircraft. The behavioral criteria used as a part of this analysis acknowledges that a behavioral reaction is likely to occur at levels below those required to cause hearing loss (TTS or PTS) or higher order physiological impacts. At close ranges and high sound levels approaching those that could cause PTS, avoidance of the area immediately around intense activity associated with a sound source (such as a low hovering helicopter) or a sound source or both is assumed in most cases. Additionally, the Navy Acoustic Effects Model does not account for the implementation of mitigation, which would prevent many of the model-estimated PTS effects. Therefore, the model-estimated PTS effects due to sonar and other active acoustic sources are further analyzed considering avoidance and implementation of mitigation measures described in Section 3.4.3.1.6 (Quantitative Analysis) and using identical procedures to those described in the technical report *Post-Model Quantitative Analysis of Animal Avoidance Behavior and Mitigation Effectiveness for Atlantic Fleet Training and Testing* (U.S. Department of the Navy 2013c).

For example, if sound-producing activities are preceded by multiple vessel traffic or hovering aircraft, beaked whales are assumed to move beyond the range to PTS before sound transmission begins, as discussed above in Section 3.4.3.1.7.1 (Avoidance of Human Activity). Table 3.4-11 shows the ranges to PTS for three of the most common and powerful sound sources proposed for use when training and testing in the Study Area. The source class Bin MF1 includes the most powerful anti-submarine warfare system for a surface combatant, the SQS-53. The range to PTS for all systems is generally much less than 50 m (55 yd.), with the exception of high-frequency cetaceans exposed to bin MF1 with a PTS range of approximately 100 m (110 yd.). Because the Navy Acoustic Effects Model does not include avoidance behavior, the preliminary model-estimated effects are based on unlikely behavior for these species—that they would tolerate staying in an area of high human activity. Beaked whales that were model-estimated to experience PTS due to sonar and other active acoustic sources are assumed to actually move away from the activity and into the range of TTS prior to the start of the sound-production for the activities listed in Table 3.4-15 and Table 3.4-16. For activities where multiple vessel traffic or hovering aircraft do not precede the sound transmissions, model predicted PTSs were not reduced based on this factor.

Table 3.4-15: Training Activities Using Sonar and Other Active Acoustic Sources Preceded by Multiple Vessel Movements or Hovering Helicopters

Training
Airborne Mine Countermeasure - Mine Detection
Civilian Port Defense
Composite Training Unit Exercise
Group Sail
Integrated Anti-Submarine Warfare Course
Joint Task Force Exercise/Sustainment Exercise
Kilo Dip
Mine Countermeasures Exercise - Ship Sonar
Rim of the Pacific Exercise/Under Sea Warfare Exercise (RIMPAC/USWEX)
Submarine Commanders Course
Tracking Exercise/Torpedo Exercise - Helo

Table 3.4-16: Testing Activities Using Sonar and Other Active Acoustic Sources Preceded by Multiple Vessel Movements or Hovering Helicopters

Testing
Airborne Mine Hunting Test
Anti-Submarine Warfare Mission Package Testing
Anti-Submarine Warfare Tracking Test - Helo
Mine Countermeasure Mission Package Testing
Mine Countermeasure/Neutralization Testing
Mine Detection/Classification Testing
Sonobuoy Lot Acceptance Testing
Torpedo (Explosive) Testing
Torpedo (Non-Explosive) Testing

The Navy Acoustic Effects Model does not consider implemented mitigation measures (as presented in detail in Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring). To account for the implementation of mitigation measures, the acoustic effects analysis assumes a model-estimated PTS would not occur if an animal at the water surface would likely be observed during those activities with Lookouts up to and during use of the sound source, considering the sightability of a species based on g(0) (see Table 3.4-9 in Section 3.4.3.1.8 (Implementing Mitigation to Reduce Sound Exposures), the range to PTS for each hearing group and source (see examples in Table 3.4-11), and mitigation effectiveness (see Table 3.4-17). The range to PTS is generally less than 50 m (55 yd.), and the largest single ping range to PTS for the most powerful sonar system is approximately 100 m (109 yd.), so Lookouts need only to detect animals before they are within a very close range of a sound source to prevent PTS. The preliminary model-estimated PTS numbers are reduced by the portion of animals that are likely to be seen (Mitigation Adjustment Factor x Sightability). Model predicted PTS effects are adjusted based on these factors and added to the model predicted TTS exposures. This is a conservative approach that will still result in an overestimation of PTS effects since the range to PTS is generally much less than 55 yd. (50 m), Lookouts need only detect animals before they are within this very close range to implement mitigation to prevent PTS, and the g(0) detection probabilities used as a sightability factor are based on having to detect animals at much greater distance (many kilometers; as presented previously in Section 3.4.3.1.8, Implementing Mitigation to Reduce Sound Exposures).

Table 3.4-17: Non-Impulse Activities Adjustment Factors Integrating Implementation of Mitigation into Modeling Analyses

Activity[1]	Factor for Adjustment of Preliminary Modeling Estimates[2]	Mitigation Platform Used for Assessment
Training		
Airborne Mine Countermeasure - Mine Detection	1	Aircraft
Civilian Port Defense	1	Vessel
Composite Training Unit Exercise	1	Vessel
Integrated Anti-Submarine Warfare Course	1	Vessel
Joint Task Force Exercise/Sustainment Exercise	1	Vessel
Group Sail	1	Vessel
Kilo Dip	1	Aircraft
Mine Countermeasures Exercise - Ship Sonar	1	Vessel
Mine Neutralization - ROV	1	Vessel
Submarine Navigational Exercise	1	Vessel
Submarine Sonar Maintenance	0.5	Vessel
Surface Ship Object Detection	1	Vessel
Surface Ship Sonar Maintenance	1	Vessel
Tracking Exercise/Torpedo Exercise - MPA Sonobuoy	0.5	Aircraft
Tracking Exercise/Torpedo Exercise - Surface	0.5	Vessel
Tracking Exercise/Torpedo Exercise - Helo	0.5	Aircraft
Testing		
Anti-Submarine Warfare Tracking Test – MPA	1	Aircraft
Combat System Ship Qualification Trials: In-Port	1	Vessel
Combat System Ship Qualification Trials: Under Sea Warfare	0.5	Vessel
Countermeasure Testing	0.5	Vessel
MCM Mission Package Testing	1	Vessel
Mine Countermeasure/Neutralization Testing	1	Vessel
Mine Detection/Classification Testing	1	Vessel
Pierside Integrated Swimmer Defense	1	Vessel
Pierside Sonar Testing	1	Vessel
Ship Signature Testing	1	Vessel
Sonobuoy Lot Acceptance Testing	1	Vessel
Submarine Sonar Testing/Maintenance	0.5	Vessel
Surface Combatant Sea Trials: Anti-Submarine Warfare Testing	1	Vessel
Surface Combatant Sea Trials: Pierside Sonar Testing	1	Vessel
Surface Ship Sonar Testing/Maintenance	1	Vessel
Torpedo (Non-Explosive) Testing	0.5	Vessel

[1] The adjustment factor for all other activities (not listed) is zero; there is no adjustment of the preliminary modeling estimates as a result of implemented mitigation.
[2] If less than half of the mitigation zone cannot be continuously visually observed due to the type of mitigation platform used for this assessment, number of Lookouts, and size of the mitigation zone, mitigation is not used as a factor adjusting the acoustic effects analysis of that activity and the activity is not listed in this table.

Animal avoidance of the area immediately around the sonar or other active acoustic system, coupled with mitigation measure designed to avoid exposing animals to high energy levels, would make the majority of model-estimated PTS to mid-frequency cetaceans unlikely. The maximum ranges to onset PTS for mid-frequency cetaceans (Table 3.4-11) do not exceed 10 m (11 yd.) in any environment modeled for the most powerful non-impulsive acoustic sources, hull-mounted sonar (e.g., Bin MF1; SQS-53C). Ranges to PTS for low-frequency cetaceans and high-frequency cetaceans (Table 3.4-11) do not exceed approximately 77 and 110 yd. (70 m and 100 m), respectively. Considering vessel speed during anti-submarine warfare activities normally exceeds 10 knots, and sonar pings occur about every 50 seconds, even for the MF1 an animal would have to maintain a position within a 22 yd. (20 m) radius in front of, or alongside the moving the ship for over three minutes (given the time between five pings) to experience PTS. In addition, the animal(s) or pod would have to remain unobserved, otherwise implemented mitigation would result in the sonar transmissions being shut down and thus ending any further exposure. Finally, the majority of marine mammals (odontocetes) have been demonstrated to have directional hearing, with best hearing sensitivity when facing a sound source (Mooney et al. 2008; Popov and Supin 2009; Kastelein et al. 2005b). An odontocete avoiding a source would receive sounds along a less sensitive hearing orientation (its tail pointed toward the source), potentially reducing impacts. All model-estimated PTS exposures of mid-frequency cetaceans, therefore, are considered to actually be TTS due to the likelihood that an animal would be observed if it is present within the very short range to PTS effects.

The Navy Acoustic Effects Model does not account for several factors (see Sections 2.3.7, Classification of Acoustic and Explosive Sources, and 3.4.3.2.1.2, Avoidance Behavior and Mitigation Measures as Applied to Sonar and Other Active Acoustic Sources) that must be considered in the overall acoustic analysis. The results in the following tables are the predicted exposures from the Navy Acoustic Effects Model adjusted by the animal avoidance and mitigation factors discussed in the section above (Section 3.4.3.2.1.2, Avoidance Behavior and Mitigation Measures as Applied to Sonar and Other Active Acoustic Sources). Mitigation measures are discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring), and provide additional protections that are not considered in the numerical results below.

Marine mammals in other functional hearing groups (i.e., low-frequency cetaceans and high-frequency cetaceans, and pinnipeds) if present but not observed by Lookouts, are assumed to leave the area near the sound source after the first few pings, thereby reducing SELs and the potential for PTS. Based on nominal marine mammal swim speeds and normal operating parameters for Navy vessels it was determined that an animal can easily avoid PTS zones within the timeframe it takes an active sound source to generate one to two pings. As a conservative measure, and to account for activities where there may be a pause in sound transmission, PTS was accounted for over three to four pings of an activity. Additionally and as presented above, during the first few pings of an event, or after a pause in sonar operations, if animals are caught unaware and it was not possible to implement mitigation measures (e.g., animals are at depth and not visible at the surface) it is possible that they could receive enough acoustic energy for that to result in a PTS exposure. Only these initial PTS exposures at the beginning of the activity or after a pause in sound transmission, are expected to actually occur. The remaining model-estimated PTS are considered to be TTS due to animal avoidance.

3.4.3.2.1.3 Predicted Impacts for Sonar and Other Active Acoustic Sources

Table 3.4-18 and Table 3.4-19 present the predicted impacts to marine mammals separated between training and testing activities for sonar and other active acoustic sources. All non-annual events are biennial (e.g., Rim of the Pacific Exercise) and are analyzed as occurring every other year, or three times during the 5-year period considered in this analysis. Annual totals presented in the tables are the summation of all annual training or all testing events plus the all proposed non-annual events occurring in a 12-month period (a maximum year). These predicted effects are the result of the acoustic analysis, including acoustic effects modeling followed by consideration of animal avoidance of multiple exposures, avoidance by sensitive species of areas with a high level of activity, and Navy mitigation measures.

It is important to note that exposure numbers presented in Table 3.4-18 and Table 3.4-19 are the total number of exposures and not necessarily the number of individual marine mammals exposed. As discussed in Section 3.4.3.1.5 (Behavioral Responses), an animal could be predicted to receive more than one acoustic impact over the course of a year.

3.4.3.2.1.4 No Action Alternative – Training Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-1, and Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources), training activities under the No Action Alternative include activities that produce in-water sound from the use of sonar and other active acoustic sources. Activities could occur throughout the Study Area but would be concentrated within 200 mi. (322 km) of San Diego in the SOCAL Range Complex and within 200 mi. (322 km) of the Hawaiian Islands in the HRC.

Table 3.4-18 provides a summary of the total estimated non-impulsive sound source exposures from Navy training that would be conducted over the course of a year under the three alternatives. For the No Action Alternative, the acoustic modeling and post-modeling analyses predict 507,933[21] marine mammal exposures to non-impulsive sound resulting in Level B harassment and 37[22] exposures resulting in Level A as defined under the MMPA for military training activities.

Predicted acoustic effects to marine mammals from training activities under the No Action Alternative from sonar and other active sound sources are primarily (approximately 92 percent) from anti-submarine warfare events involving surface ships and hull mounted sonar. As discussed in Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources), ranges to TTS for hull mounted sonar (e.g., sonar bin MF1; SQS-53 anti-submarine warfare hull-mounted sonar) can be on the order of several kilometers, whereas some behavioral effects could take place at distances exceeding 93 mi. (170 km), although significant behavioral effects are much more likely at higher received levels within a few kilometers of the sound source.

Approximately 88 percent of the predicted behavioral effects to marine mammals from training activities using sonar and other active acoustic sources under the No Action Alternative are predicted within the SOCAL Range Complex and 12 percent in the HRC.

Under the No Action Alternative about 74 percent of predicted behavioral effects to marine mammals from sonar and other active acoustic sources are associated with major training exercises (e.g., Composite Training Unit Exercise, Joint Task Force Exercise, Under Sea Warfare Exercise, Rim of the Pacific Exercise; see Table 2.8-1). These major training exercises are multi-day events composed of multiple, dispersed activities involving multiple platforms (e.g., ships, aircraft, submarines) that often require movement across or use of large areas of a range complex. Potential acoustic impacts from major training exercises, especially behavioral impacts, could be more pronounced given the duration and scale of the activity. Some animals may be exposed to this activity multiple times over the course of a few days and leave the area although these activities do not use the same training locations day-after-day during multi-day activities. Therefore, displaced animals could return after the major training exercise moves away, allowing the animal to recover from any energy expenditure or missed resources.

[21] This is the combined summation of all non-TTS and TTS exposures (behavioral effects) for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the 12-month period).
[22] This is the combined summation of all PTS exposures for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the same 12-month period).

Table 3.4-18: Predicted Impacts from Annual Training use of Sonar and Other Active Acoustic Sources

Species	Stock	No Action Alternative			Alternative 1			Alternative 2		
		Behavioral	TTS	PTS	Behavioral	TTS	PTS	Behavioral	TTS	PTS
Blue whale	Eastern North Pacific	609	534	0	1,726	2,415	0	1,726	2,415	0
	Central North Pacific	19	29	0	60	120	0	60	120	0
Fin whale	CA/OR/WA	192	186	0	629	898	0	629	898	0
	Hawaiian	20	28	0	72	119	0	72	119	0
Humpback whale	CA/OR/WA	154	141	0	410	671	0	410	671	0
	Central North Pacific	919	1,344	0	2,889	5,303	0	2,889	5,303	0
Sei whale	Eastern North Pacific	22	19	0	57	89	0	57	89	0
	Hawaiian	58	54	0	169	315	0	169	315	0
Sperm whale	CA/OR/WA	566	19	0	1,815	143	0	1,815	143	0
	Hawaiian	429	5	0	1,335	39	0	1,335	39	0
Guadalupe fur seal	Mexico	766	0	0	2,596	7	0	2,596	7	0
Hawaiian monk seal	Hawaiian	254	48	0	845	446	0	845	446	0
Bryde's whale	Eastern Tropical Pacific	12	15	0	35	77	0	35	77	0
	Hawaiian	17	18	0	47	90	0	47	90	0
Gray whale	Eastern North Pacific	936	1,204	0	3,169	6,289	1	3,169	6,289	1
	Western North Pacific	1	1	0	3	7	0	3	7	0
Minke whale	CA/OR/WA	50	45	0	144	215	0	144	215	0
	Hawaiian	44	54	0	193	254	0	193	254	0
Baird's beaked whale	CA/OR/WA	1,338	12	0	4,328	92	0	4,328	92	0
Blainville's beaked whale	Hawaiian	3,227	7	0	10,258	58	0	10,258	58	0
Bottlenose dolphin	CA/OR/WA Offshore	6,313	508	0	22,490	4,123	0	22,490	4,123	0
	California Inshore	33	0	0	173	5	0	173	5	0
	Hawaii Stock Complex	1,573	89	0	4,759	404	0	4,759	404	0
Cuvier's beaked whale	CA/OR/WA	4,194	28	0	13,153	200	0	13,153	200	0
	Hawaiian	15,884	29	0	52,679	214	0	52,679	214	0
Dwarf sperm whale	Hawaiian	300	5,420	10	812	21,545	41	812	21,545	41
Dall's porpoise	CA/OR/WA	971	7,642	18	1,887	34,937	37	1,887	34,937	37
False killer whale	Hawaii Pelagic	17	1	0	46	3	0	46	3	0
	Main Hawaiian Islands Insular	162	7	0	449	31	0	449	31	0
	Northwestern Hawaiian Islands	60	3	0	165	12	0	165	12	0
Fraser's dolphin	Hawaiian	647	22	0	1,883	126	0	1,883	126	0

Table 3.4-18: Predicted Impacts from Annual Training use of Sonar and Other Active Acoustic Sources (continued)

Species	Stock	No Action Alternative			Alternative 1			Alternative 2		
		Behavioral	TTS	PTS	Behavioral	TTS	PTS	Behavioral	TTS	PTS
Killer whale	Eastern North Pacific Offshore/ Transient	102	7	0	280	41	0	280	41	0
	Hawaiian	91	1	0	170	12	0	170	12	0
Kogia spp.	CA/OR/WA	441	2,640	7	714	12,224	32	714	12,224	32
Long-beaked common dolphin	CA/OR/WA	25,165	1,723	0	63,744	9,304	0	63,744	9,304	0
Longman's beaked whale	Hawaiian	1,133	2	0	3,651	15	0	3,651	15	0
Melon-headed whale	Hawaiian	437	16	0	1,427	84	0	1,427	84	0
Mesoplodon beaked whales*	CA/OR/WA	626	4	0	1,965	29	0	1,965	29	0
Northern right whale dolphin	CA/OR/WA	16,840	1,280	0	45,247	6,331	0	45,247	6,331	0
Pacific white-sided dolphin	CA/OR/WA	10,514	883	0	33,193	5,227	0	33,193	5,227	0
Pantropical spotted dolphin	Hawaiian	3,153	131	0	10,168	719	0	10,168	719	0
Pygmy killer whale	Hawaiian	160	6	0	530	41	0	530	41	0
Pygmy sperm whale	Hawaiian	2	39	0	6	223	0	6	223	0
Risso's dolphin	CA/OR/WA	24,833	2,034	0	74,787	11,632	0	74,787	11,632	0
	Hawaiian	349	13	0	1,008	77	0	1,008	77	0
Rough-toothed dolphin	Hawaiian	1,714	83	0	4,761	370	0	4,761	370	0
Short-beaked common dolphin	CA/OR/WA	273,387	25,446	0	855,395	143,493	0	855,395	143,493	0
Short-finned pilot whale	CA/OR/WA	83	5	0	277	31	0	277	31	0
	Hawaiian	3,012	118	0	8,597	553	0	8,597	553	0
Spinner dolphin	Hawaiian Stock Complex	818	33	0	2,404	172	0	2,404	172	0
Striped dolphin	CA/OR/WA	887	49	0	3,242	303	0	3,242	303	0
	Hawaiian	1,029	45	0	3,285	213	0	3,285	213	0
Southern sea otter	California Stock	0	0	0	0	0	0	0	0	0
California sea lion	U.S. Stock	36,763	58	0	126,130	540	0	126,130	540	0
Northern fur seal	San Miguel Island	6,950	7	0	20,039	42	0	20,039	42	0
Harbor seal	California	901	575	1	3,000	2,878	10	3,000	2,878	10
Northern elephant seal	California Breeding	4,309	1,737	1	13,315	9,152	17	13,315	9,152	17

Table 3.4-19 Predicted Impacts from Annual Testing Use of Sonar and Other Active Acoustic Sources

Species	Stock	No Action Alternative			Alternative 1			Alternative 2		
		Behavioral	TTS	PTS	Behavioral	TTS	PTS	Behavioral	TTS	PTS
Blue whale	Eastern North Pacific	31	55	0	113	278	0	119	293	0
	Central North Pacific	0	0	0	4	9	0	5	10	0
Fin whale	CA/OR/WA	12	17	0	45	130	0	50	152	0
	Hawaiian	0	0	0	5	13	0	6	17	0
Humpback whale	CA/OR/WA	7	11	0	29	65	0	31	70	0
	Central North Pacific	19	37	0	228	544	0	241	579	0
Sei whale	Eastern North Pacific	1	3	0	5	14	0	6	15	0
	Hawaiian	1	1	0	9	18	0	10	20	0
Sperm whale	CA/OR/WA	16	12	0	73	61	0	78	68	0
	Hawaiian	5	3	0	52	0	0	61	56	0
Guadalupe fur seal	Mexico	40	0	0	250	0	0	269	0	0
Hawaiian monk seal	Hawaiian	28	60	0	147	151	0	178	180	0
Bryde's whale	Eastern Tropical Pacific	0	0	0	1	4	0	1	4	0
	Hawaiian	0	1	0	3	9	0	3	10	0
Gray whale	Eastern North Pacific	107	886	0	392	1,973	0	415	2,144	0
	Western North Pacific	0	1	0	0	2	0	0	2	0
Minke whale	CA/OR/WA	2	5	0	11	34	0	12	37	0
	Hawaiian	0	0	0	8	19	0	9	21	0
Baird's beaked whale	CA/OR/WA	392	18	0	896	66	0	970	75	0
Blainville's beaked whale	Hawaiian	96	6	0	829	50	0	901	59	0
Bottlenose dolphin	CA/OR/WA Offshore	150	294	0	1,349	888	0	1,426	974	0
	California Inshore	3	618	0	9	679	0	11	758	0
	Hawaii Stock Complex	16	2	0	187	129	0	200	135	0
Cuvier's beaked whale	CA/OR/WA	857	25	0	2,000	133	0	2,166	153	0
	Hawaiian	467	11	0	3,969	234	0	4,283	266	0
Dwarf sperm whale	Hawaiian	6	159	1	52	2,069	16	57	2,297	18
Dall's porpoise	CA/OR/WA	17	1,287	9	76	4,723	22	81	5,115	25
False killer whale	Hawaii Pelagic	0	0	0	2	2	0	2	2	0
	Main Hawaiian Islands Insular	2	1	0	20	15	0	22	15	0
	Northwestern Hawaiian Islands	1	0	0	8	6	0	8	6	0
Fraser's dolphin	Hawaiian	1	0	0	37	3	0	40	4	0

Table 3.4-19: Predicted Impacts from Annual Testing use of Sonar and Other Active Acoustic Sources (continued)

Species	Stock	No Action Alternative			Alternative 1			Alternative 2		
		Behavioral	TTS	PTS	Behavioral	TTS	PTS	Behavioral	TTS	PTS
Killer whale	Eastern North Pacific Offshore/ Transient	3	4	0	25	23	0	27	26	0
	Hawaiian	0	0	0	7	5	0	8	6	0
Kogia spp.	CA/OR/WA	3	326	0	25	1,116	3	26	1,203	4
Long-beaked common dolphin	CA/OR/WA	2,902	709	0	45,244	1,859	0	45,837	1,997	0
Longman's beaked whale	Hawaiian	46	6	0	365	34	0	397	39	0
Melon-headed whale	Hawaiian	6	4	0	60	49	0	67	57	0
Mesoplodon beaked whales*	CA/OR/WA	128	3	0	298	19	0	323	22	0
Northern right whale dolphin	CA/OR/WA	433	438	0	3,136	2,210	0	3,333	2,382	0
Pacific white-sided dolphin	CA/OR/WA	347	713	0	2,090	2,308	0	2,238	2,677	0
Pantropical spotted dolphin	Hawaiian	32	10	0	394	241	0	418	264	0
Pygmy killer whale	Hawaiian	3	6	0	23	29	0	25	36	0
Pygmy sperm whale	Hawaiian	0	3	0	0	85	1	0	117	1
Risso's dolphin	CA/OR/WA	726	1,648	0	4,302	3,820	0	4,577	4,143	0
	Hawaiian	4	5	0	56	42	0	64	49	0
Rough-toothed dolphin	Hawaiian	18	10	0	213	169	0	226	182	0
Short-beaked common dolphin	CA/OR/WA	9,097	23,486	0	58,653	54,131	0	62,911	59,495	0
Short-finned pilot whale	CA/OR/WA	3	4	0	23	40	0	26	53	0
	Hawaiian	34	9	0	402	345	0	426	368	0
Spinner dolphin	Hawaiian Stock Complex	7	1	0	99	58	0	105	61	0
Striped dolphin	CA/OR/WA	16	12	0	174	549	0	204	794	0
	Hawaiian	10	5	0	143	96	0	157	111	0
Southern sea otter	California Stock	0	0	0	0	0	0	0	0	0
California sea lion	U.S. Stock	2,998	33	0	11,968	48	0	12,958	52	0
Northern fur seal	San Miguel Island	104	0	0	1,040	0	0	1,086	0	0
Harbor seal	California	66	178	2	291	517	3	321	566	3
Northern elephant seal	California Breeding	269	216	0	1,141	1,336	1	1,236	1,457	2

For shorter term exposures or those from distant sources, animals may stop vocalizing, break off feeding dives, or alternatively, ignore the acoustic stimulus, especially if it is located more than a few kilometers away (see Section 3.4.3.1.2.6, Behavioral Reactions, for discussion of research and observations on the behavioral reactions of marine mammals to sonar and other active acoustic sources).

In the ocean, the use of sonar and other active acoustic sources is transient and is unlikely to repeatedly expose the same population of animals over a short period. Around heavily trafficked Navy ports and on fixed ranges, the possibility is greater for animals that are resident during all or part of the year to be exposed multiple times to sonar and other active acoustic sources. A few behavioral reactions per year, even from a single individual, are unlikely to produce long-term consequences for that individual or the population. Furthermore, mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce the predicted impacts since not all mitigations are accounted for in the adjustments to the acoustic effects modeling numbers.

Mysticetes

Predicted acoustic effects to mysticetes from training activities under the No Action Alternative from sonar and other active sound sources are primarily (approximately 99 percent) from anti-submarine warfare events involving surface ships and hull mounted sonar. As discussed in Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources), ranges to TTS for hull mounted sonar (e.g., sonar bin MF1; SQS-53 anti-submarine warfare hull-mounted sonar) can be on the order of several thousand yards (kilometers); see Section 3.4.3.2.1.1 (Range to Effects) and Table 3.4-12 for details. If there was no background noise (such as that from vessel traffic, breaking waves, or other vocalizing marine mammals) masking the active ping occurring approximately every 50 seconds, the ping could reach and possibly be heard underwater at distances exceeding approximately 54 mi. (100 km), although significant behavioral effects are much more likely at higher received levels within a few kilometers of the sound source. The low received level (approximately 120 dB SPL) from the sonar at a distance exceeding approximately 54 mi. (100 km) is modeled as having some behavioral effects although masking by other ambient sounds, such as chorusing humpback whales when present in Hawaii (see Au et al. 2000) or other potential biological sources in Southern California (see D'Spain and Batchelor 2006), make reaction to the sound from sonar and other active sound sources by mysticetes at that distance less likely. All other activities including submarine under ice certification and mine hunting (mine countermeasures-ship sonar and airborne mine countermeasure - mine detection) use high-frequency systems that are not within mysticetes' ideal hearing range (see Section 3.4.2.3, Vocalization and Hearing of Marine Mammals, for information on low-frequency cetaceans [i.e., mysticetes] hearing abilities), and therefore predicted numbers of impacts are low. It is unlikely that any of the acoustic stressors within these events would cause a significant behavioral reaction to a mysticete.

Approximately 63 percent of the predicted acoustic effects to mysticetes from training activities using sonar and other active acoustic sources under the No Action Alternative are predicted within the SOCAL Range Complex and 37 percent in the HRC.

Research and observations show that if mysticetes are exposed to sonar or other active acoustic sources they may react in a number of ways depending on the characteristics of the sound source, their experience with the sound source, and whether they are migrating or on seasonal grounds (i.e., breeding or feeding). Reactions may include alerting; breaking off feeding dives and surfacing; diving or swimming away; or no response at all. Additionally, migrating mysticetes (such as gray and humpback whales moving through the SOCAL range complex) may divert around sound sources that are located within their path or may ignore a sound source depending on the context of the exposure.

Animals that do experience TTS may have reduced ability to detect relevant sounds such as predators, prey, or social vocalizations until their hearing recovers and is therefore as a condition potentially affecting an animal's behavior. Recovery from a threshold shift (i.e., TTS; temporary partial hearing loss) can take a few minutes to a few days depending on the severity of the initial shift. Threshold shifts do not necessarily affect all hearing frequencies equally, so some threshold shifts may not interfere with an animal's ability to hear biologically relevant sounds. For exposures resulting in TTS, long-term consequences for individuals or populations would not be expected.

The acoustic modeling and post-modeling analyses predict there would be no non-impulse sound exposure to mysticetes resulting in PTS.

Blue Whales (Endangered Species Act-Listed)

Blue whales may be exposed to sonar or other active acoustic stressors associated with training activities throughout the year. Acoustic modeling predicts that in SOCAL, Eastern North Pacific stock blue whales could be exposed to sound that may result in 534 TTS and 609 behavioral reactions per year and in Hawaii, Central North Pacific stock blue whales could be exposed to sound that may result in 29 TTS and 19 behavioral reactions per year. For both stocks and as presented above for mysticetes in general, long-term consequences for individuals or populations would not be expected.

Humpback Whales (Endangered Species Act-Listed)

Humpback whales may be exposed to sonar or other active acoustic stressors associated with training activities throughout the year. Since humpback whale migrate to the north in the summer, impacts are predicted only for the cool season in the Study Area. In the SOCAL Range Complex involving the California, Oregon, Washington stock of humpback whale, acoustic modeling predicts exposure to sound that may result in 141 TTS and 154 behavioral reactions per year. In the HRC involving the Central North Pacific stock of humpback, acoustic modeling predicts exposure to sound that may result in 1,344 TTS and 919 behavioral reactions per year. For both stocks and as presented above for mysticetes in general, long-term consequences for individuals or populations would not be expected.

Sei Whales (Endangered Species Act-Listed)

Sei whales may be exposed to sonar or other active acoustic stressors associated with training activities throughout the year. Acoustic modeling predicts that SOCAL, Eastern North Pacific stock sei whales could be exposed to sound that may result in 19 TTS and 22 behavioral reactions per year. The Hawaiian stock sei whales could be exposed to sound that may result in 54 TTS and 58 behavioral reactions per year. Recent sei whale sightings in Hawaii have included sub-adult animals. It is unlikely that the types of impacts predicted by acoustic modeling would have any greater impact on sub-adult individuals. For both stocks and as presented above for mysticetes in general, long-term consequences for individuals or populations would not be expected.

Fin Whales (Endangered Species Act-Listed)

Fin whales may be exposed to sonar or other active acoustic stressors associated with training activities throughout the year. In the SOCAL Range Complex involving the California, Oregon, Washington stock of fin whale, acoustic modeling predicts exposure to sound that may result in 186 TTS and 192 behavioral reactions per year. In the HRC involving the Central North Pacific stock of fin whale, acoustic modeling predicts exposure to sound that may result in 28 TTS and 20 behavioral reactions per year. For both stocks and as presented above for mysticetes in general, long-term consequences for individuals or populations would not be expected.

Gray Whales, Eastern North Pacific Stock and Endangered Species Act-Listed Western North Pacific Stock

Gray whales may be exposed to sonar or other active acoustic stressors during the cool seasons when and if their presence coincides with training activities in the Study Area. In SOCAL (there are no gray whales present in Hawaii), acoustic modeling predicts that the Eastern North Pacific gray whale could be exposed to sound that may result in 1,204 TTS and 936 behavioral reactions per year. The Western North Pacific stock of gray whale could be exposed to sound that may result in one TTS and one behavioral reaction per year. As presented above for mysticetes in general, for both stocks and individuals within these stocks, long-term consequences would not be expected.

Other Mysticetes (Bryde's and Minke Whales)

Bryde's and minke whales may be exposed to sonar or other active acoustic stressors associated with training activities during the cool seasons when potentially present in the Study Area. For Bryde's whales in the SOCAL Range Complex involving the Eastern Tropical Pacific stock, acoustic modeling predicts exposure to sound that may result in 15 TTS and 12 behavioral reactions per year. In the HRC involving the Hawaiian stock of Bryde’s whale, acoustic modeling predicts exposure to sound that may result in 18 TTS and 17 behavioral reactions per year. For minke whale in the SOCAL Range Complex involving the California, Oregon, Washington stock, acoustic modeling predicts exposure to sound that may result in 45 TTS and 50 behavioral reactions per year. In the HRC involving the Hawaiian stock of minke whale, acoustic modeling predicts exposure to sound that may result in 54 TTS and 44 behavioral reactions per year. As presented above for mysticetes in general, for both species, stocks, and individuals within these stocks, long-term consequences would not be expected.

Odontocetes

Predicted impacts to odontocetes from training activities under the No Action Alternative from sonar and other active acoustic sources are about 98 percent from anti-submarine warfare events involving surface ships and hull mounted sonar. As discussed in Section 3.4.3.2.1.1 (Range to Effects), for mid-frequency odontocetes (cetaceans constituting the majority of marine mammals present), ranges to TTS for hull mounted sonar (e.g., sonar bin MF1; SQS-53 anti-submarine warfare hull-mounted sonar) is within a maximum of approximately 200 yd. (200 m) for a single ping. For high-frequency cetaceans (i.e., Dall’s porpoises and dwarf and pygmy sperm whales), ranges to TTS for multiple pings can stretch to distances of over 5 mi. (10 km). If there was no background noise (such as that from vessel traffic, breaking waves, or other vocalizing marine mammals) masking the active ping occurring approximately every 50 seconds, the most powerful surface ship hull mounted sonar could, under rather optimal conditions, reach and possibly be heard underwater at distances exceeding approximately 107 mi. (170 km). The low received level (approximately 120 dB SPL) at that distance is modeled as having some behavioral effects possible, although significant behavioral effects are much more likely at higher received levels within a few kilometers of the sound source. Modeling predicts behavioral effects at long distance and low received levels but does not take into account background ambient noise levels or other competing biological sounds, which may mask sound from distant Navy sources. D’Spain and Batchelor (2006) measured a source spectral density of 105–120 dB re 1 µPa2 /Hz at 1 m (in the mid-frequency range) and calculated an estimated source level of 135–150 dB re 1 µPa at 1 m from various biologics (fish and marine mammals) contributing to those underwater ambient sound levels recorded to the southeast of San Clemente Island.

Activities involving anti-submarine warfare training often involve multiple participants and activities associated with the event. More sensitive species of odontocetes such as beaked whales, Dall's porpoises, and dwarf and pygmy sperm whales may avoid the area for the duration of the event (see Section 3.4.3.1.2.6, Behavioral Reactions, for a discussion of these species observed reactions sonar and other active acoustic sources). After the event ends, displaced animals would likely return to the area within a few days as seen in the Bahamas study with Blainville's beaked whales (Tyack et al. 2011). This would allow the animal to recover from any energy expenditure or missed resources, reducing the likelihood of long-term consequences for the individual or population.

Activities including Tracking Exercises/Torpedo Exercises by submarines and aircraft are responsible for the remaining majority (approximately 2 percent) of the total predicted acoustic effects to odontocetes from the use of sonar and other active acoustic sources. It is unlikely that any of the acoustic stressors within these events would cause significant behavioral reactions in odontocetes because the few predicted impacts are spread out in time and space. Long-term consequences for individuals or populations would not be expected.

Animals that do experience TTS may have reduced ability to detect relevant sounds such as predators, prey, or social vocalizations until their hearing recovers. Recovery from a threshold shift (i.e., TTS; temporary partial hearing loss) can take a few minutes to a few days depending on the severity of the initial shift. Threshold shifts do not necessarily affect all hearing frequencies equally, so some threshold shifts may not interfere with an animal's ability to hear biologically relevant sounds. For exposures resulting in TTS, long-term consequences for individuals or populations would not be expected.

For PTS, it is uncertain whether some permanent hearing loss over a part of a marine mammal's hearing range would have long-term consequences for that individual, given that natural hearing loss occurs in marine mammals as a result of disease, parasitic infestations, and age-related impairment (Ketten 2012). Furthermore, likely avoidance of intense activity and sound coupled with mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce the potential for PTS exposures to occur. Considering these factors, long-term consequences for individuals or populations would not be expected.

Sperm Whales (Endangered Species Act-Listed)

Sperm whales (classified as mid-frequency cetaceans [see Section 3.4.2.3.2, Mid-Frequency Cetaceans]) may be exposed to sonar or other active acoustic stressors associated with training activities throughout the year. For sperm whale in the SOCAL Range Complex involving the California, Oregon, Washington stock, acoustic modeling predicts exposure to sound that may result in 19 TTS and 566 behavioral reactions per year. In the HRC involving the Hawaiian stock of sperm whale, acoustic modeling predicts exposure to sound that may result in 5 TTS and 429 behavioral reactions per year.

Research and observations (see Section 3.4.3.1.2.6, Behavioral Reactions) show that if sperm whales are exposed to sonar or other active acoustic sources they may react in a number of ways depending on their experience with the sound source and what activity they are engaged in at the time of the acoustic exposure. Sperm whales have shown resilience to acoustic and human disturbance, although they may react to sound sources and activities within a few kilometers. Sperm whales that are exposed to activities that involve the use of sonar and other active acoustic sources may alert, ignore the stimulus, avoid the area by swimming away or diving, or display aggressive behavior. As presented above for odontocetes in general, long-term consequences for sperm whale individuals or populations would not be expected.

False Killer Whale, Hawaii Pelagic Stock, Northwestern Hawaiian Islands Stock, and Main Hawaiian Islands Insular Stock (the latter Endangered Species Act-Listed)

False killer whales may be exposed to sonar or other active acoustic stressors associated with training activities throughout the year in the HRC portion of the Study Area; they are not expected to be present within the SOCAL Range Complex. There are three stocks of false killer whale recognized by in Hawaiian waters (see Section 3.4.2.16.1, False Killer Whale, Status and Management). As noted previously, NMFS considers all false killer whales found within 40 km of the main Hawaiian Islands part of the Main Hawaiian Islands insular stock false killer whales and those beyond 140 km as belonging to the Hawaii pelagic stock. The animals belonging to the Northwestern Hawaiian Islands stock are insular to the Northwestern Hawaii Islands but have also observed off Kauai (Bradford et al. 2012; National Oceanic and Atmospheric Administration 2012). Within the main Hawaiian Islands, the area of 100 km overlap between the stocks is approximately where the majority of Navy training has historically occurred and where the majority of acoustic modeling was therefore focused. This overlap precludes analysis of differential impact between the stocks based on spatial criteria and therefore ratios for each stock were derived (based on their abundance) to prorate the total modeled exposures in order to quantify acoustic exposures for each of the three stocks.

For the Hawaii pelagic stock of false killer whale, acoustic modeling predicts exposure to sound that may result in 7 TTS and 162 behavioral reactions per year. For the Northwestern Hawaiian Islands stock of false killer whale, acoustic modeling predicts exposure to sound that may result in 3 TTS and 60 behavioral reactions per year. For the Main Hawaiian Islands insular stock (which is proposed for listing under ESA), acoustic modeling predicts exposure to sound that may result in 1 TTS and 17 behavioral reactions per year. For these stocks of false killer whale, and individuals within these stocks, long-term consequences would not be expected.

Beaked Whales

Beaked whales may be exposed to sonar or other active acoustic stressors associated with training activities throughout the year. Acoustic modeling predicts that the various species of beaked whales (see Table 3.4-1) could be exposed to sound that may result in 82 TTS and 26,402 behavioral reactions. Beaked whale species are separated into two stocks within the Study Area: the California, Oregon, Washington stocks and the Hawaiian stocks. Predicted effects to beaked whales within the SOCAL Range Complex (Baird’s, Cuvier’s, and *Mesoplodon* spp. beaked whales) are predicted to impact the California, Oregon, Washington stocks and effects predicted for HRC would impact the Hawaiian stocks (Blainville’s, Cuvier’s, and Longman’s beaked whales).

Research and observations (see Section 3.4.3.1.2.6, Behavioral Reactions) show that if beaked whales are exposed to sonar or other active acoustic sources they may startle, break off feeding dives, and avoid the area of the sound source to levels of 157 dB re 1 µPa, or below (McCarthy et al. 2011). Furthermore, in research done at the Navy's instrumented tracking range in the Bahamas, animals leave the immediate area of the anti-submarine warfare training exercise, but return within a few days after the event ends. Significant behavioral reactions seem likely in most cases if beaked whales are exposed to anti-submarine sonar within a few tens of kilometers (see Section 3.4.3.2.1, Impacts from Sonar and Other Active Acoustic Sources), especially for prolonged periods (a few hours or more) since research indicates beaked whales have been shown to will leave an area where anthropogenic sound is present (Tyack et al. 2011). At the Bahamas range and at Navy instrumented ranges in the Study Area that have been operating for decades (in Hawaii north of Kauai and in SOCAL west of San Clemente Island), populations of beaked whales continue to inhabit those intensively used ranges. Photographic evidence indicating re-sightings of individual beaked whales (from two species: Cuvier’s and Blainville’s beaked whales) suggesting long-term site fidelity to the area west of the Island of Hawaii (McSweeney et al. 2007) is a channel used for years to conduct anti-submarine warfare training during the Rim of the Pacific exercise and the Under Sea Warfare exercise (Major Exercises involving multiple vessels and aircraft). In Southern California to the west of San Clemente Island, surveys encountered a high number Cuvier's beaked whales, leading Falcone et al. (2009) to suggest the area may be an important region for this species. For over three decades, this ocean area has been the location of the Navy's instrumented training range and is one of the most intensively used training and testing areas in the Pacific, given its proximity to the Naval installations in San Diego.

Based on the best available science, the Navy believes that beaked whales that exhibit a significant behavioral reaction due to sonar and other active acoustic training activities would generally not have long-term consequences for individuals or populations. However, because of a lack of scientific consensus regarding the causal link between sonar and stranding events, NMFS has stated in a letter to the Navy dated October 2006 that it "cannot conclude with certainty the degree to which mitigation measures would eliminate or reduce the potential for serious injury or mortality."

Therefore, the Navy is requesting two (2) serious injury or mortality takes for beaked whale species per year. This approach overestimates the potential effects to marine mammals associated with Navy sonar training in the Study Area, as no mortality or serious injury of any species is anticipated. This request will be made even though almost 40 years of conducting similar exercises in the Study Area without observed incident indicates that injury, strandings, and mortality are not expected to occur as a result of Navy activities.

Neither NMFS nor the Navy anticipates that marine mammal strandings or mortality will result from the operation of sonar or other acoustic sources during Navy exercises within the Study Area. Additionally, through the MMPA process (which allows for adaptive management), NMFS and the Navy will determine the appropriate way to proceed in the event that a causal relationship were to be found between Navy activities and a future stranding involving beaked whale or other marine mammal species.

Costs and long-term consequences to the individual and population as a result of a beaked whale receiving a PTS or TTS is the same as presented above in the general discussion for odontocetes. Population level consequences are not expected.

Pygmy and Dwarf Sperm Whales (*Kogia* spp.)

Pygmy and dwarf sperm whales (genus: *Kogia*) (classified as high-frequency cetaceans [see Section 3.4.2.3.1, High-Frequency Cetaceans]) may be exposed to sonar or other active acoustic stressors associated with training activities throughout the year. In SOCAL the two *Kogia* species are managed as a single California, Oregon, Washington stock and management unit. Acoustic modeling predicts that *Kogia* spp. in SOCAL could be exposed to sound that may result in 7 PTS, 2,640 TTS, and 441 behavioral reactions. In Hawaii, NMFS manages *Kogia* as separate species and stocks. Within the HRC acoustic modeling predicts that Hawaiian stock pygmy sperm whale could be exposed to sound that may result in 39 TTS, and 2 behavioral reactions and Hawaiian stock dwarf sperm whale could be exposed to sound that may result in 10 PTS, 5,420 TTS, and 300 behavioral reactions.

Research and observations (see Section 3.4.3.1.2.6, Behavioral Reactions) on *Kogia* species are limited. However, these species tend to avoid human activity and presumably anthropogenic sounds. Pygmy and dwarf sperm whales may startle and leave the immediate area of the anti-submarine warfare training exercise. Significant behavioral reactions seem more likely than with most other odontocetes, however it is unlikely that animals would receive multiple exposures over a short time period allowing animals time to recover lost resources (e.g., food) or opportunities (e.g., mating). Therefore, long-term consequences for individual *Kogia* or their respective populations are not expected.

Costs and long-term consequences to the individual and population as a result of a *Kogia* receiving a PTS or TTS exposure is the same as presented above in the general discussion for odontocetes. Population level consequences are not expected.

Dall's Porpoise

Dall's porpoise (classified as high-frequency cetaceans [see Section 3.4.2.3.1, High-Frequency Cetaceans]) are present only in the SOCAL Range Complex portion of the Study Area and are part of the California, Oregon, Washington stock. Dall's porpoise may be exposed to sonar or other active acoustic stressors associated with training activities throughout the year. Acoustic modeling predicts that Dall's porpoise could be exposed to sound that may result in 18 PTS, 7,642 TTS and 971 behavioral reactions. Costs and long-term consequences to the individual and population as a result of a Dall's porpoise receiving a PTS or TTS is the same as presented above in the general discussion for odontocetes. Population level consequences are not expected.

Dolphins and Small Whales (Delphinids)

Delphinids (classified as mid-frequency cetaceans [see Section 3.4.2.3.2, Mid-Frequency Cetaceans]) may be exposed to sonar or other active acoustic stressors associated with training activities throughout the year. Species included as delphinids for purposes of this discussion include the following: bottlenose dolphin, Fraser's dolphin, killer whale, long-beaked common dolphin, melon-headed whale, northern right whale dolphin, Pacific white-sided dolphin' pantropical spotted dolphin, pygmy killer whale, Risso's dolphin, rough toothed dolphin, short-beaked common dolphin, short-finned pilot whale, spinner dolphin, and striped dolphin. Acoustic modeling predicts that delphinids (see Table 3.4-1) could be exposed to sound that may result in 32,409 TTS and 369,426 behavioral reactions. The majority of these exposures (25,446 TTS and 237,387 behavioral reactions) are attributed to short-beaked common dolphins as a result of their high density within the SOCAL Range Complex portion of the Study Area. The acoustic modeling and post-modeling analyses predict there would be no exposure to delphinids from sonar and other active acoustic sources resulting in PTS, due to the short range from the source required for PTS to occur (see discussion in Section 3.4.3.2.1.1, Range to Effects).

Research and observations (see Section 3.4.3.1.2.6, Behavioral Reactions) show that if delphinids are exposed to sonar or other active acoustic sources they may react in a number of ways depending on their experience with the sound source and what activity they are engaged in at the time of the acoustic exposure. Delphinids may not react at all until the sound source is approaching within a few hundred meters to within a few kilometers depending on the environmental conditions and species. Delphinids that are exposed to activities that involve the use of sonar and other active acoustic sources may alert, ignore the stimulus, change their behaviors or vocalizations, avoid the sound source by swimming away or diving, or be attracted to the sound source. Long-term consequences to individual delphinids or populations are not likely due to exposure to sonar or other active acoustic sources.

Costs and long-term consequences to the individual and population as a result of delphinids receiving an exposure resulting in PTS or TTS are the same as presented above in the general discussion for odontocetes. Population level consequences are not expected.

Pinniped

Research and observations (see Section 3.4.3.1.2.6, Behavioral Reactions) show that pinnipeds in the water are tolerant of anthropogenic noise and activity. If seals are exposed to sonar or other active acoustic sources they may react in a number of ways depending on their experience with the sound source and what activity they are engaged in at the time of the acoustic exposure. Seals may not react at all until the sound source is approaching within a few hundred meters and then may alert, ignore the stimulus, change their behaviors, or avoid the immediate area by swimming away or diving. Significant behavioral reactions would not be expected in most cases and long-term consequences for individuals or pinniped populations are unlikely.

Recovery from a hearing threshold shift (i.e., TTS; temporary partial hearing loss) can take a few minutes to a few days depending on the severity of the initial shift. More severe shifts may not fully recover and thus would be considered PTS. Threshold shifts do not necessarily affect all hearing frequencies equally, so threshold shifts may not necessarily interfere with an animal's ability to hear biologically relevant sounds. As discussed previously in this section, it is uncertain whether some permanent hearing loss over a part of a marine mammal's hearing range would have long-term consequences for that individual given that natural hearing loss occurs in marine mammals as a result of disease, parasitic infestations, and age-related impairment (Ketten 2012).

Phocids (Harbor Seal, Northern Elephant Seal, and Hawaiian Monk Seal)

Harbor seal and northern elephant seal are the species of phocid pinnipeds expected within the SOCAL Range Complex portion of the Study Area. Harbor seal are part of the California Stock and northern elephant seal are the California breeding stock. Hawaiian monk seal are present in Hawaii and considered the Hawaiian stock. Phocids may be exposed to sonar or other active acoustic stressors associated with training activities throughout the year.

Predicted effects to phocids from annual training activities under the No Action Alternative are in the majority (approximately 98 percent) from anti-submarine warfare events involving surface ships, submarines, and hull mounted sonar. Remaining predicted effects to seals from this stressor are from mine countermeasure events (less than 2 percent). As discussed in Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources) ranges to TTS for hull mounted sonar (e.g., sonar bin MF1; SQS-53) can be on the order of a several kilometers for phocid seals (see discussion in Section 3.4.3.2.1.1, Range to Effects). Some behavioral effects could hypothetically take place at distances exceeding 54 mi. (100 km), although significant behavioral effects are much more likely at higher received levels within a few kilometers of the sound source. For behavioral exposures, long-term consequences would not be expected. Costs and long-term consequences to the individual and population as a result of a phocid receiving a PTS or TTS is the same as presented above under the general discussion for pinniped. Population level consequences are not expected.

Acoustic modeling predicts phocids in SOCAL could be exposed to sound that may result in 2 PTS, 2,312 TTS, and 5,210 behavioral reactions. Modeling predicts 1 PTS exposure to harbor seal and 1 PTS exposure to northern elephant seal. The majority of all exposures (80 percent) are attributed to northern elephant seal and the remainder (20 percent) are attributed to harbor seal.

Hawaiian Monk Seal (Endangered Species Act-Listed)

Acoustic modeling predicts that the Hawaiian stock of Hawaiian monk seal could be exposed to sound from sonar and other active acoustic sources that may result in 48 TTS and 254 behavioral reactions. As discussed in Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources) ranges to TTS for hull mounted sonar (e.g., Sonar bin MF1; SQS-53) can be on the order of a several kilometers for monk seal, and some behavioral impacts could take place at distances exceeding 100 km, although significant behavioral effects are much more likely at higher received levels within a few kilometers of the sound source. Significant behavioral reactions would not be expected and long-term consequences for individuals or populations are unlikely. The costs and long-term consequences as a result of TTS or PTS are the same as presented above for pinniped in general and would apply similarly to Hawaiian monk seal. Population level consequences are not expected. Activities involving sound or energy from sonar and other active acoustic sources will not occur on shore in designated Hawaiian monk seal critical habitat where haul-out and resting behavior occurs and would have no effect on critical habitat at sea.

Otariids (Sea Lion and Fur Seal)

California sea lion, Guadalupe fur seal, and northern fur seal comprise the otariid species of pinniped, which are present only in the SOCAL portion of the Study Area. The Guadalupe fur seal is listed as threatened under the ESA. Otariids may be exposed to sonar or other active acoustic stressors associated with training activities throughout the year. Acoustic modeling predicts otariids in SOCAL could be exposed to sound that may result in 65 TTS and 44,479 behavioral reactions. The majority of the TTS exposures (approximately 89 percent) and behavioral reactions (approximately 83 percent) are attributed to the California Stock of California sea lion and the remainder TTS (11 percent) and most of behavioral reactions (16 percent) are attributed to northern fur seal.

For behavioral exposures otariids in SOCAL, long-term consequences would not be expected. Costs and long-term consequences to the individual and population as a result of an otariid receiving a TTS exposure is the same as presented above under the general discussion for pinniped. Population level consequences are not expected.

Guadalupe Fur Seal (Endangered Species Act-Listed as Threatened)

Acoustic modeling predicts that the Mexico stock of Guadalupe fur seal could be exposed to sound from sonar and other active acoustic sources that may result in 766 behavioral reactions. As discussed in Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources) ranges to some behavioral impacts could take place at distances exceeding 100 km, although significant behavioral effects are much more likely at higher received levels within a few kilometers of the sound source. Significant behavioral reactions would not be expected and long-term consequences for individuals or populations are unlikely. Critical habitat has not been designated Guadalupe fur seal.

Mustelid (Southern Sea Otter, Translocated Colony)

The sea otter present in the Study Area (at San Nicolas Island; see Section 3.4.2.47.1, Sea Otter, Status and Management) are part of a translocated colony managed by the U.S. Fish and Wildlife Service. Currently, the California stock of southern sea otter are not expected to be present in the Study Area since their range does not extend south of Santa Barbara County (this county line is approximately 78 mi. [126 km]) north of the Study Area’s northern edge in SOCAL).

Because it is unlikely that a sea otter would be in waters where depths exceed 35 m (115 ft.), it is extremely unlikely that sea otters would be present in proximity to most Navy training or testing events taking place in the water. Acoustic modeling for southern sea otter at San Nicolas Island was not undertaken given they are far from where activities involving sonar and other active acoustic sources are proposed to occur, they inhabit complex shallow water environments where acoustic modeling is very imprecise and therefore not representative, and they spend little time underwater thus very much limiting the potential for exposure in any case. Research indicates sea otters often remained undisturbed, quickly become tolerant of the various sounds, and even when purposefully harassed, they generally moved only a short distance (100 to 200 m) before resuming normal activity. Given these factors, long-term consequences for individuals or the population would not be expected.

Conclusion

Training activities under the No Action Alternative include the use of sonar and other active acoustic sources as described in Table 2.8-1 and Section 3.0.5.3.1 (Acoustic Stressors). These activities may result in inadvertent takes of marine mammals in the Study Area.

Pursuant to the MMPA, the use of sonar and other acoustic sources during training activities under the No Action Alternative:

- *May expose marine mammals up to 507,933 times annually to sound levels that would be considered Level B harassment, as defined by the MMPA*
- *May expose marine mammals up to 37 times annually to sound levels that would be considered Level A harassment, as defined by the MMPA*
- *May expose up to 2 beaked whales annually to sound levels that may elicit stranding and subsequent serious injury or mortality*

Pursuant to the ESA, the use of sonar and other acoustic sources during training activities as described in the No Action Alternative:

- *May affect, and is likely to adversely affect, the humpback whale, sei whale, fin whale, Western North Pacific gray whale, blue whale, sperm whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.1.5 No Action Alternative - Testing Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-2 through 2.8-5, and Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources), testing activities under the No Action Alternative include activities that produce in-water sound from the use of sonar and other active acoustic sources. Activities could occur throughout the Study Area but would be concentrated within 200 mi. (322 km) of San Diego in the SOCAL Range Complex and within 200 mi. (322 km) of the Hawaiian Islands in the HRC.

Table 3.4-19 provides a summary of the total estimated non-impulsive sound source exposures from Navy testing that would be conducted under the No Action Alternative over the course of a year; there are no non-annual events proposed. The acoustic modeling and post-modeling analyses predict 50,874[23] marine mammal exposures to non-impulsive sound resulting in Level B harassment and 12[24] exposures resulting in Level A as defined under the MMPA for military training activities.

Predicted acoustic effects to marine mammals from testing activities under the No Action Alternative from sonar and other active sound sources are primarily (approximately 98 percent) from Torpedo (Non-Explosive) Testing, and both Autonomous Underwater Vehicle and Fixed Anti-Terrorism/Force Protection Mine Countermeasures Underwater Communications and Ocean Meteorology and

[23] This is the combined summation of all non-TTS and TTS exposures (behavioral effects) for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the 12-month period).
[24] This is the combined summation of all PTS exposures for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the same 12-month period).

Oceanography involving a variety of sources. None of these events have exposures resulting from use of hull mounted sonar. As discussed in Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources), ranges to TTS for these sources can be on the order of several thousand yards (kilometers); see Section 3.4.3.2.1.1 (Range to Effects) and Table 3.4-12 for details. Although sound from sonar at a distance exceeding approximately 54 mi. (100 km) is modeled as having some behavioral effects, significant behavioral effects are much more likely at higher received levels within a few kilometers of the sound source.

Approximately 98 percent of the predicted acoustic effects to marine mammals from testing activities using sonar and other active acoustic sources under the No Action Alternative are predicted within the SOCAL Range Complex and 2 percent in the HRC. Within the SOCAL Range Complex, 84 percent of the all exposures are to four species consisting of Dall’s porpoise, long-beaked common dolphin, Risso’s dolphin, short-beaked common dolphin, and California sea lion. For Dall’s porpoise, this is a result of the relative low impact criteria compared to other species. For long-beaked common dolphin, Risso’s dolphin, short-beaked common dolphin, and California sea lion it is a result of these animals being the most numerous within the SOCAL Range Complex. In Hawaii, for the HRC, the majority of exposures (approximately 55 percent) are predicted for Cuvier’s beaked whale and dwarf sperm whale given their high densities and their low impact criteria relative to other species.

Mysticetes

Predicted acoustic effects to mysticetes from testing activities under the No Action Alternative from sonar and other active sound sources are follow the same pattern for all exposures in that the majority of exposures (approximately 92 percent) are from Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft, Torpedo (Non-Explosive) Testing, and both Autonomous Underwater Vehicle and Fixed Anti-Terrorism/Force Protection Mine Countermeasures Underwater Communications and Ocean Meteorology and Oceanography involving a variety of sources. Remaining predicted effects (less than 8 percent) to mysticetes from this stressor are from other sources and events. As discussed in Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources), ranges to TTS for other sources (e.g., sonar bin MF5; SSQ-62 DICASS sonobuoy) are less than 50 m, whereas some behavioral effects could take place at distances exceeding approximately 24 km, although significant behavioral effects are much more likely at higher received levels within a few kilometers of the sound source. All other activities including Autonomous Underwater Vehicle and Fixed Anti-Terrorism/Force Protection Mine Countermeasures Underwater Communications and Ocean Meteorology and Oceanography generally use high-frequency systems that are not within mysticetes' ideal hearing range (see Section 3.4.2.3, Vocalization and Hearing of Marine Mammals, for information on low-frequency cetaceans [i.e., mysticetes] hearing abilities), and therefore predicted numbers of impacts are low. It is unlikely that any of the acoustic stressors within these events would cause a significant behavioral reaction to a mysticete.

Approximately 95 percent of the predicted acoustic effects to mysticetes from testing activities using sonar and other active acoustic sources under the No Action Alternative are predicted within the SOCAL Range Complex and 5 percent in the HRC.

Research and observations show that if mysticetes are exposed to sonar or other active acoustic sources they may react in a number of ways depending on the characteristics of the sound source, their experience with the sound source, and whether they are migrating or on seasonal grounds (i.e., breeding or feeding). Reactions may include changes in vocalization; alerting; breaking off feeding dives and surfacing; diving or swimming away; or no response at all. Additionally, migrating mysticetes (such as gray and humpback whales moving through the SOCAL range complex) may divert around sound sources that are located within their path or may ignore a sound source depending on the context of the exposure.

Animals that do experience TTS may have reduced ability to detect relevant sounds such as predators, prey, or social vocalizations until their hearing recovers. Recovery from a threshold shift (i.e., TTS; temporary partial hearing loss) can take a few minutes to a few days depending on the severity of the initial shift. Threshold shifts do not necessarily affect all hearing frequencies equally, so some threshold shifts may not interfere with an animal's ability to hear biologically relevant sounds. For exposures resulting in TTS, long-term consequences for individuals or populations would not be expected.

For PTS, it is uncertain whether some permanent hearing loss over a part of a marine mammal's hearing range would have long-term consequences for that individual, given that many mammals lose hearing ability as they age. Furthermore, mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce the predicted impacts since not all mitigations are accounted for in adjustments to the modeling. Considering these factors, long-term consequences for individuals or populations would not be expected.

Blue Whales (Endangered Species Act-Listed)

Blue whales may be exposed to sonar or other active acoustic stressors associated with testing activities throughout the year. Acoustic modeling predicts that in SOCAL, Eastern North Pacific stock blue whales could be exposed to sound that may result in 55 TTS and 31 behavioral reactions per year. In Hawaii, Central North Pacific stock blue whales would not be exposed to sound resulting in any exposures under the current impact criteria. For both stocks and as presented above for mysticetes in general, long-term consequences for individuals or populations would not be expected.

Humpback Whales (Endangered Species Act-Listed)

Humpback whales may be exposed to sonar or other active acoustic stressors associated with testing activities throughout the year. Since humpback whales migrate to the north in the summer, impacts are predicted only for the cool season in the Study Area. In the SOCAL Range Complex involving the California, Oregon, Washington stock of humpback whale, acoustic modeling predicts exposure to sound that may result in 11 TTS and 7 behavioral reactions per year. In the HRC involving the Central North Pacific stock of humpback, acoustic modeling predicts exposure to sound that may result in 37 TTS and 19 behavioral reactions per year. For both stocks and as presented above for mysticetes in general, long-term consequences for individuals or populations would not be expected.

Sei Whales (Endangered Species Act-Listed)

Sei whales may be exposed to sonar or other active acoustic stressors associated with testing activities throughout the year. Acoustic modeling predicts that SOCAL, Eastern North Pacific stock sei whales could be exposed to sound that may result in 3 TTS and 1 behavioral reaction per year. Sei whales are considered rare in Hawaiian waters. The Hawaiian stock sei whales could be exposed to sound that may result in 1 TTS and 1 behavioral reaction per year. Recent sei whale sightings in Hawaii have included sub-adult animals. It is unlikely that the types of impacts predicted by acoustic modeling would have any greater impact on sub-adult individuals. For both stocks and as presented above for mysticetes in general, long-term consequences for individuals or populations would not be expected.

Fin Whales (Endangered Species Act-Listed)

Fin whales may be exposed to sonar or other active acoustic stressors associated with testing activities throughout the year. Acoustic modeling predicts that in SOCAL, the California, Oregon, Washington stock of fin whales could be exposed to sound that may result in 17 TTS and 12 behavioral reaction per year. Fin whale in Hawaiian waters would not be exposed to sonar or other active acoustic stressors associated with testing activities, which would exceed the current impact thresholds.

Gray Whales, Eastern North Pacific Stock and Endangered Species Act-Listed Western North Pacific Stock

Gray whales may be exposed to sonar or other active acoustic stressors during the cool seasons when and if their presence coincides with testing activities in the Study Area. In SOCAL (there are no gray whales present in Hawaii), acoustic modeling predicts that the Eastern North Pacific gray whale could be exposed to sound that may result in 866 TTS and 107 behavioral reactions per year. The Western North Pacific stock of gray whale could be exposed to sound that may result in one TTS per year. As presented above for mysticetes in general, for both stocks and individuals within these stocks, long-term consequences would not be expected.

Other Mysticetes (Bryde's and Minke Whales)

In SOCAL, the eastern tropical Pacific stock of Bryde's whales would not be exposed to sonar or other active acoustic stressors associated with testing activities, which would exceed the current impact thresholds. In the HRC involving the Hawaiian stock of Bryde’s whale, acoustic modeling predicts exposure to sound that may result in 1 TTS per year. For minke whale in the SOCAL Range Complex involving the California, Oregon, Washington stock, acoustic modeling predicts exposure to sound that may result in 5 TTS and 2 behavioral reactions per year. In the HRC involving the Hawaiian stock of minke whale, would not be exposed to sonar or other active acoustic stressors associated with testing activities, which would exceed the current impact thresholds. As presented above for mysticetes in general, for both species, stocks, and individuals within these stocks, long-term consequences would not be expected.

Odontocetes

Predicted impacts to odontocetes from testing activities under the No Action Alternative from sonar and other active acoustic sources are about 97 percent from Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft, Sonobuoy Lot Acceptance Test, Torpedo (Non-Explosive) Testing, and both Autonomous Underwater Vehicle and Fixed Anti-Terrorism/Force Protection Mine Countermeasures Underwater Communications and Ocean Meteorology and Oceanography involving a variety of sources. None these events have exposures resulting from use of hull mounted sonar. As discussed in Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources) and Section 3.4.3.2.1.1 (Range to Effects), ranges to TTS for a sonobuoy (e.g., sonar bin MF5; SSQ-62 DICASS sonobuoy) are less than 50 yd. (50 m) odontocetes. Some behavioral impacts could take place at distances exceeding 13 nm for more sensitive species (high-frequency cetaceans and beaked whales), although significant behavioral effects are much more likely at higher received levels within a few kilometers of the sound source.

Small individual percentages of the total exposures are contributed by all other testing activities. It is unlikely that any of the acoustic stressors within these events would cause significant behavioral reactions in odontocetes because the few predicted impacts are spread out in time and space. Long-term consequences for individuals or populations would not be expected.

Animals that do experience TTS may have reduced ability to detect relevant sounds such as predators, prey, or social vocalizations until their hearing recovers. Recovery from a threshold shift (i.e., TTS; temporary partial hearing loss) can take a few minutes to a few days depending on the severity of the initial shift. Threshold shifts do not necessarily affect all hearing frequencies equally, so some threshold shifts may not interfere with an animal's ability to hear biologically relevant sounds. For exposures resulting in TTS, long-term consequences for individuals or populations would not be expected.

For PTS, it is uncertain whether some permanent hearing loss over a part of a marine mammal's hearing range would have long-term consequences for that individual, given that natural hearing loss has been documented in marine mammals that have been studied (small odontocetes and pinnipeds) as a result of disease, parasitic infestations, and age-related impairment (Ketten 2012). Furthermore, mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce the predicted impacts. Considering these factors, long-term consequences for individuals or populations would not be expected.

Sperm Whales (Endangered Species Act-Listed)

Sperm whales (classified as mid-frequency cetaceans [see Section 3.4.2.3.2, Mid-Frequency Cetaceans]) may be exposed to sonar or other active acoustic stressors associated with testing activities throughout the year. For sperm whale in the SOCAL Range Complex involving the California, Oregon, Washington stock, acoustic modeling predicts exposure to sound that may result in 12 TTS and 16 behavioral reactions per year. In the HRC involving the Hawaiian stock of sperm whale, acoustic modeling predicts exposure to sound that may result in 3 TTS and 5 behavioral reactions per year.

Research and observations (see Section 3.4.3.1.2.6, Behavioral Reactions) show that if sperm whales are exposed to sonar or other active acoustic sources they may react in a number of ways depending on their experience with the sound source and what activity they are engaged in at the time of the acoustic exposure. Sperm whales have shown resilience to acoustic and human disturbance, although they may react to sound sources and activities within a few kilometers. Sperm whales that are exposed to activities that involve the use of sonar and other active acoustic sources may alert, ignore the stimulus, avoid the area by swimming away or diving, or display aggressive behavior. As presented above for odontocetes in general, long-term consequences for sperm whale individuals or populations would not be expected.

False Killer Whale, Hawaii Pelagic Stock, Northwestern Hawaiian Islands Stock, and Main Hawaiian Islands Insular Stock (the latter Endangered Species Act-Listed)

False killer whales may be exposed to sonar or other active acoustic stressors associated with testing activities throughout the year in the HRC portion of the Study Area; they are not expected to be present within the SOCAL Range Complex. As presented for the discussion of training activities previously, there are three stocks of false killer whale recognized by in Hawaiian waters (see Section 3.4.2.16.1, False Killer Whale, Status and Management) and ratios for each stock were derived (based on their abundance) to prorate the total modeled exposures in order to quantify acoustic exposures for each of the three stocks.

For the Hawaii pelagic stock of false killer whale, acoustic modeling predicts exposure to sound that may result in 1 TTS exposure and 2 behavioral reactions per year. For the Northwestern Hawaiian Islands stock of false killer whale, acoustic modeling predicts exposure to sound that may result in 1 behavioral reaction per year. For the Main Hawaiian Islands insular stock, acoustic modeling predicts they would not be exposed to sonar or other active acoustic stressors associated with testing activities, which would exceed the current impact thresholds. For these stocks, and individuals within these stocks, long-term consequences would not be expected.

Beaked Whales

Beaked whales may be exposed to sonar or other active acoustic stressors associated with testing activities throughout the year. Acoustic modeling predicts that the various species of beaked whales (see Table 3.4-1) could be exposed to sound that may result in 69 TTS and 1,986 behavioral reactions. Beaked whale species are separated into two stocks within the Study Area: the California, Oregon, Washington stocks and the Hawaiian stocks. Predicted effects to beaked whales within the SOCAL Range Complex are predicted to impact the California, Oregon, Washington stocks and effects predicted for HRC would impact the Hawaiian stocks.

Research and observations (see Section 3.4.3.1.2.6, Behavioral Reactions) show that if beaked whales are exposed to sonar or other active acoustic sources they may startle, break off feeding dives, and avoid the area of the sound source to levels of 157 dB re 1 µPa, or below (McCarthy et al. 2011). Furthermore, in research done at the Navy's instrumented tracking range in the Bahamas, animals leave the immediate area of the anti-submarine warfare training exercise, but return within a few days after the event ends. Significant behavioral reactions seem likely in most cases if beaked whales are exposed to anti-submarine sonar within a few tens of kilometers (see Section 3.4.3.2.1, Impacts from Sonar and Other Active Acoustic Sources), especially for prolonged periods (a few hours or more) since research indicates beaked whales have been shown to will leave an area where anthropogenic sound is present (Tyack et al. 2011). At the U.S. Navy test and evaluation range in the Bahamas and at Navy instrumented ranges the Study Area that have been operating for decades (in Hawaii north of Kauai and in SOCAL west of San Clemente Island), populations of beaked whales continue to inhabit those intensively used ranges. Significant behavioral reactions (temporarily leaving an area) seem likely in most cases if beaked whales are exposed to anti-submarine sonar within a few tens of kilometers (see Section 3.4.3.2.1, Impacts from Sonar and Other Active Acoustic Sources), especially for prolonged periods (a few hours or more) since research indicates beaked whales have been shown to leave an area where anthropogenic sound is present (Tyack et al. 2011). At the Bahamas range and at Navy instrumented ranges that have been operating for decades (in Hawaii north of Kauai and in Southern California west of San Clemente Island), populations of beaked whales appear to be stable. Photographic evidence indicating re-sightings of individual beaked whales (from two species; Cuvier's and Blainville's beaked whales) suggesting long-term site fidelity to the area west of the Island of Hawaii (McSweeney et al. 2007) is an area used for years to conduct Anti-Submarine Warfare training during Rim of the Pacific and Under Sea Warfare Exercises (Major Exercises involving multiple vessels and aircraft). In Southern California to the west of San Clemente Island, surveys encountered a high number Cuvier's beaked whales, leading Falcone et al. (2009) to suggest the area may be an important region for this species. For over three decades, this ocean area has been the location of the Navy's instrumented training range and is one of the most intensively used training and testing areas in the Pacific, given the proximity to the Naval installations in San Diego.

Based on the best available science (McCarthy et al. 2011; Tyack et al. 2011; Southall et al. 2012; U.S. Department of the Navy 2009a, 2010, 2011), the Navy believes that beaked whales that exhibit a significant behavioral reaction due to sonar and other active acoustic testing activities would generally not have long-term consequences for individuals or populations. No mortality or serious injury to beaked whales is anticipated. Costs and long-term consequences to the individual and population as a result of a beaked whale receiving a PTS or TTS is the same as presented above in the general discussion for odontocetes. Population level consequences are not expected.

Pygmy and Dwarf Sperm Whales (*Kogia* spp.)

Pygmy and dwarf sperm whales (genus: *Kogia*) (classified as high-frequency cetaceans [see Section 3.4.2.3.1, High-Frequency Cetaceans]) may be exposed to sonar or other active acoustic stressors associated with testing activities throughout the year. In SOCAL, the two *Kogia* species are managed as a single California, Oregon, Washington stock and management unit. Acoustic modeling predicts that *Kogia* spp. in SOCAL could be exposed to sound that may result in 3 TTS and 326 behavioral reactions. In Hawaii, NMFS manages *Kogia* as separate species and stocks. Within the HRC acoustic modeling predicts that Hawaiian stock pygmy sperm whale could be exposed to sound that may result in 3 TTS and the Hawaiian stock dwarf sperm whale could be exposed to sound that may result in 1 PTS, 159 TTS and 6 behavioral reactions.

Research and observations (see Section 3.4.3.1.2.6, Behavioral Reactions) on *Kogia* species are limited. However, these species tend to avoid human activity and presumably anthropogenic sounds. Pygmy and dwarf sperm whales may startle and leave the immediate area of the anti-submarine warfare training exercise. Significant behavioral reactions seem more likely than with most other odontocetes, however it is unlikely that animals would receive multiple exposures over a short time period allowing animals time to recover lost resources (e.g., food) or opportunities (e.g., mating). Therefore, long-term consequences for individual *Kogia* or their respective populations are not expected.

Costs and long-term consequences to the individual and population as a result of a *Kogia* receiving a PTS or TTS exposure is the same as presented above in the general discussion for odontocetes. Population level consequences are not expected.

Dall's Porpoise

Dall's porpoise (classified as high-frequency cetaceans [see Section 3.4.2.3.1, High-Frequency Cetaceans]) are present only in the SOCAL Range Complex portion of the Study Area and are part of the California, Oregon, Washington stock. Dall's porpoise may be exposed to sonar or other active acoustic stressors associated with training activities throughout the year. Acoustic modeling predicts that Dall's porpoise could be exposed to sound that may result in 9 PTS, 1,287 TTS, and 17 behavioral reactions. Costs and long-term consequences to the individual and population as a result of a Dall's porpoise receiving a PTS or TTS is the same as presented above in the general discussion for odontocetes. Population level consequences are not expected.

Dolphins, and Small Whales (Delphinids)

Delphinids (classified as mid-frequency cetaceans [see Section 3.4.2.3.2, Mid-Frequency Cetaceans]) may be exposed to sonar or other active acoustic stressors associated with testing activities throughout the year. Species included as delphinids for purposes of this discussion include the following: bottlenose dolphin, Fraser's dolphin, killer whale, long-beaked common dolphin, melon-headed whale, northern right whale dolphin, Pacific white-sided dolphin' pantropical spotted dolphin, pygmy killer whale, Risso's dolphin, rough toothed dolphin, short-beaked common dolphin, short-finned pilot whale, spinner dolphin, and striped dolphin. Acoustic modeling predicts that delphinids (see Table 3.4-1) could be exposed to sound that may result in 27,968 TTS and 13,793 behavioral reactions as a result of 98 percent from Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft, Sonobuoy Lot Acceptance Test, Torpedo (Non-Explosive) Testing, and Autonomous Underwater Vehicle and Fixed Anti-Terrorism/Force Protection Mine Countermeasures Underwater Communications and Ocean Meteorology and Oceanography involving a variety of sources. None these events have exposures resulting from use of hull mounted sonar. As discussed in Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources), ranges to TTS for ranges to TTS for other sources (e.g., sonar bin MF5;

SSQ-62 DICASS sonobuoy) are less than 50 m for mid-frequency odontocetes (cetaceans). The majority of these exposures (2,486 TTS, and 9,097 behavioral reactions) are attributed to short-beaked common dolphins within the SOCAL Range Complex portion of the Study Area.

Research and observations (see Section 3.4.3.1.2.6, Behavioral Reactions) show that if delphinids are exposed to sonar or other active acoustic sources they may react in a number of ways depending on their experience with the sound source and what activity they are engaged in at the time of the acoustic exposure. Delphinids may not react at all until the sound source is approaching within a few hundred meters to within a few kilometers depending on the environmental conditions and species. Delphinids that are exposed to activities that involve the use of sonar and other active acoustic sources may alert, ignore the stimulus, change their behaviors or vocalizations, avoid the sound source by swimming away or diving, or be attracted to the sound source. Long-term consequences to individual delphinids or populations are not likely due to exposure to sonar or other active acoustic sources.

Costs and long-term consequences to the individual and population as a result of delphinids receiving an exposure resulting in PTS or TTS are the same as presented above in the general discussion for odontocetes. Population level consequences are not expected.

Pinniped

Research and observations (see Section 3.4.3.1.2.6, Behavioral Reactions) show that pinnipeds in the water are tolerant of anthropogenic noise and activity. If seals are exposed to sonar or other active acoustic sources they may react in a number of ways depending on their experience with the sound source and what activity they are engaged in at the time of the acoustic exposure. Seals may not react at all until the sound source is approaching within a few hundred meters and then may alert, ignore the stimulus, change their behaviors, or avoid the immediate area by swimming away or diving. Significant behavioral reactions would not be expected in most cases and long-term consequences for individuals or pinniped populations are unlikely.

Recovery from a hearing threshold shift (i.e., TTS; temporary partial hearing loss) can take a few minutes to a few days depending on the severity of the initial shift. More severe shifts may not fully recover and thus would be considered PTS. Threshold shifts do not necessarily affect all hearing frequencies equally, so some threshold shifts may not interfere with an animal’s ability to hear biologically relevant sounds. It is uncertain whether some permanent hearing loss over a part of a marine mammal's hearing range would have long-term consequences for that individual, although many mammals lose hearing ability as they age. Exposures resulting in TTS or PTS to individuals are unlikely to have long-term consequences for the population. Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce the predicted impacts.

Phocids (Harbor Seal, Northern Elephant Seal, and Hawaiian Monk Seal)

Harbor seal and northern elephant seal are the species of phocid pinnipeds within the SOCAL Range Complex portion of the Study Area. Harbor seal are part of the California Stock and northern elephant seal are the California breeding stock. Hawaiian monk seal are present in Hawaii and considered the Hawaiian stock. Phocids may be exposed to sonar or other active acoustic stressors associated with testing activities throughout the year.

Predicted effects to phocid seals from annual testing activities under the No Action Alternative from sonar and other active acoustic sources indicate phocids could be exposed to sound that may result in 2 PTS, 422 TTS and 363 behavioral reactions. The impacts in SOCAL are primarily (approximately

97 percent) from Autonomous Underwater Vehicle and Fixed Anti-Terrorism/Force Protection Mine Countermeasures Underwater Communications and Ocean Meteorology and Oceanography. As discussed in Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources), ranges to TTS for sources associated with Autonomous Underwater Vehicle and Fixed Anti-Terrorism/Force Protection Mine Countermeasures Underwater Communications and Ocean Meteorology and Oceanography (i.e., source bin HF6) should be less than 50 yd. (50 m) for phocid seals. Some behavioral effects could hypothetically take place at distances exceeding 1.6 nm, although significant behavioral effects are much more likely at higher received levels within a few kilometers of the sound source. Costs and long-term consequences to the individual and population as a result of a phocid receiving a PTS, TTS, or a behavioral effect is the same as presented above under the general discussion for pinniped. Population level consequences are not expected.

Approximately 89 percent of the predicted acoustic effects to phocids from testing activities under the No Action Alternative are predicted within the SOCAL Range Complex and 11 percent in the HRC. Modeling predicts harbor seal in SOCAL could be exposed to sound that may result in 2 PTS, 178 TTS, and 66 behavioral reactions. Modeling predicts northern elephant seal in SOCAL could be exposed to sound that may result in 216 TTS and 269 behavioral reactions.

Hawaiian Monk Seal (Endangered Species Act-Listed)

Acoustic modeling predicts that the Hawaiian stock of Hawaiian monk seal could be exposed to sound from sonar and other active acoustic sources during testing activities that may result in 28 TTS and 60 behavioral reactions. The majority of these exposures in Hawaii result from Autonomous Underwater Vehicle and Fixed Anti-Terrorism/Force Protection Mine Countermeasures Underwater Communications and Ocean Meteorology and Oceanography with a small contribution from Torpedo (Non-Explosive) Testing. As discussed in Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources) ranges to TTS should be less than 50 m for Hawaiian monk seal. Some behavioral effects could hypothetically take place at distances exceeding 1.6 nm (3 km). If Hawaiian Monk seal are exposed to sound from testing activities, they may not react until the sound source is approaching within a few hundred meters and then may alert, ignore the stimulus, change their behaviors, or avoid the immediate area by swimming away or diving.

Significant behavioral reactions would not be expected and long-term consequences for individuals or populations are unlikely. The costs and long-term consequences as a result of TTS or PTS are the same as presented above for pinniped in general and would apply similarly to Hawaiian monk seal. Population level consequences are not expected. Activities involving sound or energy from sonar and other active acoustic sources will not occur on shore in designated Hawaiian monk seal critical habitat where haul-out and resting behavior occurs and would have no effect on critical habitat at sea.

Otariids (Fur Seal and Sea Lion)

California sea lion, northern fur seal, and Guadalupe fur seal, comprise the otariid species of pinniped present in the SOCAL portion of the Study Area; there are no otariid present in Hawaii. The Mexico stock of Guadalupe fur seal is listed as threatened under the ESA. Otariids may be exposed to sonar or other active acoustic stressors associated with training activities throughout the year. Acoustic modeling predicts otariids in SOCAL could be exposed to sound that may result in 33 TTS and 3,142 behavioral reactions. The majority of these exposures (95 percent) are attributed to the California Stock of California sea lion. Exposures to the San Miguel Island stock of northern fur seal and Mexico stock of Guadalupe fur seal account for the remaining 5 percent of the exposures. The majority of these exposures in SOCAL result from Autonomous Underwater Vehicle and Fixed Anti-Terrorism/Force

Protection Mine Countermeasures Underwater Communications and Ocean Meteorology and Oceanography with a small contribution from Torpedo (Non-Explosive) Testing. As discussed in Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources) and above for phocids, range to TTS for the sources used in these events should be less than 50 yd. (50 m) for otariids. Some behavioral effects could hypothetically take place at distances exceeding 93 nm (173 km), although significant behavioral effects are much more likely at higher received levels within a few hundred meters of the sound source. The acoustic modeling and post-modeling analyses predict there would be no non-impulse sound exposure to otariid resulting in PTS.

For behavioral exposures otariids in SOCAL, long-term consequences would not be expected. Costs and long-term consequences to the individual and population as a result of an otariid receiving a TTS is the same as presented above under the general discussion for pinniped. Population level consequences are not expected.

Guadalupe Fur Seal (Endangered Species Act-Listed as Threatened)

Acoustic modeling predicts that the Mexico stock of Guadalupe fur seal could be exposed to sound from sonar and other active acoustic sources used in testing activities may result in 40 behavioral reactions. Significant behavioral reactions by Guadalupe fur seal would not be expected and long-term consequences for individuals or the population are unlikely. Critical habitat has not been designated Guadalupe fur seal.

Mustelid (Southern Sea Otter, Translocated Colony)

The sea otter present in the Study Area (at San Nicolas Island; see Section 3.4.2.47.1, Sea Otter Status and Management) are part of a translocated colony managed by the U.S. Fish and Wildlife Service. Acoustic modeling for southern sea otter at San Nicolas was not undertaken given they are far from where activities involving sonar and other active acoustic sources are proposed to occur, they inhabit complex shallow water environments where acoustic modeling is very imprecise and therefore would not be representative, and they spend little time underwater thus very much limiting the potential for exposure to underwater sound in any case. Research indicates sea otters often remained undisturbed, quickly become tolerant of the various sounds, and even when purposefully harassed, they generally moved only a short distance 100 to 200 yd. (100 to 200 m) before resuming normal activity. The U.S. Fish and Wildlife Service has determined that previous DoD actions have not posed a threat to the San Nicolas colony of southern sea otter and the average growth rate for the translocated colony has been higher than that for those inhabiting the central California coastline in recent years (U.S. Department of the Interior 2012a). Given these factors, long-term consequences for individuals or the population would not be expected.

Conclusion

Testing activities under the No Action Alternative include the use of sonar and other active acoustic sources as described in Table 2.8-2 through 2.8-5 and Section 3.0.5.3.1 (Acoustic Stressors). These activities would result in inadvertent takes of marine mammals in the Study Area.

Pursuant to the MMPA, use of sonar and other active acoustic sources during testing activities under the No Action Alternative:

- *May expose marine mammals up to 50,874 times annually to sound levels that would be considered Level B harassment, as defined by the MMPA*
- *May expose marine mammals up to 12 times annually to sound levels that would be considered Level A harassment, as defined by the MMPA*

Pursuant to the ESA, the use of sonar and other active acoustic sources during testing activities as described in the No Action Alternative:

- *May affect, and is likely to adversely affect, the humpback whale, sei whale, blue whale, fin whale, Western North Pacific gray whale, sperm whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.1.6 Alternative 1 – Training Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-1, and Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources), training activities under Alternative 1 that produce in-water sound from the use of sonar and other active acoustic sources would increase from those provided in the No Action Alternative. Activities would occur in the same locations throughout the Study Area as presented for the No Action Alternative and would be concentrated within 200 mi. (322 km) of San Diego in the SOCAL Range Complex and within 200 mi. (322 km) of the Hawaiian Islands in the HRC. New training activities proposed under Alternative 1 and notable changes in activities from the No Action Alternative are as follows:

- Utilize new weapons in the conduct of anti-air warfare, such as the 57 mm (2.24 in.) (large-caliber) gun system and rolling airframe missile system installed on the Littoral Combat Ship.
- Increase in the number of anti-submarine warfare events conducted, the amount of acoustic sensors used during those events.
- Introduction of new planned anti-submarine warfare sensors being made available.
- Adding new anti-submarine warfare events such as training with an anti-torpedo torpedo.
- Increase in number of mine warfare events conducted and the amount of time acoustic sensors are used during those events.
- New use of planned mine warfare sensors, neutralizers, and platforms, especially unmanned and remotely operated vehicles.
- Conduct homeland security and anti-terrorism/force protection training events in various ports and harbors.

The increase in proposed training activities under Alternative 1 over the No Action Alternative would in turn lead to an approximate 333 percent increase in predicted total impacts (behavioral reactions, TTS, and PTS) from training activities to marine mammals. This could mean an increase in the number of individual animals exposed per year or an increase in the number of times per year some animals are exposed, although the types and severity of individual responses to sonar and other active acoustic sources are not expected to change between Alternative 1 and the No Action Alternative.

Table 3.4-18 provides a summary of the total estimated non-impulsive sound exposures within the established criteria resulting from Navy training that would be conducted under Alternative 1 over the course of a year. The acoustic modeling and post-modeling analyses predict 1,689,564[25] marine mammal exposures to non-impulsive sound resulting in Level B harassment and 138[26] exposures resulting in Level A as defined under the MMPA for military training activities.

Pursuant to the MMPA, the use of sonar and other active acoustic sources during training activities under Alternative 1:

- *May expose marine mammals up to 1,689,564 times annually to sound levels that would be considered Level B harassment, as defined by the MMPA*
- *May expose marine mammals up to 138 times annually to sound levels that would be considered Level A harassment, as defined by the MMPA*
- *May expose up to 2 beaked whales annually to sound levels that may elicit stranding and subsequent serious injury or mortality*

Pursuant to the ESA, the use of sonar and other active acoustic sources during training activities as described in Alternative 1:

- *May affect, and is likely to adversely affect, the humpback whale, sei whale, fin whale, Western North Pacific gray whale, blue whale, sperm whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.1.7 Alternative 1 – Testing Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-2 through 2.8-5, and Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources), testing activities under Alternative 1 that produce in-water sound from the use of sonar and other active acoustic sources would increase from those provided in the No Action Alternative. Activities would occur in the same locations throughout the Study Area as presented for the No Action Alternative and would be concentrated within 200 mi. (322 km) of San Diego in the SOCAL Range Complex and within 200 mi. (322 km) of the Hawaiian Islands in the HRC. New training activities proposed under Alternative 1 and notable changes in activities from the No Action Alternative are as follows:

- Reduce number of events for pierside integrated swimmer defense
- Conduct ship trials on new platforms described in Section 2.7.3, Proposed Platforms and Systems
- Conduct testing on new Littoral Combat Ship Mission Packages: anti-submarine warfare, surface warfare, and mine countermeasures (see Section 2.7.3.2, Ships discussion of the Littoral Combat Ship for more information)
- Increase the number of Combat System Ship Qualification Trials
- Increase flexibility of locations used during testing
- Use newly developed and future anti-surface warfare sensors
- Use newly developed and future anti-submarine warfare sensors
- Addition of high-altitude torpedo and sonobuoy testing
- Adding new anti-submarine warfare events such as training with an anti-torpedo torpedo
- Addition of special warfare test events

[25] This is the combined summation of all non-TTS and TTS exposures (behavioral effects) for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the 12-month period).
[26] This is the combined summation of all PTS exposures for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the same 12-month period).

- Testing of unmanned undersea vehicle mine countermeasures
- Anti-terrorism/force protection mine countermeasures testing
- Anti-terrorism/force protection underwater surveillance systems testing
- Testing of underwater communication systems
- Development and demonstration of technologies that improve the Navy's fixed intelligence, surveillance, and reconnaissance sensor systems
- Test and evaluation of passive mobile intelligence, surveillance, and reconnaissance sensor systems
- Testing of autonomous undersea vehicles such as gliders

Specific for SOCAL:

- Increase in anti-submarine warfare tracking test–helicopter events conducted in the Hawaii and Southern California operating areas (OPAREAs)
- Use of new mine training ranges for mine warfare events in the SOCAL Range Complex
- Increase in anti-submarine warfare torpedo tests in the Southern California OPAREA

Specific for HRC:

- Increase in air platform weapons integration tests conducted in the Hawaii OPAREA

The increase in proposed testing activities under Alternative 1 over the No Action Alternative would in turn lead to an approximate 435 percent increase in predicted total impacts (behavioral reactions, TTS, and PTS) to marine mammals. This could mean an increase in the number of individual animals exposed per year or an increase in the number of times per year some animals are exposed, although the types and severity of individual responses to sonar and other active acoustic sources are not expected to change between Alternative 1 and the No Action Alternative.

Table 3.4-19 provides a summary of the total estimated non-impulsive sound exposures from Navy testing that would be conducted under Alternative 1 over the course of a year. The acoustic modeling and post-modeling analyses predict 221,431[27] marine mammal exposures to non-impulsive sound resulting in Level B harassment and 46 exposures resulting in Level A as defined under the MMPA for military testing activities.

Pursuant to the MMPA, the use of sonar and other active acoustic sources during testing activities under Alternative 1:

- *May expose marine mammals up to 221,431 times annually to sound levels that would be considered Level B harassment, as defined by the MMPA*
- *May expose marine mammals up to 46 times annually to sound levels that would be considered Level A harassment, as defined by the MMPA*

[27] This is the combined summation of all non-TTS and TTS exposures (behavioral effects) for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the 12-month period).

Pursuant to the ESA, the use of sonar and other active acoustic sources during testing activities as described in Alternative 1:

- *May affect, and is likely to adversely affect, the humpback whale, sei whale, fin whale, Western North Pacific gray whale, blue whale, sperm whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.1.8 Alternative 2 – Training Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-1, and Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources), proposed training activities involving sonar and other acoustic sources under Alternative 2 are identical to training activities proposed under Alternative 1. Therefore, the predicted impacts for Alternative 2 are identical to those described above in Section 3.4.3.2.1.6 (Alternative 1 – Training Activities).

Pursuant to the MMPA, the use of sonar and other active acoustic sources during training activities under Alternative 2:

- *May expose marine mammals up to 1,689,564 times annually to sound levels that would be considered Level B harassment, as defined by the MMPA*
- *May expose marine mammals up to 138 times annually to sound levels that would be considered Level A harassment, as defined by the MMPA*
- *May expose up to 2 beaked whales annually to sound levels that may elicit stranding and subsequent serious injury or mortality*

Pursuant to the ESA, the use of sonar and other active acoustic sources during training activities as described in Alternative 2:

- *May affect, and is likely to adversely affect, the humpback whale, sei whale, fin whale, Western North Pacific gray whale, blue whale, sperm whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.1.9 Alternative 2 – Testing Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-2 through 2.8-5, and Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources), proposed testing activities involving sonar and other acoustic sources under Alternative 2 would increase over what was analyzed for the No Action. Section 3.4.3.2.1.5 (No Action Alternative – Testing Activities) describes predicted impacts on marine mammals. These activities would happen in the same general locations under Alternative 2 as under the No Action Alternative and would be concentrated within 200 mi. (322 km) of San Diego in the SOCAL Range Complex and within 200 mi. (322 km) of the Hawaiian Islands in the HRC.

New training activities proposed under Alternative 2 and notable changes in activities from the No Action Alternative are as follows:

- Tests associated with new ship construction such as increase in the number of Littoral Combat Ship Mission Package test events.
- Increase number of ship signature test events.
- Increase number of Anti-Surface Warfare/Anti-Submarine Warfare events conducted.

- Introduction of Broad Area Maritime Surveillance Unmanned Aerial Vehicles and their use during Maritime Patrol Aircraft Anti-Submarine Warfare testing events.
- Having capacity to conduct all at-sea sonar testing in either SOCAL or HRC.
- Having capacity to conduct all underwater deployed unmanned aerial vehicle testing in either SOCAL or HRC.
- Increase number of Mine Warfare Test events conducted.
- Increase number of Shipboard Protection Systems and Swimmer Defense Test events conducted.
- Increase number of Unmanned Vehicle Test events conducted.
- Increase number of events conducted overall, with a 10 percent increase in the tempo of all proposed Naval Air Systems Command testing activities.

The increase in proposed testing activities under Alternative 2 over the No Action Alternative would in turn lead to an approximately 468 percent increase in predicted impacts (behavioral reactions, TTS, and PTS) to marine mammals. This could mean an increase in the number of individual animals exposed per year or an increase in the number of times per year some animals are exposed, although the types and severity of individual responses to sonar and other active acoustic sources are not expected to change between Alternative 2 and the No Action Alternative.

Model-predicted acoustic impacts on marine mammals from exposure to sonar and other active acoustic sources for annually recurring testing activities under Alternative 2 are shown in Table 3.4-18. The acoustic modeling and post-modeling analyses predict 238,352[28] marine mammal exposures to non-impulsive sound resulting in Level B harassment and 53[29] exposures resulting in Level A as defined under the MMPA for military testing activities.

Costs and long-term consequences for individuals and the population resulting from exposure to sonar and other active acoustic source sound and energy are discussed above under the No Action Alternative. Although the numbers of the predicted effects differ between Alternative 2 and the No Action Alternative, the types and severity of reactions and the related consequences would be similar (Section 3.4.3.2.1.5, No Action Alternative – Testing Activities).

Pursuant to the MMPA, the use of sonar and other active acoustic sources during testing activities under Alternative 2:

- *May expose marine mammals up to 238,352 times annually to sound levels that would be considered Level B harassment, as defined by the MMPA*
- *May expose marine mammals up to 53 times annually to sound levels that would be considered Level A harassment, as defined by the MMPA*

Pursuant to the ESA, the use of sonar and other active acoustic sources during testing activities as described in Alternative 2:

- *May affect, and is likely to adversely affect, the humpback whale, sei whale, fin whale, Western North Pacific gray whale, blue whale, sperm whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*

[28] This is the combined summation of all non-TTS and TTS exposures (behavioral effects) for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the 12-month period).
[29] This is the combined summation of all PTS exposures for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the same 12-month period).

- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.2 Impacts from Explosives

Marine mammals could be exposed to energy and sound from underwater explosions associated with proposed activities as described in Chapter 2 (Description of Proposed Action and Alternatives). Predicted impacts on marine mammals from at-sea explosions are based on a modeling approach that considers many factors. The inputs for the models consider the net explosive weight, the properties of detonations underwater, and environmental factors such as depth of the explosion, overall water depth, water temperature, and bottom type. The net explosive weight accounts for the mass and type of explosive material. Energy from an explosion is capable of causing mortality, injury to the lungs or gastrointestinal tract, hearing loss, or a behavioral response depending on the level of exposure.

Section 3.4.3.1.2.1 (Direct Injury) presents a review of observations and experiments involving marine mammals and reactions to impulsive sounds and underwater detonations. Energy from explosions is capable of causing mortality, direct injury, hearing loss, or a behavioral response depending on the level of exposure. The death of an animal will, of course, eliminate future reproductive potential and cause a long-term consequence for the individual that must then be considered for potential long-term consequences for the population. Exposures that result in long-term injuries such as PTS may limit an animal’s ability to find food, communicate with other animals, or interpret the surrounding environment. Impairment of these abilities can decrease an individual’s chance of survival or impact its ability to successfully reproduce. TTS can also impair an animal’s abilities, but the individual may recover quickly with little significant effect. Behavioral responses can include shorter surfacings, shorter dives, fewer blows (breaths) per surfacing, longer intervals between blows, ceasing or increasing vocalizations, shortening or lengthening vocalizations, and changing frequency or intensity of vocalizations (National Research Council 2005). However, it is not clear how these responses relate to long-term consequences for the individual or population (National Research Council 2005).

Explosions in the ocean or near the water surface can introduce loud, impulsive, broadband sounds into the marine environment. These sounds are likely within the audible range of most cetaceans, but the duration of individual sounds is very short. The direct sound from explosions used during Navy training and testing activities last less than a second, and most events involve the use of only one or a few explosions. Furthermore, events are dispersed in time and throughout the Study Area. These factors reduce the likelihood of these sources causing substantial auditory masking in marine mammals.

3.4.3.2.2.1 Range to Effects

The following section provides the range (distance) over which specific physiological or behavioral effects are expected to occur based on the explosive criteria (Section 3.4.3.1.4, Thresholds and Criteria for Predicting Acoustic and Explosive Impacts on Marine Mammals) and the explosive propagation calculations from the Navy Acoustic Effects Model (Section 3.4.3.1.6.3). The range to effects is important information in estimating the accuracy of model results against real-world situations and determining adequate mitigation ranges to avoid higher-level effects, especially physiological effects such as injury and mortality.

Figure 3.4-10 through Figure 3.4-13 show the range to slight lung injury and mortality for five representative animals of different masses for 0.5–1,000 lb. net explosive weight detonations (Bins E2, E5, E9, and E12). Modeled ranges for onset slight lung injury and onset mortality are based on the smallest calf weight in each category and therefore represents a conservative estimate (i.e., longer ranges) since populations contain many animals larger than calves and are therefore less susceptible to injurious effects. Animals within these water volumes would be expected to receive minor injuries at the outer ranges, increasing to more substantial injuries, and finally mortality as an animal approaches the detonation point.

It is also important to note that Navy's modeling uses onset mortality criteria is based on receipt of impulse energy where only 1 percent of the animals exposed would not survive the injuries received. All animals within the range to onset mortality are quantified as mortalities, although many animals would actually recover from or otherwise survive the injury that is the basis of the mortality criteria.

Table 3.4-20 shows the average approximate ranges to the potential effect based on the thresholds described in Section 3.4.3.1.4 (Thresholds and Criteria for Predicting Acoustic and Explosive Impacts on Marine Mammals). Similar to slight lung injury and mortality ranges discussed above, behavioral, TTS, and PTS ranges also represent conservative estimates (i.e., longer ranges) based on assuming all impulses are 1 second in duration. In fact, most impulses are much less than 1 second and therefore contain less energy than what is being used to produce the estimated ranges below.

3.4.3.2.2.2 Avoidance Behavior and Mitigation Measures as Applied to Explosions

As discussed above, within the Navy Acoustic Effects Model, animats (virtual animals) do not move horizontally or react in any way to avoid sound at any level. In reality, various researchers have demonstrated that cetaceans can perceive the location and movement of a sound source (e.g., vessel, seismic source, etc.) relative to their own location and react with responsive movement away from the source, often at distances of a kilometer or more (Au and Perryman 1982; Jansen et al. 2010; Richardson et al. 1995; Tyack et al. 2011; Watkins 1986; Wursig et al. 1998). Section 3.4.3.1.2 (Analysis Background and Framework) reviews research and observations of marine mammals' reactions to sound sources including seismic surveys and explosives. The Navy Acoustic Effects Model also does not account for the implementation of mitigation, which would prevent many of the model-predicted injurious and mortal exposures to explosives. Therefore, the model-estimated mortality and Level A effects are further analyzed and adjusted to account for animal movement (avoidance) and implementation of mitigation measures [(see Section 3.4.3.1.6 (Quantitative Analysis)] using identical procedures to those described in the technical report *Post-Model Quantitative Analysis of Animal Avoidance Behavior and Mitigation Effectiveness for Atlantic Fleet Training and Testing* (U.S. Department of the Navy 2013c).

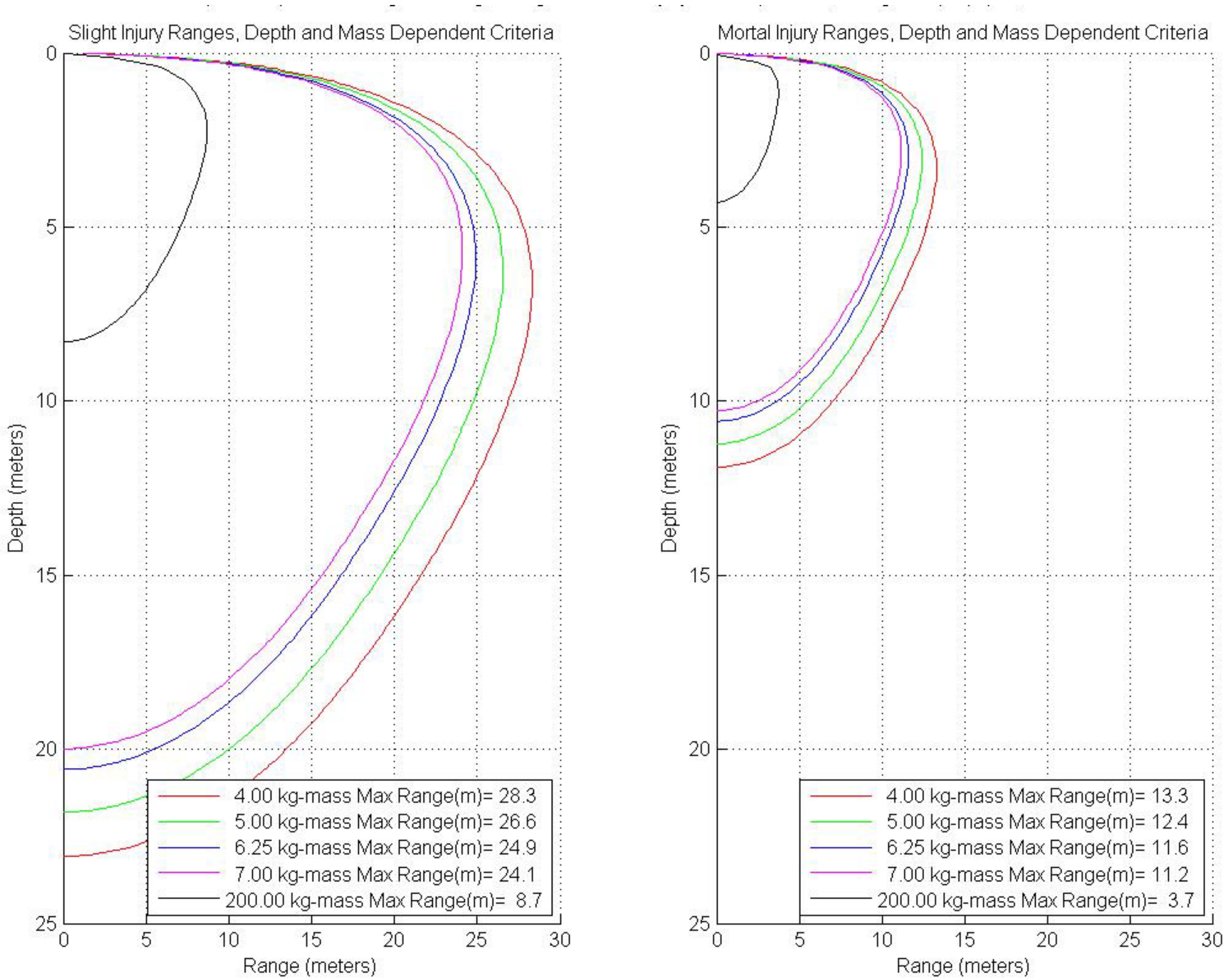


Figure 3.4-10: Threshold Profiles for Slight Lung Injury (left) and Mortality (right) Based on Five Representative Animal Masses for a 0.5-Pound Net Explosive Weight Charge (Bin E2) Detonated at 1-m Depth

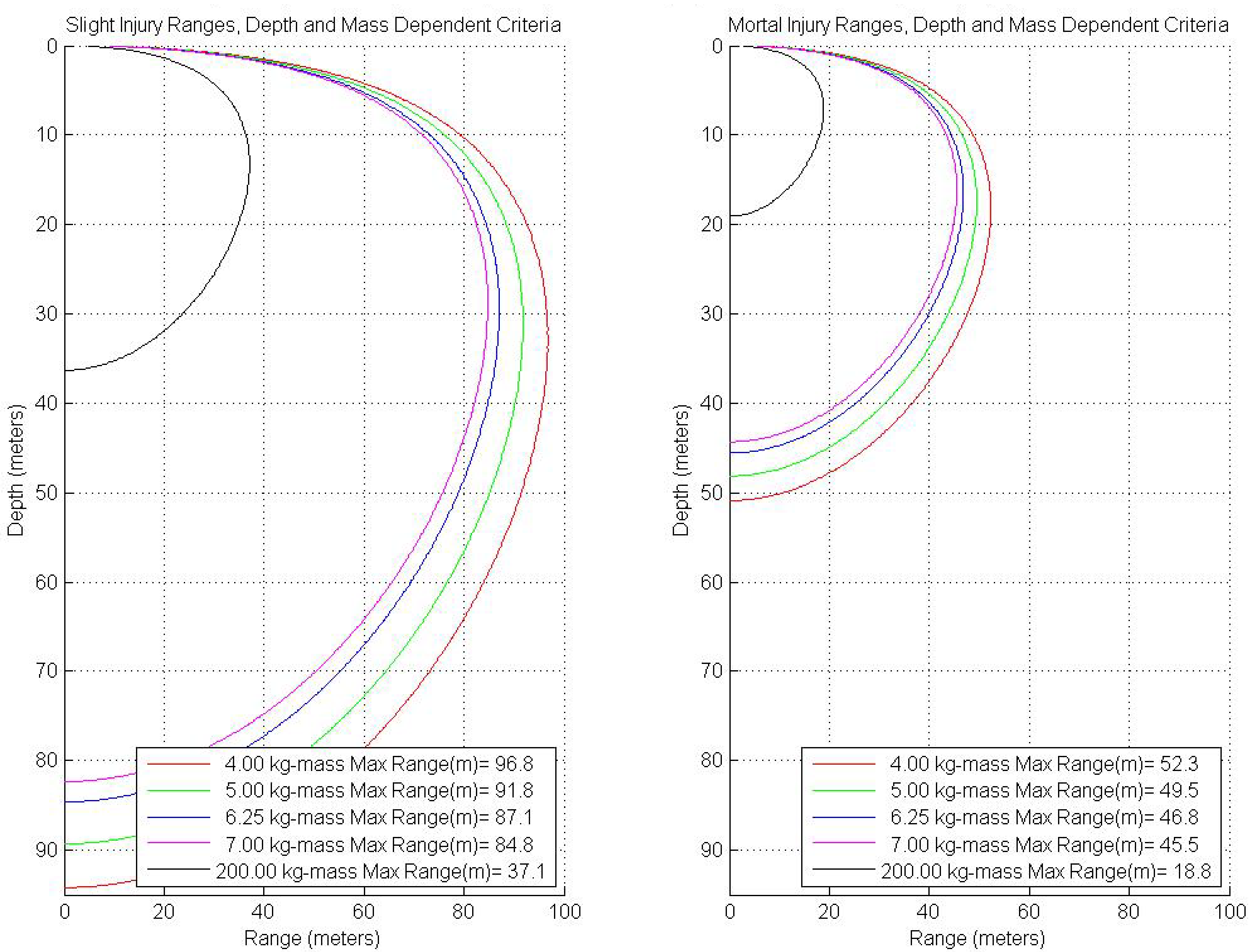


Figure 3.4-11: Threshold Profiles for Slight Lung Injury (left) and Mortality (right) Based on Five Representative Animal Masses for a 10-Pound Net Explosive Weight Charge (Bin E5) Detonated at 1-m Depth

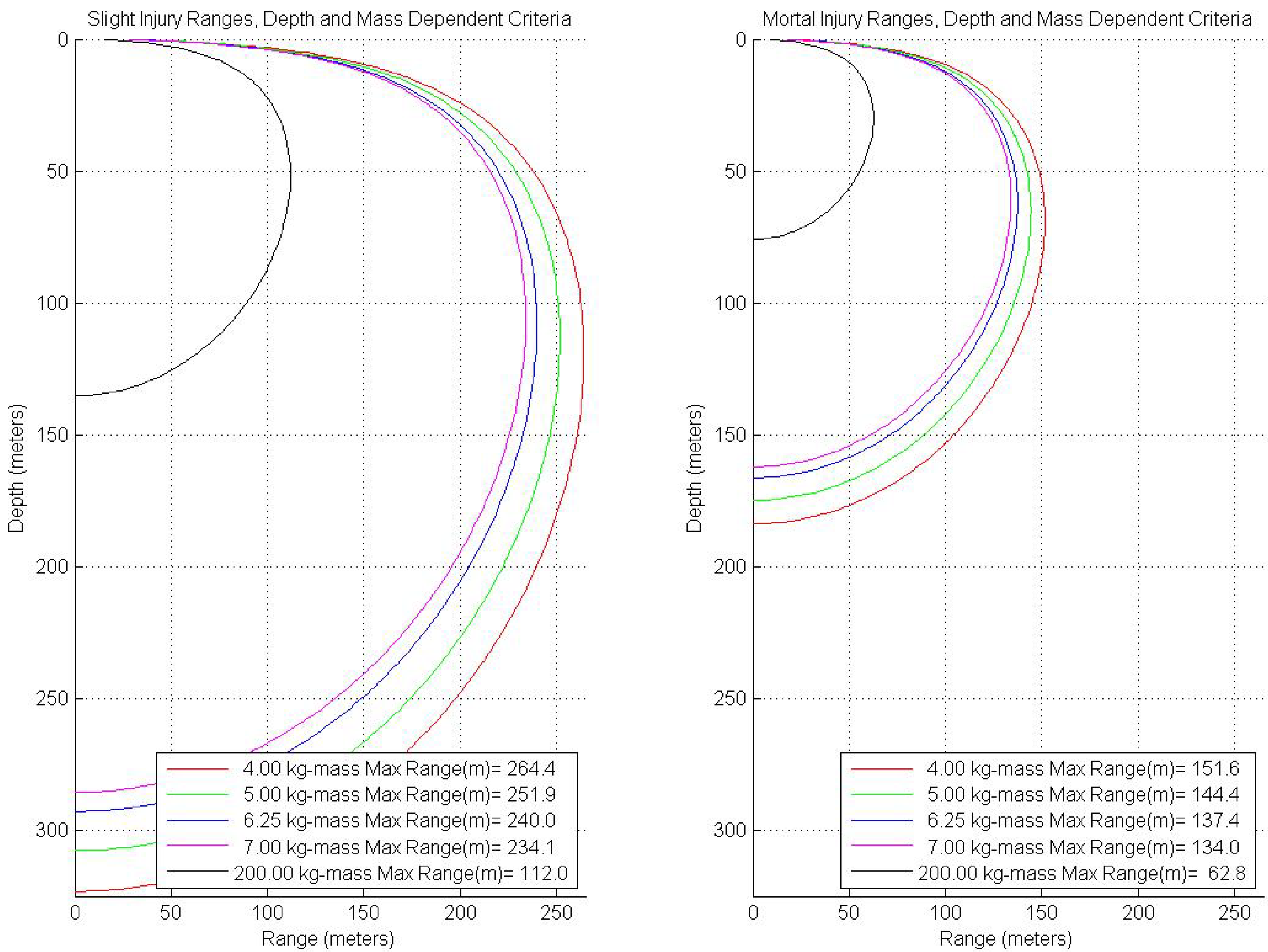


Figure 3.4-12: Threshold Profiles for Slight Lung Injury (left) and Mortality (right) Based on Five Representative Animal Masses for a 250-Pound Net Explosive Weight Charge (Bin E9) Detonated at 1-m Depth

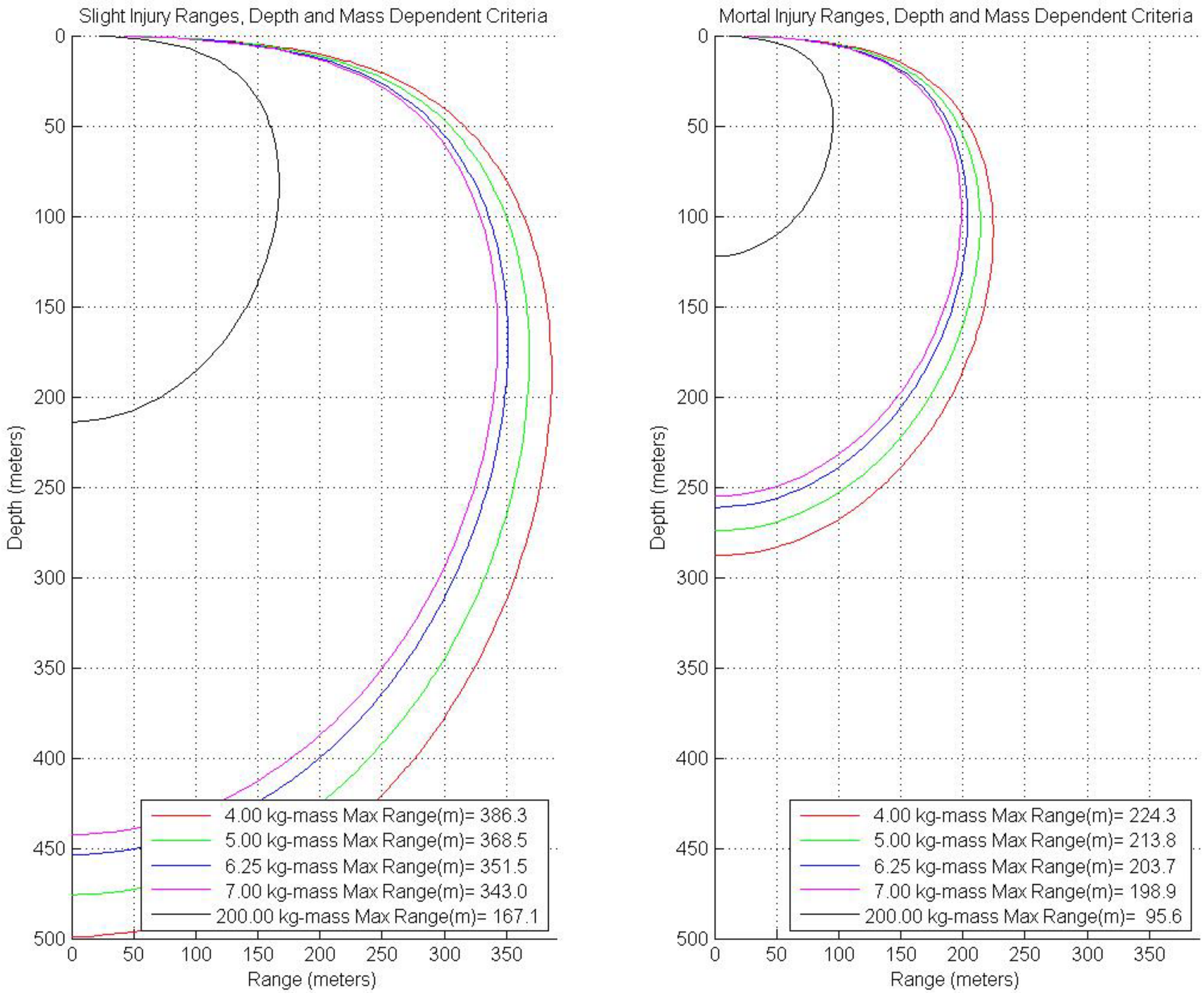


Figure 3.4-13: Threshold Profiles for Slight Lung Injury (left) and Mortality (right) Based on Five Representative Animal Masses for a 1,000-Pound Net Explosive Weight Charge (Bin E12) Detonated at 1-m Depth

Table 3.4-20: Average Approximate Range to Effects from Explosions for Marine Mammals within the Study Area

Hearing Group Criteria/Predicted Impact	Average Approximate Range (meters) to Effects for Sample Explosive Bins					
	Bin E3 (0.6-2.6 lb NEW)	Bin E5 (6-10 lb. NEW)	Bin E7 (21-60 lb. NEW)	Bin E9 (101-250 lb. NEW)	Bin E10 (251-500 lb. NEW)	Bin E12 (651-1,000 lb. NEW)
Low-frequency Cetaceans						
Onset Mortality	10	20	80	65	80	95
Onset Slight Lung Injury	20	40	165	110	135	165
Onset Slight GI Tract Injury	40	80	150	145	180	250
PTS	85	170	370	255	305	485
TTS	215	445	860	515	690	1,760
Behavioral Response	320	525	1,290	710	905	2,655
Mid-frequency Cetaceans						
Onset Mortality	25	45	205	135	165	200
Onset Slight Lung Injury	50	85	390	235	285	345
Onset Slight GI Tract Injury	40	80	150	145	180	250
PTS	35	70	160	170	205	265
TTS	100	215	480	355	435	720
Behavioral Response	135	285	640	455	555	970
High-Frequency Cetaceans						
Onset Mortality	30	50	225	145	175	215
Onset Slight Lung Injury	55	90	425	250	305	370
Onset Slight GI Tract Injury	40	80	150	145	180	250
PTS	140	375	710	470	570	855
TTS	500	705	4,125	810	945	2,415
Behavioral Response	570	930	5,030	2,010	4,965	5,705
Otariidae and Mustelidae						
Onset Mortality	35	65	285	175	215	260
Onset Slight Lung Injury	70	115	530	307	370	450
Onset Slight GI Tract Injury	40	8	150	145	180	250
PTS	30	50	30	50	85	150
TTS	40	85	210	220	260	400
Behavioral Response	60	145	305	300	350	530
Phocinea						
Onset Mortality	30	50	240	150	185	225
Onset Slight Lung Injury	60	100	445	265	320	385
Onset Slight GI Tract Injury	40	80	150	145	180	250
PTS	95	180	410	340	445	680
TTS	235	500	1,215	665	815	1,350
Behavioral Response	345	600	1,575	815	950	1,685

If explosive activities are preceded by multiple vessel traffic or hovering aircraft, beaked whales are assumed to move beyond the range to onset mortality before detonations occur. Table 3.4-20 shows the ranges to onset mortality for mid-frequency and high frequency cetaceans for a representative range of charge sizes. The range to onset mortality for all net explosive weights is less than 284 yd. (260 m), which is conservatively based on range to onset mortality for a calf. Because the Navy Acoustic Effects Model does not include avoidance behavior, the model-estimated mortalities are based on unlikely behavior for these species—that they would tolerate staying in an area of high human activity.

Therefore, beaked whales that were model-estimated to be within range of a mortality criteria exposure are assumed to avoid the activity and analyzed as being in the range of potential injury prior to the start of the explosive activity for the activities listed in Table 3.4-21.

Table 3.4-21: Activities Using Impulse Sources Preceded by Multiple Vessel Movements or Hovering Helicopters for the Study Area

Training
Civilian Port Defense
Mine Countermeasure (MCM) – Mine Neutralization
Firing Exercise
Gunnery Exercise (Surface-to-Surface) Ship/Boat – Medium-caliber
Mine Neutralization – Explosive Ordnance Disposal
Mine Neutralization – Remotely Operated Vehicle
Missile Exercise [Air to Surface]
Sinking Exercise
Underwater Demolition Qualification / Certification
Testing
Anti-Surface Warfare Tracking Test – Helicopter
Mine Countermeasures Mission Package Testing
Mine Countermeasures Neutralization Testing
Pierside Integrated Swimmer Defense
Sonobuoy Lot Acceptance Test
Torpedo (explosive) Testing

The Navy Acoustic Effects Model does not consider mitigation, which is discussed in detail in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring). As explained in Section 3.4.3.1.8 (Implementing Mitigation to Reduce Sound Exposures), to account for the implementation of mitigation measures, the acoustic analysis assumes a model-predicted mortality or injury would not occur if an animal at the water surface would likely be observed during those activities with Lookouts up to and during the use of explosives, considering the mitigation effectiveness (see Table 3.4-22) and sightability of a species based on g(0) (see For military readiness activities, MMPA Level A harassment includes any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild. Injury, as defined in this EIS/OEIS, is the destruction or loss of biological tissue from a marine mammal. The destruction or loss of biological tissue will result in an alteration of physiological function that exceeds the normal daily physiological variation of the intact tissue. For example, increased localized histamine production, edema, production of scar tissue, activation of clotting factors, white blood cell response, etc., may be expected following injury. Therefore, this EIS/OEIS assumes that all injury is qualified as a physiological effect and, to be consistent with prior actions and rulings (National Marine Fisheries Service 2001b, 2008b, 2008c) all injuries (except those serious enough to be expected to result in mortality) are considered MMPA Level A harassment.

Table 3.4-9 in Section 3.4.3.1.8, Implementing Mitigation to Reduce Sound Exposures). The mitigation effectiveness is considered over two regions of an activity's mitigation zone: (1) the range to onset mortality closer to the explosion and (2) range to onset PTS. The model-estimated mortalities and injuries are reduced by the portion of animals that are likely to be seen [Mitigation Effectiveness x Sightability, g(0)]; these animals are instead assumed to be present within the range to injury and range to TTS, respectively.

Table 3.4-22: Impulse Activities Adjustment Factors Integrating Implementation of Mitigation into Modeling Analyses for the Study Area

Activity[1,2]	Factor for Adjustment of Preliminary Modeling Estimates[3]		Mitigation Platform Used for Assessment
	Injury Zone	Mortality Zone	
Training			
Bombing Exercise [Air to Surface] (HF/LF)	0	1	Aircraft
Bombing Exercise [Air to Surface] (MF)	0.5	1	Aircraft
Civilian Port Defense	1	1	Vessel
Gunnery Exercise [Air to Surface] - Medium Caliber (HF)	0.5	0.5	Aircraft
Gunnery Exercise [Air to Surface] - Medium Caliber (MF/LF)	1	1	Aircraft
Gunnery Exercise [Surface-to-Surface] - Boat - Medium Caliber (HF)	0.5	0.5	Vessel
Gunnery Exercise [Surface to Surface] - Boat - Medium Caliber (MF/LF)	1	1	Vessel
Gunnery Exercise [Surface to Surface] - Ship - Medium Caliber (HF)	0.5	0.5	Vessel
Gunnery Exercise [Surface to Surface] - Ship - Medium Caliber (MF/LF)	1	1	Vessel
Mine Neutralization – Explosive Ordnance Disposal	0.5	1	Vessel
Mine Neutralization – Remote Operated Vehicle	1	1	Vessel
Sinking Exercise (HF/LF)	0	1	Aircraft
Sinking Exercise (MF)	0.5	1	Aircraft
Tracking Exercise/Torpedo Exercise – Maritime Patrol Aircraft Sonobuoy	0.5	0.5	Aircraft
Underwater Demolition Qualification/Certification	1	1	Vessel
Testing			
Airborne Mine Neutralization Test	1	1	Aircraft
Anti-Submarine Warfare Tracking Test - Helicopter	0.5	0.5	Aircraft
Mine Countermeasures Mission Package Testing	1	1	Vessel
Sonobuoy Lot Acceptance Testing	1	1	Vessel
Torpedo (Explosive) Testing	0.5	1	Aircraft

[1] Ranges to effect differ for functional hearing groups based on weighted threshold values. HF: high frequency cetaceans; MF: mid-frequency cetaceans; LF: low frequency cetaceans. The adjustment factor for all other activities (not listed) is zero and there is no adjustment of the preliminary modeling estimates as a result of implemented mitigation for those activities.
[2] If less than half of the mitigation zone can be continuously visually observed or if the mitigation zone cannot be visually observed during most of the scenarios within the activity due to the type of surveillance platform(s), number of Lookouts, and size of the mitigation zone, mitigation is not considered in the acoustic effects analysis of that activity and the activity is not listed in this table. For activities in which only mitigation in the mortality zone is considered in the analysis, no value is provided for the injury zone.
[3] A zero value is provided if the predicted maximum zone for the criteria is large and exceeds what mitigation procedures are likely to affect; a zero value indicates mitigation did not adjust or reduce the predicted exposures under that criteria.

During an activity with a series of explosions (not concurrent multiple explosions), an animal is expected to exhibit an initial startle reaction to the first detonation followed by a behavioral response after multiple detonations. At close ranges and high sound levels approaching those that could cause PTS, avoidance of the area around the explosions is the assumed behavioral response for most cases. The ranges to PTS for each functional hearing group for a range of explosive sizes (single detonation) are shown in Table 3.4-20. Animals not observed by Lookouts within the ranges to PTS at the time of the initial couple of explosions are assumed to experience PTS; however, all animals that exhibit avoidance reactions beyond the initial range to PTS are assumed to move away from the expanding range to PTS effects with each additional explosion.

Odontocetes have been demonstrated to have directional hearing, with best hearing sensitivity facing a sound source (Mooney et al. 2008; Popov and Supin 2009; Kastelein et al. 2005b). Therefore, an odontocete avoiding a source would receive sounds along a less sensitive hearing axis, potentially reducing impacts. Because the Navy Acoustic Effects Model does not account for avoidance behavior, the model-estimated effects are based on the unlikely behavior that animals would remain in the vicinity of potentially injurious sound sources. Therefore, only the initial exposures resulting in model-estimated PTS are expected to actually occur. The remaining model-estimated PTS exposures (resulting from accumulated energy) are considered to be TTS due to avoidance. Activities involving multiple non-concurrent explosive or other impulsive sources are listed in Table 3.4-23.

Table 3.4-23: Activities with Multiple Non-concurrent Impulse or Explosions

Training
Airborne Mine Neutralization Systems
Bombing Exercise [Air to Surface]
Civilian Port Defense
Gunnery Exercise [Air to Surface]
Gunnery Exercise [Surface to Surface] - Large Caliber
Gunnery Exercise [Surface to Surface] - Medium Caliber
Mine Neutralization – Explosive Ordnance Disposal
Mine Neutralization – Remote Operated Vehicle
Sinking Exercise
Underwater Demolition
Testing
Mine Countermeasure Mission Package Testing
Mine Countermeasures Mission Package Testing
Pierside Integrated Swimmer Defense
Sonobuoy Lot Acceptance Testing

3.4.3.2.2.3 Predicted Impacts

Table 3.4-24 through Table 3.4-29 present the predicted impacts to marine mammals separated between training and testing activities for explosions. All non-annual events are biennial (e.g., Rim of the Pacific Exercise) and are analyzed as occurring every other year, or three times during the 5-year period considered in this analysis. Annual totals presented in the tables are the summation of all annual plus the all proposed non-annual events occurring in a 12-month period (a maximum year).

This analysis uses the Navy Acoustic Effects Model (Section 3.4.3.1.6.3) to predict effects using the explosive criteria and thresholds described in Section 3.4.3.1.4 (Thresholds and Criteria for Predicting Acoustic and Explosive Impacts on Marine Mammals) and avoidance and mitigation factors are then used as described in Section 3.4.3.1.6 (Quantitative Analysis) to more accurately enumerate likely effects to marine mammals.

It is also important to note that acoustic impacts presented in Table 3.4-24 through Table 3.4-29 are the total number of exposures under the effects criteria and not necessarily the number of individuals exposed. As discussed in Section 3.4.3.1.5 (Behavioral Responses), an animal could be predicted to receive more than one acoustic impact over the course of a year. Species presented in tables had species density values (i.e., theoretically present to some degree) within the areas modeled for the given alternative and activities, although modeling may still indicate no effects after summing all annual exposures. This acoustic effects analysis uses the Navy Acoustic Effects Model followed by post-model consideration of avoidance and implementation of mitigation to predict effects using the explosive criteria and thresholds.

The Navy Acoustic Effects Model does not account for several factors that must be considered in the overall explosive analysis. When there is uncertainty in model input values, a conservative approach is often chosen to assure that potential effects are not under-estimated. As a result, the Navy Acoustic Effects Model provides estimates that are conservative (over-estimates the likely impacts). The following is a list of several such factors that cause the model to overestimate potential effects:

- The onset mortality criterion is based on the impulse at which one percent of the animals receiving an injury would not recover. Therefore, many animals that are counted as a mortality under the current criteria, may actually recover from their injuries.
- Slight lung injury criteria is based on the impulse at which one percent of the animals exposed would incur a slight lung injury from which full recovery would be expected. Therefore, many animals that are estimated to suffer slight lung injury in this analysis may actually not incur injuries.
- The metrics used for the threshold for slight lung injury and mortality (i.e., acoustic impulse) are based on the animal's mass. The smaller an animal, the more susceptible that individual is to these effects. In this analysis, all individuals of a given species are assigned the weight of that species newborn calf or pup weight. Since many individuals in a population are larger than a newborn calf or pup of that species, this assumption causes the acoustic model to overestimate the number of animals that may suffer slight lung injury or mortality. As discussed in the explanation of onset mortality and onset slight lung injury criteria, the volumes of water in which the threshold for onset mortality may be exceeded are generally less than a fifth for an adult animal versus a calf.
- Many explosions from munitions such as bombs and missiles will actually occur upon impact with above-water targets. However, for this analysis, sources such as these were modeled as exploding at approximately 1 yd. (1 m) depth. This overestimates the amount of explosive and acoustic energy entering the water and therefore overestimates effects on marine mammals.

These predicted impacts shown below are the result of the acoustic analysis, including acoustic effect modeling followed by consideration of animal avoidance of multiple exposures, avoidance of areas with high level of activity by sensitive species, and mitigation. It is important to note that acoustic impacts presented in the following tables are the total number of impacts and not necessarily the number of individuals impacted. As discussed in Section 3.4.3.1.2.6 (Behavioral Responses), an animal could be predicted to receive more than one acoustic impact over the course of a year.

3.4.3.2.2.4 No Action Alternative – Training

As described in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-1, and Section 3.0.5.3.1.2 (Explosives), training activities under the No Action Alternative would use underwater detonations and explosive ordnance. Training activities involving explosions could be conducted throughout the Study Area and typically occur more than 3 nm from shore. Exceptions to this are locations in SOCAL (e.g., SSTC, Northwest Harbor at San Clemente Island) and in Hawaii (Puuloa, Lima Landing) where these activities have been occurring for decades in nearshore shallow water locations.

As presented in Table 3.4-24, for the No Action Alternative, the acoustic modeling and post-modeling analyses predict 601 marine mammal exposures to impulsive sound (explosives) resulting in Level B[30] harassment, 109 exposures resulting in Level A[31], and 6 mortality[32] as defined under the MMPA for military readiness activities.

Until a recent incident in March 2011, there were no known incidents or records of any explosives training activity involving injury to a marine mammal at any site in the Study Area. In most cases, the same Navy training activities presented in the No Action Alternative have been occurring at many of the same sites in the Study Area for at least three decades and without incident. At the SSTC on Coronado, California, on average per year there are approximately 415 detonations occurring during an estimated 311 training events at that location. Despite the Navy's excellent decades-long track record, on March 4, 2011, it is clear that a training event resulted in the known mortalities to four[33] long-beaked common dolphins, which inadvertently died as a direct result of an underwater detonation. Range clearance procedures had been implemented and there were no marine mammals in the area when the timed-fuse countdown to detonation began. Personnel moved back from the site, and just before the detonation was to occur, dolphins were observed moving into the clearance zone. Due to the danger to personnel, the Navy could not attempt to divert those animals, stop the timer, or disarm the explosive.

Modeling results (without adjustments for mitigation and avoidance) and the record of having conducted the same or similar events for decades both indicate injuries and mortality are unlikely. Given the short radii for the impact zone, range clearance procedures, and that it is unlikely for marine mammals to be in the area also suggests injuries and mortality are unlikely. Although the March 4, 2011, event was an unfortunate and an extremely rare incident (given that it has never occurred before), it remains extremely unlikely that a similar event involving the use of explosives in a training event would re-occur. Based on this one occurrence however, under the No Action Alternative the Navy will request authorization under the MMPA for the annual incidental mortality of five small odontocetes (e.g., dolphins) and/or pinnipeds associated with Navy training activities using explosives in the Study Area.

Mysticetes

Predicted impacts on mysticetes from training activities under the No Action Alternative from explosions are relatively low over a year of training activities, with 1 PTS, 19 TTS, and 14 behavioral responses predicted. Table 3.4-20 presents predicted ranges to specified effects for low-frequency cetaceans (mysticetes).

---

[30] This is the combined summation of all non-TTS and TTS exposures (behavioral effects) for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the 12-month period).

[31] This is the combined summation of all PTS, gastro-intestinal, and slight lung injury exposures for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the same 12-month period).

[32] This is the combined summation of all 1% mortality (50% lung injury) exposures for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the same 12-month period).

[33] Immediately after the detonation, Navy personnel found three dead long-beaked common dolphins and reported the incident to the Navy chain of command who informed NMFS. Three days later a long–beaked common dolphin was discovered at Oceanside (approximately 40 miles (65 km) up the coast and another was discovered 10 days after the training event at La Jolla and approximately 15 miles (45 km) from the training site. Due to the species being one which commonly strands and the number of days and distance from the event, the association of this last stranded animals with the event is not certain (see Danil and St. Leger 2011).

Table 3.4-24: Predicted Impacts from Explosions for Annual Training under the No Action Alternative

Species	Stock	Behavioral	TTS	PTS	GI Injury	Lung Injury	Mortality
Blue whale	Eastern North Pacific	1	2	0	0	0	0
	Central North Pacific	0	0	0	0	0	0
Fin whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Humpback whale	CA/OR/WA	0	0	0	0	0	0
	Central North Pacific	0	0	0	0	0	0
Sei whale	Eastern North Pacific	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Sperm whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Guadalupe fur seal	Mexico	0	0	0	0	0	0
Hawaiian monk seal	Hawaiian	1	1	0	0	0	0
Bryde's whale	Eastern Tropical Pacific	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Gray whale	Eastern North Pacific	13	17	1	0	0	0
	Western North Pacific	0	0	0	0	0	0
Minke whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Baird's beaked whale	CA/OR/WA	0	0	0	0	0	0
Blainville's beaked whale	Hawaiian	0	0	0	0	0	0
Bottlenose dolphin	CA/OR/WA Offshore	2	2	0	0	0	0
	California Inshore	1	2	0	0	0	0
	Hawaii Stock Complex	0	0	0	0	0	0
Cuvier's beaked whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Dwarf sperm whale	Hawaiian	1	1	6	0	0	0
Dall's porpoise	CA/OR/WA	25	27	6	0	1	0
False killer whale	Hawaii Pelagic	0	0	0	0	0	0
	Main Hawaiian Islands Insular	0	0	0	0	0	0
	Northwestern Hawaiian Islands	0	0	0	0	0	0
Fraser's dolphin	Hawaiian	0	0	0	0	0	0

Table 3.4-25: Predicted Impacts from Explosions for Annual Training under the No Action Alternative (continued)

Species	Stock	Behavioral	TTS	PTS	GI Injury	Lung Injury	Mortality
Killer whale	Eastern North Pacific Offshore/Transient	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Kogia spp.	CA/OR/WA	2	2	1	0	0	0
Long-beaked common dolphin	CA/OR/WA	3	7	0	0	0	0
Longman's beaked whale	Hawaiian	0	0	0	0	0	0
Melon-headed whale	Hawaiian	0	0	0	0	0	0
Mesoplodon beaked whales*	CA/OR/WA	0	0	0	0	0	0
Northern right whale dolphin	CA/OR/WA	5	8	0	0	1	0
Pacific white-sided dolphin	CA/OR/WA	4	7	0	0	1	0
Pantropical spotted dolphin	Hawaiian	0	1	0	0	0	0
Pygmy killer whale	Hawaiian	0	0	0	0	0	0
Pygmy sperm whale	Hawaiian	0	0	0	0	0	0
Risso's dolphin	CA/OR/WA	10	13	0	0	1	0
	Hawaiian	0	0	0	0	0	0
Rough-toothed dolphin	Hawaiian	0	0	0	0	0	0
Short-beaked common dolphin	CA/OR/WA	121	228	4	1	58	3
Short-finned pilot whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Spinner dolphin	Hawaiian Stock Complex	0	0	0	0	0	0
Striped dolphin	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Southern sea otter	San Nicolas Island Translocated Colony	0	0	0	0	0	0
California sea lion	U.S. Stock	24	14	10	0	12	3
Northern fur seal	San Miguel Island	1	0	0	0	2	0
Harbor seal	California	5	5	0	0	0	0
Northern elephant seal	California Breeding	21	24	3	0	1	0

Blue Whales (Endangered Species Act-Listed)

Blue whales may be exposed to sound or energy from explosions associated with training activities throughout the year. Acoustic modeling predicts that in SOCAL, Eastern North Pacific stock blue whales could be exposed to sound that may result in 2 TTS and 1 behavioral reaction per year. In Hawaii, Central North Pacific stock blue whales would not be exposed to sound or energy from explosions associated with training activities, which would exceed the current impact thresholds. For both stocks and as presented above for mysticetes in general, long-term consequences for individuals or populations would not be expected.

Humpback Whales (Endangered Species Act-Listed)

Humpback whales would not be exposed to sound or energy from explosions associated with training activities, which would exceed the current impact thresholds. The presence of the Central Pacific stock of humpback whales in Hawaii is primarily coastal and during winter and spring (November through April). For the maximum year analyzed, some training events involving use of explosives would likely occur in summer (e.g., during the biennial Rim of the Pacific Exercise) when Central Pacific stock of humpback whales would not be present in HRC. In addition, the majority of training using explosives occurs further offshore than typical humpback whale winter distribution in the HRC (e.g., Warning Areas 188, 192, 193, 194, 196, and Mela South [Figure 2.1-2]). Sinking Exercise events occur offshore in waters in excess of 50 mi. (93 km) from land and in a depth no less than 6,000 ft. (1,830 m) and also historically occur in the summer during Rim of the Pacific Exercise. The greatest density of humpback whales in HRC in are found in shallower waters within the 100 fathom (183 m) isobaths, and the vast majority of the rarer outliers deeper than 100 fathoms (183 m) are found within the 1,000 fathom (1,830 m) isobaths that are still significantly shallower than the above warning areas (73 FR 35510, 35520). There would be no Central Pacific stock of humpback whale occurrence near the HRC very near shore underwater detonation locations. Naval Inactive Ship Maintenance Facility is within Pearl Harbor, and the other in-water ranges for underwater detonations (Puuloa Underwater Range, Barbers Point Underwater Range, and Ewa Training Minefield [Figure 2.1-4]) are in waters shallower than expected for humpback whale occurrence, with historic and most likely exercise use being in waters at or shallower than approximately 60 ft. (20 m). In the unlikely event of humpback whales moving to atypically and extremely shallow waters within the mitigation zone for underwater detonations at the deepest part of the ranges (e.g., Puuloa and Ewa Training Minefield), due to the high degree of salience of the visual cue of their blow and relatively short dive times, they are expected to be easily spotted during the implementation of mitigation measures that require visual searches for 30 minutes prior to an underwater detonation as discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring).

The California, Oregon, Washington stock of humpback is also somewhat transitory through the Navy's SOCAL Range Complex. The California, Oregon, Washington stock of humpback whales was one of the least sighted baleen whales in summer and winter aerial surveys over key Navy training areas within the SOCAL Range Complex (U.S. Department of the Navy 2013a). This was from dedicated aerial surveys that completed 39,129 nm (72,467 km) of survey effort from October 2008 through June 2012 (and continuing in 2013). Peak occurrence is from December through June and out of 68 individual humpback whale sightings during this monitoring over approximately 4 years, 73 percent of the sightings were during the cool water season (U.S. Department of the Navy 2013a). There would be no California, Oregon, Washington stock of humpback whales expected in the vicinity of very near shore underwater detonation locations in SOCAL.

Given the very near location for underwater detonations where humpbacks do not occur and application of mitigation during explosive events (Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring), the likelihood of humpback whale occurrence in either HRC or SOCAL co-occurring with major at-sea explosive use being relatively low, and the likely seasonal component of humpback whale distribution north of both HRC and SOCAL during the summer foraging season, humpback whales would not be exposed to sound or energy from explosions associated with training activities exceeding the current impact thresholds. Although limited numbers of individual ESA-listed humpback whale might occasionally be present in the Study Area, it is unlikely that explosive stressors and this species would co-occur based on the expected locations of training, best available science regarding marine mammal densities, and the typical short duration of the activity.

Sei Whales (Endangered Species Act-Listed)

Sei whales would not be exposed to sound or energy from explosions associated with training activities, which would exceed the current impact thresholds. The Hawaiian stock of sei whale has not been sighted frequently in NMFS-conducted Hawaii surveys. Although a few sightings were made in a 2002 survey by NMFS, and were used to derive the best available abundance estimate for this stock, NMFS also acknowledged that the majority of sei whales would be expected to have migrated and be at higher latitudes in their feeding grounds at the time of year that survey occurred (summer/fall) (Carretta et al. 2013). During the Navy's extensive monitoring surveys in the HRC between 2007 and 2013, only two sei whale groups were observed (U.S. Department of the Navy 2013b); these 2007 sightings were considered unusual enough for publication (Smultea et al. 2010). No individuals from the Central Pacific stock of sei whales are expected to occur in the vicinity of very near shore underwater detonation locations in HRC given the groups observed in 2007 were in waters approximately 1,000-2,700 fathoms (2,000-5,000 m) deep and approximately 27-38 nm (50-70 km) from shore (Smultea et al. 2010). Although sei whales may occur in deep water where training involving use of explosives occurs, some events such as Sinking Exercises have historically been conducted only during Rim of the Pacific Exercise in the summer when migratory baleen whales are thought to leave Hawaiian waters.

The Eastern North Pacific Stock of sei whale has not been sighted frequently in NMFS U.S. West Coast surveys. There have only been 9 sightings by NMFS in their California, Oregon, and Washington strata from 1991 to 2008 (Carretta et al. 2013), with no NMFS sightings reported in the Navy's SOCAL Range Complex over this period. Five years of Navy funded compliance monitoring using aerial surveys in SOCAL reported 14 individuals in a category called fin/Bryde's/sei whale sighted between 2008-2012 over the deep basin waters east and west of San Clemente Island. Morphological similarities between the three species (fin/Bryde's/sei whale) made it difficult to confirm if any of these sightings were specifically sei whales. In addition, over several tens of thousands of hours of passive acoustic Navy funded monitoring for the same period, no sei whale vocalization were reported, although summer seasonal vocalizations of Bryde's whales were confirmed (U.S. Department of the Navy 2013a). There would be no Eastern North Pacific stock of sei whales expected in the vicinity of very near shore underwater detonation locations in SOCAL.

Given the near shore nature of many training explosive events, application of mitigation during these events (Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring), the likelihood of sei whale occurrence in either HRC and SOCAL being relatively low, and the likely seasonal component of sei whale distribution further north and seaward of both HRC and SOCAL, sei whales would not be exposed to sound or energy from explosions associated with training activities exceeding the current impact thresholds. Although limited numbers of individual ESA-listed sei whale might occasionally be present in the Study Area, it is unlikely that explosive stressors and this species would co-occur based on the expected locations of training, best available science regarding marine mammal densities, and the typical short duration of the activity.

Fin Whales (Endangered Species Act-Listed)

Fin whales would not be exposed to sound or energy from explosions associated with training activities, which would exceed the current impact thresholds.

Gray Whales, Eastern North Pacific Stock and Endangered Species Act-Listed Western North Pacific Stock

Gray whales may be exposed to sound or energy from explosions during the cool seasons when and if their presence coincides with training activities in the Study Area. In SOCAL (there are no gray whales present in Hawaii), acoustic modeling predicts that the Eastern North Pacific gray whale could be exposed to sound that may result in 1 PTS, 23 TTS, and 14 behavioral reactions per year. The Western North Pacific stock of gray whale would not be exposed to sound or energy from explosions associated with training activities, which would exceed the current impact thresholds. As presented above for mysticetes in general, for both stocks and individuals within these stocks, long-term consequences would not be expected.

Other Mysticetes (Bryde's and Minke Whales)

Bryde's and minke whales would not be exposed to sound or energy from explosions associated with training activities, which would exceed the current impact thresholds.

Odontocetes

Predicted impacts to odontocetes from training activities under the No Action Alternative from sound or energy from explosions are approximately 92 percent from Bombing Exercise (air to surface), Gunnery Exercise [surface-to-surface] - Ship - Large Caliber, Mine Neutralization – EOD, and Tracking Exercise/Torpedo Exercise - Maritime Patrol Aircraft Extended Echo Ranging Sonobuoy. These Annual predicted impacts involve three mortality, 74 slight lung injury, 17 PTS, 393 TTS, and 154 behavioral reactions. The majority of these predicted effects (approximately 73 percent) are to short-beaked common dolphin, which occur in large pods making them easier to detect for implementation of mitigation measures. As noted previously, explosive impact criteria are based upon newborn calf weights, and therefore these effects are over predicted by the model, assuming most animals within the population are larger than a newborn calf. Furthermore, as explained above, the criteria for mortality and injury are very conservative (e.g., overestimate the effect). Nevertheless, it is possible for odontocetes to be injured or killed by an explosion in isolated instances. While the Navy does not anticipate mortalities from the use of underwater detonations, the possibility exists. Considering that some species for which these impacts are predicted have stocks with hundreds of thousands of animals, removing a few animals from the population is unlikely to have measurable long-term consequences.

Recovery from a threshold shift (i.e., partial hearing loss) can take a few minutes to a few days, depending on the severity of the initial shift. PTS would not fully recover. Threshold shifts do not necessarily affect all hearing frequencies equally, so some threshold shifts may not interfere with an animal hearing biologically relevant sounds. It is uncertain whether some permanent hearing loss over a part of a marine mammal's hearing range would have long-term consequences for that individual, since many mammals lose hearing ability as they age.

Research and observations (Section 3.4.3.1.2.6, Behavioral Reactions) show that if odontocetes are exposed to explosions, they may react by alerting, ignoring the stimulus, changing their behaviors or vocalizations, or avoiding the area by swimming away or diving. Overall, predicted impacts are low. Occasional behavioral reactions to intermittent explosions are unlikely to cause long-term consequences for individual animals or populations of odontocetes.

Sperm Whales (Endangered Species Act-Listed)

Sperm whales (classified as mid-frequency cetaceans [see Section 3.4.2.3.2, Mid-Frequency Cetaceans]) may be exposed to sound or energy from explosions associated with training activities throughout the year. Acoustic modeling predicts that sperm whales would not be exposed to sound or energy from explosions associated with training activities, which would exceed the current impact thresholds. The Hawaiian stock of sperm whales are likely present year-round in the HRC from sighting, stranding, and acoustic evidence (Carretta et al. 2013). It is not known whether any or all of these animals routinely enter the U.S. Exclusive Economic Zone of the Hawaiian Islands (Carretta et al. 2013). Nonetheless, since a 2002 shipboard line-transect survey of the entire Hawaiian Islands Exclusive Economic Zone (Barlow 2006) showed an even distribution of sightings of sperm whales to the borders of the Exclusive Economic Zone, this population is likely to extend to a larger pool of individuals well beyond the boundaries of the HRC, insulating any population-level effects as a result of individuals that do enter the HRC. The Pacific Navy Marine Species Density Database uses the Central Pacific spatial density model for sperm whales (Becker et al. 2012). This ecological model is applied for all four seasons to the HRC. When considering the average deep-water density from this model, together with the total surface area of estimated zones of injury around an explosive event, and the number of events, the probability of injury to a sperm whale may be calculated and is extremely unlikely. The modeling predicts that the total annual injury (the summation of all predicted PTS, gastrointestinal, and slight lung injury effects) for the Hawaiian stock sperm whale in the HRC from explosives is 0.003417. Events involving use of explosives often involve multiple detonations in a single event, making it less likely that animals would be exposed than if the detonations were spread out in time and location, and also more likely that the animals are spotted by implementing mitigation measures as discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring).

There would be no Hawaiian stock of sperm whale occurrence in the vicinity of very near shore underwater detonation locations in HRC, due to deep water distribution of this species. Naval Inactive Ship Maintenance Facility is within Pearl Harbor, and the other in-water ranges for underwater detonations (Puuloa Underwater Range, Barbers Point Underwater Range, and Ewa training Minefield [Figure 2.1-4]) are in waters much shallower than expected for sperm whale occurrence, with most historical and likely exercise use being in waters at or shallower than approximately 60 ft. (20m).

The California, Washington, Oregon stock of sperm whales have been documented infrequently occurring in the deep offshore waters of the SOCAL Range Complex with one sighting of a pod of 20 animals 29 nm (54 km) west of San Diego in spring of 2011 and sporadic echolocation detections from passive acoustic devices from fixed sensors and sonobuoys (U.S, Department of the Navy 2013b).

Given the near shore nature of many training explosive events and the application of mitigation during these events (Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring), sperm whales would not likely be exposed to large numbers of explosive training events in the deep offshore waters of HRC and SOCAL (model predicted total annual injury to sperm whales from use of explosives in SOCAL total approximately 0.018050 annually). However, deep diving sperm whales may possibly be present at-sea and could be exposed to sound or energy from explosions associated with training activities during infrequent Sinking Exercises (HRC only), Bombing Exercises (air to surface) (HRC and SOCAL), and some Missile Exercises (west and south of San Clemente Island in the SOCAL portion of the Study Area) (Figure 2.1-7). Long-term consequences for individuals or populations would not be expected.

False Killer Whale, Hawaii Pelagic Stock, Northwestern Hawaiian Islands Stock, and Main Hawaiian Islands Insular Stock (the latter Endangered Species Act-Listed)

False killer whales in the HRC portion of the Study Area may be exposed to sound or energy from explosions associated with training activities throughout the year. Acoustic modeling predicts that false killer whales would not be exposed to sound or energy from explosions associated with training activities, which would exceed the current impact thresholds. Distribution of Main Hawaiian Islands insular false killer whales has been assessed using data from visual surveys and satellite tag data. Tagging data from seven groups of individuals tagged off the islands of Hawaii and Oahu indicate that the whales move rapidly and semi-regularly throughout the main Hawaiian Islands and have been documented as far as 60 nm (112 km) offshore over a total range of approximately 31,970 mi^2 (82,800 km^2) (Baird et al. 2012). Baird et al. (2012), note that limitations in the sampling, "suggest the range of the population is likely underestimated." Photo identification studies also document that the animals regularly use both leeward and windward sides of the islands (Baird et al. 2005; Baird 2009a; Baird et al. 2010b, Forney et al. 2010). Some individual false killer whales tagged off the island of Hawaii have remained around that island for extended periods (days to weeks), but individuals from all tagged groups eventually were found broadly distributed throughout the main Hawaiian Islands (Baird 2009a; Forney et al. 2010). Individuals utilize habitat over varying water depths of approximately < 27 fathoms to > 2,190 fathoms (< 50 m to > 4,000 m) (Baird et al. 2010b). It has been hypothesized that interisland movements may depend on the density and movement patterns of their prey species (Baird 2009a). Baird et al. (2012) examined satellite tag deployments on Main Hawaiian Islands insular false killer whales to assess their range, and preliminarily identified three locations of primary habitat: (1) off the north half of Hawaii Island, (2) north of Maui and Molokai, and (3) southwest of Lanai. Other waters where animals have been observed were judged likely to be relatively low-density areas for this population .The three high density areas identified do not overlap with the waters in which the Navy proposes to conduct underwater explosives training: Warning Areas 188, 191, 192, 193, 194, 196, and Mela South, as well as the near shore demolition ranges, all at Oahu, i.e., Puuloa Underwater Range, Barbers Point Underwater Range, Naval Inactive Ship Maintenance Facility, Lima Landing and Ewa Training Minefield (Figures 2.1-2 and 2.1-4). Baird et al. (2012a) noted, however, that due to limitations in the sampling, "there are probably other high-use areas that have not been identified."

It is unlikely that explosive stressors and ESA-listed false killer whales would co-occur based on the expected locations of training (e.g., nearshore underwater detonations), best available science regarding marine mammal densities, and the typical short duration of the activity. Acoustic modeling predicts that false killer whales would not be exposed to sound or energy from explosions associated with training activities, which would exceed the current impact thresholds. Long-term consequences for individuals or populations would not be expected.

Beaked Whales

Beaked whales may be exposed to sound or energy from explosions associated with training activities throughout the year. Acoustic modeling predicts that beaked whales would not be exposed to sound or energy from explosions associated with training activities, which would exceed the current impact thresholds. Long-term consequences for individuals or populations would not be expected.

Pygmy and Dwarf Sperm Whales (*Kogia* spp.)

Pygmy and dwarf sperm whales (genus: *Kogia*) (classified as high-frequency cetaceans [see Section 3.4.2.3.1, High-Frequency Cetaceans]) may be exposed to sound or energy from explosions associated with training activities throughout the year. In SOCAL the two *Kogia* species are managed as a single California, Oregon, Washington stock and management unit. Acoustic modeling predicts that *Kogia* spp. in SOCAL could be exposed to sound or energy from explosions that may result in 1 PTS, 1 TTS and 2 behavioral reactions. Long-term consequences for populations would not be expected.

In Hawaii, NMFS manages *Kogia* as separate species and stocks. Within the HRC, acoustic modeling predicts that Hawaiian stock pygmy sperm whale and dwarf sperm whale may be exposed to sound or energy from explosions associated with training activities throughout the year. Acoustic modeling predicts that pygmy sperm whale would not, however, be exposed to sound or energy from explosions associated with training activities that would exceed the current impact thresholds.

Hawaiian stock dwarf sperm whale could be exposed to sound or energy from explosions that may result in 6 PTS, 1 TTS, and 1 behavioral reaction. Recovery from a threshold shift (i.e., TTS; temporary partial hearing loss) can take a few minutes to a few days, depending on the severity of the initial shift. Threshold shifts do not necessarily affect all hearing frequencies equally, so some threshold shifts may not interfere with an animal hearing biologically relevant sounds. Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce the predicted impacts since not all mitigations are considered in the adjustment of modeling results. Long-term consequences for the individuals or the population of these species would not be expected.

Dall's Porpoise

Dall's porpoise (classified as high-frequency cetaceans [see Section 3.4.2.3.1, High-Frequency Cetaceans]) are present only in the SOCAL Range Complex portion of the Study Area and are part of the California, Oregon, Washington stock. Dall's porpoise may be exposed to sound or energy from explosions associated with training activities throughout the year. Acoustic modeling predicts that Dall's porpoise could be exposed to sound or energy from explosions that may result in 1 slight lung injury, 6 PTS, 27 TTS, and 25 behavioral reactions.

As noted above for odontocetes in general, the explosive impact criteria are based upon newborn calf weights, and therefore these effects are over predicted by the model, assuming most animals within the population are larger than a newborn calf. Nevertheless, it is possible for Dall's porpoise to be injured by an explosion in isolated instances. Considering that one slight lung injury is predicted for a Dall's porpoise stock with tens of thousands of animals, injury to an animal from that population would be unlikely to have measurable long-term consequences.

As discussed in Section 3.4.3.2.2.1 (Range to Effects), ranges to PTS as an injury effect are on average less than approximately 935 yd. (855 m) from the largest explosive (Bin E12) used in HSTT for a high frequency cetacean such as Dall's porpoise. Recovery from a TTS (i.e., TTS; temporary partial hearing loss) can take a few minutes to a few days, depending on the severity of the initial shift. PTS would not fully recover. Threshold shifts do not necessarily affect all hearing frequencies equally, so some threshold shifts may not interfere with an animal hearing biologically relevant sounds. It is uncertain whether some permanent hearing loss over a part of a marine mammal's hearing range would have long-term consequences for that individual, although many mammals lose hearing ability as they age.

Research and observations (Section 3.4.3.1.2.6, Behavioral Reactions) show that if odontocetes are exposed to explosions, they may react by alerting, ignoring the stimulus, changing their behaviors or vocalizations, or avoiding the area by swimming away or diving. Behavioral impacts could take place at distances exceeding approximately 3 nm (5.7 km) from the largest explosive (Bin E12) for Dall's porpoise, although significant behavioral effects are much more likely at higher received levels within a few hundred meters of the sound source. Overall, predicted impacts to Dall's porpoise are low, and mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce potential impacts. Occasional behavioral reactions to intermittent explosions are unlikely to cause long-term consequences for individual animals or populations.

Dolphins and Small Whales (Delphinids)

Delphinids (classified as mid-frequency cetaceans [see Section 3.4.2.3.2, Mid-Frequency Cetaceans]) may be exposed to sonar or other active acoustic stressors associated with training activities throughout the year. Species included as delphinids, for purposes of this discussion, include the following: bottlenose dolphin, Fraser's dolphin, killer whale, long-beaked common dolphin, melon-headed whale, northern right whale dolphin, Pacific white-sided dolphin' pantropical spotted dolphin, pygmy killer whale, Risso's dolphin, rough toothed dolphin, short-beaked common dolphin, short-finned pilot whale, spinner dolphin, and striped dolphin.

A total of 3 onset mortality (i.e., 1 percent probability of mortality), 61 onset slight lung injury, and 1 gastrointestinal tract injury are predicted; all these predicted effects except four of the slight lung injury are to short-beaked common dolphin. The explosive criteria are based upon newborn calf weights, and therefore these effects are over predicted by the model, assuming most animals within the population are larger than a newborn calf. Furthermore, as explained in Section 3.4.3.1.4.8 (Mortality and Injury from Explosives), the criteria for mortality and slight lung injury are very conservative (e.g., overestimate the effect). Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) are designed to avoid potential effects from underwater detonations, especially higher order effects such as injury and death. Nevertheless, it is possible for short-beaked common dolphin to be injured or killed by an explosion in isolated instances. Considering that short-beaked common dolphin for which these effects are predicted have a stock with hundreds of thousands of animals, removing three animals from the population would be unlikely to have measurable long-term consequences.

A total of 4 PTS and 268 TTS are predicted for seven species of delphinids. As discussed in Section 3.4.3.2.2.1 (Range to Effects), ranges to PTS as an injury effect are on average less than approximately 290 yd. (265 m) for the majority of odontocetes (mid-frequency cetaceans) from the largest explosive (Bin E12) used in HSTT. Recovery from a TTS (i.e., TTS; temporary partial hearing loss) can take a few minutes to a few days, depending on the severity of the initial shift. PTS would not fully recover. Threshold shifts do not necessarily affect all hearing frequencies equally, so some threshold shifts may not interfere with an animal hearing biologically relevant sounds. It is uncertain whether some permanent hearing loss over a part of a marine mammal's hearing range would have long-term consequences for that individual, although many mammals lose hearing ability as they age. Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce the predicted impacts.

Acoustic modeling indicates that 146 delphinids from seven species could be exposed to sound or energy from underwater explosions that would result in a behavioral response. Research and observations (Section 3.4.3.1.2.6, Behavioral Reactions) show that if delphinids are exposed to explosions, they may react by alerting, ignoring the stimulus, changing their behaviors or vocalizations, or avoiding the area by swimming away or diving. Some behavioral impacts could take place at distances exceeding approximately 1060 yd. (970 m) for more sensitive species, although significant behavioral effects are much more likely at higher received levels closer to the sound and energy source. Overall, predicted effects are low, and mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce potential impacts. Occasional behavioral reactions to intermittent explosions are unlikely to cause long-term consequences for individual animals or populations.

Pinniped

Predicted impacts to pinniped from training activities under the No Action Alternative from sound or energy from explosions are approximately 97 percent from Bombing Exercise (air to surface), Mine Neutralization – Explosive Ordnance Disposal, and Gunnery Exercise [surface to surface] - Ship - Large Caliber proposed to continue taking place in SOCAL.

Phocids (Harbor Seal, Northern Elephant Seal, and Hawaiian Monk Seal)

Harbor seal and northern elephant seal are the species of phocid pinnipeds expected within the SOCAL Range Complex portion of the Study Area. Harbor seal are part of the California Stock and northern elephant seal are the California breeding stock. Hawaiian monk seal are present in Hawaii and considered the Hawaiian stock. Phocids may be exposed to sound or energy from underwater explosions associated with training activities throughout the year.

Acoustic modeling predicts northern elephant seal in SOCAL could be exposed to sound that may result in one slight lung injury annually. The slight lung injury criteria are based upon newborn calf weights, and therefore these effects are over predicted by the model, assuming most elephant seal within the population are larger than a newborn calf. Furthermore, as explained in Section 3.4.3.1.4.8 (Mortality and Injury from Explosives), the criteria for mortality and slight lung injury are very conservative (e.g., overestimate the effect). Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) are designed to avoid potential effects from underwater detonations, especially higher order effects resulting in injury. These effects would be unlikely to have measurable long-term consequences to the stock.

A total of 3 PTS and 29 TTS are predicted for harbor seal and northern elephant seal in SOCAL. As discussed in Section 3.4.3.2.2.1 (Range to Effects), ranges to PTS as an injury effect are on average less than 680 m from the largest explosive (Bin E12) used in HSTT. PTS would not fully recover. Recovery from a TTS (i.e., TTS; temporary partial hearing loss) can take a few minutes to a few days, depending on the severity of the initial shift. Threshold shifts do not necessarily affect all hearing frequencies equally, so some threshold shifts may not interfere with an animal hearing biologically relevant sounds. It is uncertain whether some permanent hearing loss over a part of a marine mammal's hearing range would have long-term consequences for that individual, although many mammals lose hearing ability as they age. Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce the predicted impacts.

Acoustic modeling indicates that there would be 26 exposures to sound or energy from underwater explosions that would result in a behavioral response in SOCAL. Research and observations (Section 3.4.3.1.2.6, Behavioral Reactions) show that if pinnipeds are exposed to impulsive sound, they may react by alerting, ignoring the stimulus, changing their behaviors or vocalizations, or leaving the area. Some behavioral impacts could take place at distances exceeding approximately 0.9 nm (1.7 km) from the largest explosive (Bin E12) used in HSTT. Overall, predicted effects are low, and mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce potential impacts. Occasional behavioral reactions to intermittent explosions are unlikely to cause long-term consequences for individual animals or populations.

Hawaiian Monk Seal (Endangered Species Act-Listed)

Acoustic modeling predicts that the Hawaiian stock of Hawaiian monk seal could be exposed to sound or energy from underwater explosions that may result in 1 TTS and 1 behavioral reaction. As discussed above for the other phocid seal in the Study Area, the costs and long-term consequences as a result of TTS would apply similarly to Hawaiian monk seal. Population level consequences are not expected. Activities involving sound or energy from underwater explosions will not occur on shore in designated Hawaiian monk seal critical habitat where haul-out and resting behavior occurs and would have no effect on critical habitat at sea.

Otariids (Sea Lion and Fur Seal)

California sea lion, Guadalupe fur seal, and northern fur seal comprise the otariid species of pinniped, which are present only in the SOCAL portion of the Study Area. The Guadalupe fur seal is listed as threatened under the ESA. Otariids may be exposed to sound or energy from underwater explosions associated with training activities throughout the year. Predicted impacts to otariids from training activities under the No Action Alternative from sound or energy from explosions are approximately 75 percent from Bombing Exercise (air to surface) and Mine Neutralization – Explosive Ordnance Disposal.

As presented on Table 3.4-24, a total of 3 onset mortality (i.e., 1 percent probability of mortality to California sea lion) and 12 slight lung injury to California sea lion are predicted. A total of 2 slight lung injury are predicted for northern fur seal. These explosive criteria are based upon newborn calf weights, and therefore these effects are over predicted by the model, assuming most animals within the population are larger than a newborn dolphin calf. Furthermore, as explained in Section 3.4.3.1.4.8 (Mortality and Injury from Explosives), the criteria for mortality and slight lung injury are very conservative (e.g., overestimate the effect). Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) are designed to avoid potential effects from underwater detonations, especially higher order effects such as injury and death. Nevertheless, it is possible for otariids to be injured or killed by an explosion in isolated instances. Considering that California sea lion has a stock with hundreds of thousands of animals, removing several animals from the population would be unlikely to have measurable long-term consequences.

A total of 10 PTS and 14 TTS are predicted for California sea lion). As discussed in Section 3.4.3.2.2.1 (Range to Effects), ranges to PTS as an injury are on average less than approximately 160 yd. (150 m) from the largest explosive (Bin E12) used in HSTT. PTS would not fully recover. Recovery from a TTS (i.e., TTS; temporary partial hearing loss) can take a few minutes to a few days, depending on the severity of the initial shift. Threshold shifts do not necessarily affect all hearing frequencies equally, so some threshold shifts may not interfere with an animal hearing biologically relevant sounds. It is uncertain whether some permanent hearing loss over a part of a marine mammal's hearing range would have long-term consequences for that individual, although many mammals lose hearing ability as they age. Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce the predicted impacts.

Acoustic modeling predicts 24 exposures to California sea lion and one exposure to northern fur seal resulting in behavioral reactions. Some behavioral impacts could take place at distances exceeding approximately 580 yd. (530 m) from the largest explosive (Bin E12) used in HSTT. As described above for phocid seal, overall, predicted effects are low, and mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce potential impacts. Occasional behavioral reactions to intermittent explosions are unlikely to cause long-term consequences for individual animals or populations.

Guadalupe Fur Seal (Endangered Species Act-Listed as Threatened)

Acoustic modeling predicts that the Mexico stock of Guadalupe fur seal would not be exposed to sound or energy from explosions associated with training activities, which would exceed the current impact thresholds. The Guadalupe fur seal population has been increasing at an average annual growth rate of 13.7 percent from the single breeding colony at Guadalupe Island (Carretta et al. 2013). It would not be unexpected for some Guadalupe fur seals to forage at-sea within portions of the SOCAL Range Complex in the Study Area. However, proximity to Guadalupe Island as the primary breeding colony would likely mean more animals would be either outside of the SOCAL Range Complex, or only in more southern regions of the range where explosive training typically does not occur. Females, the more biologically important component of the population, would also be more tightly bound to Guadalupe Island (mating, breeding, molting) while young solitary males might travel further. There have been historic sporadic individual sightings of solitary males at some of the southern Channel Islands (San Nicolas), and even Guadalupe fur seal stranding as far north as the Pacific Northwest (Engelhard et al. 2012). In July and August 2012, a single male, single female, and single pup were sighted by NMFS biologists at San Miguel Island, north of the SOCAL Range Complex (DeAngelis 2013). Overall, however, the majority of the population likely occurs outside of the SOCAL Range Complex.

Although limited numbers of individual ESA-listed Guadalupe fur seals might occasionally be present in the Study Area, it is unlikely that explosive stressors and this species would co-occur based on the expected locations of training, best available science regarding marine mammal densities, and the typical short duration of the activity. Some behavioral impacts could take place at distances exceeding approximately 580 yd. (530 m) from the largest explosive (Bin E12) used in HSTT. As described above for phocid seal, overall, predicted effects are low, and mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce potential impacts. Occasional behavioral reactions to intermittent explosions are unlikely to cause long-term consequences for individual animals or populations. Critical habitat has not been designated Guadalupe fur seal.

Mustelid (Southern Sea Otter, Translocated Colony)

The sea otter present in the Study Area (at San Nicolas Island; see Section 3.4.2.47.1, Sea Otter Status and Management) are part of a translocated colony managed by the U.S. Fish and Wildlife Service. Currently, the California stock of southern sea otter are not expected to be present in the Study Area since their range does not extend south of Santa Barbara County (this county line is approximately 78 mi. [126 km]) north of the Study Area's northern edge in SOCAL).

Because it is unlikely that a sea otter would be in waters where depths exceed 35 m (115 ft.), it is extremely unlikely that sea otters would be present in proximity to most Navy training or testing events taking place in the water. Acoustic modeling for southern sea otter at San Nicolas was not undertaken given they are far from where activities involving in water explosives are proposed to occur, they inhabit complex shallow water environments where acoustic modeling is very imprecise and therefore not representative, and they spend little time underwater thus very much limiting the potential for exposure in any case. Research indicates sea otters often remained undisturbed, quickly become tolerant of the various sounds, and even when purposefully harassed, they generally moved only a short distance (100 to 200 m) before resuming normal activity. U.S. Fish and Wildlife Service has determined that previous Department of Defense (DoD) actions have not posed a threat to the San Nicolas colony of southern sea otter and the average growth rate for the translocated colony has been higher than that for those inhabiting the central California coastline in recent years (U.S. Department of the Interior 2012a). Given these factors, long-term consequences for individuals or the population would not be expected.

Conclusion

Training activities under the No Action Alternative include sound or energy from underwater explosions resulting from activities as described in Table 2.8-1 of Chapter 2 (Description of Proposed Action and Alternatives) and in Section 3.0.5.3.1.2 (Explosives). These activities could result in inadvertent takes of marine mammals in the Study Area.

Pursuant to the MMPA, the use of explosives during training activities under the No Action Alternative:

- *May expose marine mammals up to 601 times annually to sound or pressure levels that would be considered Level B harassment, as defined by the MMPA*
- *May expose marine mammals up to 109 times annually to sound or pressure levels that would be considered Level A harassment, as defined by the MMPA*
- *May result in serious injury or incidental mortality to 6 small odontocetes (e.g., dolphin) or pinniped annually*

Pursuant to the ESA, the use of explosives during training activities as described in the No Action Alternative:

- *May affect, and is likely to adversely affect, blue whale, sperm whale, and Hawaiian monk seal*
- *May affect, but is not likely to adversely affect, humpback whale, Western North Pacific gray whale, sei whale, fin whale, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.2.5 No Action Alternative – Testing

As described in Chapter 2 (Description of Proposed Action and Alternatives), Tables 2.8-2 through 2.8-5, and Section 3.0.5.3.1.2 (Explosives), testing activities under the No Action Alternative would use underwater detonations and explosive ordnance. Testing activities involving explosions could be conducted throughout the Study Area and typically occur more than 3 nm from shore. Exceptions to this are locations in SOCAL (e.g., SSTC, Northwest Harbor at San Clemente Island) and in Hawaii (Puuloa, Lima Landing) where these activities have been occurring for decades in nearshore shallow water locations.

As presented in Table 3.4-25, modeling indicates that under the No Action Alternative there would be 81 exposures from impulsive sound or underwater detonations during testing events that may result in Level B harassment and 3 that may result in Level A as defined under the MMPA for military readiness activities. Of these, 54 would be from TTS. Modeling indicates that under the No Action Alternative, there would be 3 exposures to sound or energy from underwater explosions that exceed the onset of slight lung injury annually; there are no proposed non-annual activities. Injuries unlikely for the reasons presented previously (see Section 3.4.3.2.2.4, No Action Alternative – Training). Given the short radii for the impact zone, range clearance procedures, and that it is unlikely for marine mammals to be in the area also suggests injuries are unlikely. There are no mortalities predicted for testing activities using explosives under the No Action Alternative.

Mysticetes

Predicted impacts on mysticetes from testing activities under the No Action Alterative from explosions are low over a year of testing activities, with 4 TTS and 4 behavioral responses predicted annually to the Central North Pacific of humpback whale.

Blue Whales (Endangered Species Act-Listed)

Blue whales may be exposed to sound or energy from explosions associated with testing activities throughout the year but would not be exposed to sound or energy from explosions associated with testing activities, which would exceed the current impact thresholds. Long-term consequences for individuals or populations would not be expected.

Humpback Whales (Endangered Species Act-Listed)

Humpback whales may be exposed to sound or energy from explosions associated with testing activities during the cool season when present in the Study Area. In Hawaii, Central North Pacific stock humpback whales could be exposed to sound or energy from explosions that may result in 4 TTS and 4 behavioral reactions per year. Long-term consequences for individuals or the population of humpback whale would not be expected.

Sei Whales (Endangered Species Act-Listed)

Sei whales may be exposed to sound or energy from explosions associated with testing activities throughout the year but would not be exposed to sound or energy from explosions associated with testing activities, which would exceed the current impact thresholds. Long-term consequences for individuals or populations would not be expected.

Fin Whales (Endangered Species Act-Listed)

Fin whales may be exposed to sound or energy from explosions associated with testing activities throughout the year but would not be exposed to sound or energy from explosions associated with testing activities, which would exceed the current impact thresholds. Long-term consequences for individuals or populations would not be expected.

Gray Whales, Eastern North Pacific Stock and Endangered Species Act-Listed Western North Pacific Stock

Gray whales may be exposed to sound or energy from explosions during the cool seasons when and if their presence coincides with testing activities in the Southern California portion of the Study Area. Acoustic modeling predicts that the Eastern North Pacific gray whale could be exposed to sound that may result in 1 PTS, 2 TTS, and 2 behavioral reactions per year. The Western North Pacific stock of gray whale would not be exposed to sound or energy from explosions associated with testing activities, which would exceed the current impact thresholds. As presented above for mysticetes in general, for both stocks and individuals within these stocks, long-term consequences would not be expected.

Other Mysticetes (Bryde's and Minke Whales)

Bryde's and minke whales may be exposed to sound or energy from explosions associated with testing activities throughout the year but would not be exposed to sound or energy from explosions associated with testing activities, which would exceed the current impact thresholds. Long-term consequences for individuals or populations would not be expected.

Table 3.4-25: Predicted Impacts from Explosions for Annual Testing under the No Action Alternative

Species	Stock	Behavioral	TTS	PTS	GI Injury	Lung Injury	Mortality
Blue whale	Eastern North Pacific	0	0	0	0	0	0
	Central North Pacific	0	0	0	0	0	0
Fin whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Humpback whale	CA/OR/WA	0	0	0	0	0	0
	Central North Pacific	4	4	0	0	0	0
Sei whale	Eastern North Pacific	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Sperm whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Guadalupe fur seal	Mexico	0	0	0	0	0	0
Hawaiian monk seal	Hawaiian	0	0	0	0	0	0
Bryde’s whale	Eastern Tropical Pacific	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Gray whale	Eastern North Pacific	2	2	1	0	0	0
	Western North Pacific	0	0	0	0	0	0
Minke whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Baird’s beaked whale	CA/OR/WA	0	0	0	0	0	0
Blainville’s beaked whale	Hawaiian	0	0	0	0	0	0
Bottlenose dolphin	CA/OR/WA Offshore	2	2	0	0	0	0
	California Inshore	0	0	0	0	0	0
	Hawaii Stock Complex	0	0	0	0	0	0
Cuvier’s beaked whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Dwarf sperm whale	Hawaiian	1	0	8	0	0	0
Dall’s porpoise	CA/OR/WA	6	2	5	0	0	0
False killer whale	Hawaii Pelagic	0	0	0	0	0	0
	Main Hawaiian Islands Insular	0	0	0	0	0	0
	Northwestern Hawaiian Islands	0	0	0	0	0	0
Fraser’s dolphin	Hawaiian	0	0	0	0	0	0

Table 3.4-25: Predicted Impacts from Explosions for Annual Testing under the No Action Alternative (continued)

Species	Stock	Behavioral	TTS	PTS	GI Injury	Lung Injury	Mortality
Killer whale	Eastern North Pacific Offshore/Transient	0	0	0	0	0	0
Killer whale	Hawaiian	0	0	0	0	0	0
Kogia spp.	CA/OR/WA	1	0	1	0	0	0
Long-beaked common dolphin	CA/OR/WA	3	14	0	0	4	0
Longman's beaked whale	Hawaiian	0	0	0	0	0	0
Melon-headed whale	Hawaiian	0	0	0	0	0	0
Mesoplodon beaked whales*	CA/OR/WA	0	0	0	0	0	0
Northern right whale dolphin	CA/OR/WA	4	4	0	0	1	0
Pacific white-sided dolphin	CA/OR/WA	2	3	0	0	1	0
Pantropical spotted dolphin	Hawaiian	0	0	0	0	2	0
Pygmy killer whale	Hawaiian	0	0	0	0	0	0
Pygmy sperm whale	Hawaiian	0	0	0	0	0	0
Risso's dolphin	CA/OR/WA	6	7	0	0	1	0
	Hawaiian	0	0	0	0	0	0
Rough-toothed dolphin	Hawaiian	0	0	0	0	0	0
Short-beaked common dolphin	CA/OR/WA	66	94	0	0	68	18
Short-finned pilot whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Spinner dolphin	Hawaiian Stock Complex	0	0	0	0	0	0
Striped dolphin	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Southern sea otter	San Nicolas Island Translocated Colony	0	0	0	0	0	0
California sea lion	U.S. Stock	15	2	0	0	11	3
Northern fur seal	San Miguel Island	1	0	0	0	0	0
Harbor seal	California	1	1	0	0	0	0
Northern elephant seal	California Breeding	6	7	0	0	1	0

Odontocetes

Predicted impacts to odontocetes from testing activities under the No Action Alterative from sound or energy from explosions are approximately all (99 percent) from Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft and Sonobuoy Lot Acceptance Tests.

Sperm Whales (Endangered Species Act-Listed)

Sperm whales (classified as mid-frequency cetaceans [see Section 3.4.2.3.2, Mid-Frequency Cetaceans]) may be exposed to sound or energy from explosions associated with testing activities throughout the year but would not be exposed to sound or energy from explosions associated with testing activities, which would exceed the current impact thresholds. Long-term consequences for individuals or populations would not be expected.

False Killer Whale, Hawaii Pelagic Stock, Northwestern Hawaiian Islands Stock, and Main Hawaiian Islands Insular Stock (the latter Endangered Species Act-Listed)

False killer whales in the HRC portion of the Study Area may be exposed to sound or energy from explosions associated with testing activities throughout the year. Acoustic modeling predicts that no false killer whales would be impacted. Long-term consequences for individuals or populations would not be expected.

Beaked Whales

Beaked whales may be exposed to sound or energy from explosions associated with testing activities throughout the year. Acoustic modeling predicts that no beaked whales would be impacted. Long-term consequences for individuals or populations would not be expected.

Pygmy and Dwarf Sperm Whales (*Kogia* spp.)

Pygmy and dwarf sperm whales (genus: *Kogia*) (classified as high-frequency cetaceans [see Section 3.4.2.3.1, High-Frequency Cetaceans]) may be exposed to sound or energy from explosions associated with testing activities throughout the year. In SOCAL the two *Kogia* species are managed as a single California, Oregon, Washington stock and management unit. Acoustic modeling predicts that no *Kogia* spp. in SOCAL would be impacted. Long-term consequences for individuals or populations would not be expected.

In Hawaii, NMFS manages *Kogia* as separate species and stocks. Within the HRC acoustic modeling predicts that no Hawaiian stock pygmy sperm whale or dwarf sperm whale would be impacted. Long-term consequences for individuals or populations would not be expected.

Dall's Porpoise

Dall's porpoise (classified as high-frequency cetaceans [see Section 3.4.2.3.1, High-Frequency Cetaceans]) are present only in the SOCAL Range Complex portion of the Study Area and are part of the California, Oregon, Washington stock. Dall's porpoise may be exposed to sound or energy from explosions associated with testing activities throughout the year. Acoustic modeling predicts that Dall's porpoise could be exposed to sound or energy from explosions that may result in 5 PTS and 2 TTS exposures.

As discussed in Section 3.4.3.2.2.1 (Range to Effects), ranges to PTS as an injury effect are on average less than 855 meters from the largest explosive (Bin E12) used in HSTT for a high frequency cetacean such as Dall's porpoise. Recovery from a TTS (i.e., TTS; temporary partial hearing loss) can take a few minutes to a few days, depending on the severity of the initial shift. PTS would not fully recover.

Threshold shifts do not necessarily affect all hearing frequencies equally, so some threshold shifts may not interfere with an animal hearing biologically relevant sounds. It is uncertain whether some permanent hearing loss over a part of a marine mammal's hearing range would have long-term consequences for that individual, although many mammals lose hearing ability as they age. Population level consequences are not expected. Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce the predicted impacts.

Acoustic modeling indicates that Dall's porpoise would be exposed to sound or energy from underwater explosions that would result in 6 behavioral responses. Research and observations (Section 3.4.3.1.2.6, Behavioral Reactions) show that if odontocetes are exposed to explosions, they may react by alerting, ignoring the stimulus, changing their behaviors or vocalizations, or avoiding the area by swimming away or diving. Behavioral impacts could take place at distances exceeding approximately 5.7 km (3 nm) from the largest explosive (Bin E12) for Dall's porpoise, although significant behavioral effects are much more likely at higher received levels within a few hundred meters of the sound source. Overall, predicted effects are low, and mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce potential impacts. Occasional behavioral reactions to intermittent explosions are unlikely to cause long-term consequences for individual animals or populations.

Dolphins and Small Whales (Delphinids)

Delphinids (classified as mid-frequency cetaceans [see Section 3.4.2.3.2, Mid-Frequency Cetaceans]) may be exposed to sonar or other active acoustic stressors associated with testing activities throughout the year. Species included as delphinids for purposes of this discussion include the following: bottlenose dolphin, Fraser's dolphin, killer whale, long-beaked common dolphin, melon-headed whale, northern right whale dolphin, Pacific white-sided dolphin' pantropical spotted dolphin, pygmy killer whale, Risso's dolphin, rough toothed dolphin, short-beaked common dolphin, short-finned pilot whale, spinner dolphin, and striped dolphin. For the Hawaii portion of the Study Area, modeling indicates that these species would not be exposed to sound or energy from explosions associated with training activities, which would exceed the current impact thresholds.

A total of 114 TTS are predicted for six species of delphinids in Southern California portion of the Study Area (there were no PTS predicted). The majority of these predicted exposures (82 percent) are to short-beaked common dolphin. Recovery from a TTS (i.e., TTS; temporary partial hearing loss) can take a few minutes to a few days, depending on the severity of the initial shift. Threshold shifts do not necessarily affect all hearing frequencies equally, so some threshold shifts may not interfere with an animal hearing biologically relevant sounds. Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce the predicted impacts.

Acoustic modeling indicates that 83 delphinids annually could be exposed to sound or energy from underwater explosions that would result in a behavioral response. Research and observations (Section 3.4.3.1.2.6, Behavioral Reactions) show that if delphinids are exposed to explosions, they may react by alerting, ignoring the stimulus, changing their behaviors or vocalizations, or avoiding the area by swimming away or diving. Some behavioral impacts could take place at distances exceeding approximately 1060 yd. (970 m) for more sensitive species, although significant behavioral effects are much more likely at higher received levels closer to the sound and energy source. Overall, predicted effects are low, and mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce potential impacts. Occasional behavioral reactions to intermittent explosions are unlikely to cause long-term consequences for individual animals or populations.

Pinniped

Predicted impacts to odontocetes from testing activities under the No Action Alterative from sound or energy from explosions all occur as a result of Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft and Sonobuoy Lot Acceptance Tests in SOCAL.

Phocids (Harbor Seal, Northern Elephant Seal, and Hawaiian Monk Seal)

Harbor seal and northern elephant seal are the species of phocid pinnipeds expected within the SOCAL Range Complex portion of the Study Area. Harbor seal are part of the California Stock and northern elephant seal are the California breeding stock. Hawaiian monk seal are present in Hawaii and considered the Hawaiian stock. Phocids in SOCAL and Hawaii may be exposed to sound or energy from underwater explosions associated with testing activities throughout the year.

As presented on Table 3.4-25, a total of 1 slight lung injury is predicted annually to northern elephant seal. The explosive criteria for slight lung injury is based upon newborn calf weights, and therefore these effects are over predicted by the model, assuming most northern elephant seal are larger than a newborn dolphin calf. Furthermore, as explained in Section 3.4.3.1.4.8 (Mortality and Injury from Explosives), the criteria for slight lung injury is very conservative (e.g., overestimate the effect). Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) are designed to avoid potential effects from underwater detonations, especially higher order effects such as injury and death. Nevertheless, it is possible for a northern elephant seal to be injured by an explosion in isolated instances. Considering that northern elephant seals for which this effect is predicted have a stock exceeding a hundred thousand animals, removing an animal from the population would be unlikely to have measurable long-term consequences.

In SOCAL, a total of 1 TTS are predicted for harbor seal and 7 TTS for northern elephant seal. As discussed in Section 3.4.3.2.2.1 (Range to Effects), ranges to TTS are on average less than approximately 1,480 yd. (1.4 km) from the largest explosive (Bin E12) used in HSTT. Recovery from a TTS (i.e., TTS; temporary partial hearing loss) can take a few minutes to a few days, depending on the severity of the initial shift. Threshold shifts do not necessarily affect all hearing frequencies equally, so some threshold shifts may not interfere with an animal hearing biologically relevant sounds. It is uncertain whether some permanent hearing loss over a part of a marine mammal's hearing range would have long-term consequences for that individual, although many mammals lose hearing ability as they age. Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce the predicted impacts.

Acoustic modeling indicates that there would be seven exposures to sound or energy from underwater explosions that would result in a behavioral response to phocids in SOCAL. Research and observations (Section 3.4.3.1.2.6, Behavioral Reactions) show that if pinnipeds are exposed to impulsive sound, they may react by alerting, ignoring the stimulus, changing their behaviors or vocalizations, or leaving the area. Some behavioral impacts could take place at distances exceeding approximately 1,860 yd. (1.7 km) from the largest explosive (Bin E12) used in HSTT. Overall, predicted effects are low, and mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce potential impacts. Occasional behavioral reactions to intermittent explosions are unlikely to cause long-term consequences for individual animals or populations.

Hawaiian Monk Seal (Endangered Species Act-Listed)

Acoustic modeling predicts Hawaiian monk seal would not be exposed to sound or energy from explosions associated with training activities, which would exceed the current impact thresholds. Activities involving sound or energy from underwater explosions will not occur on shore in designated Hawaiian monk seal critical habitat where haul out and resting behavior occurs and would have no effect on critical habitat at sea.

Otariids (Sea Lion and Fur Seal)

California sea lion, Guadalupe fur seal, and northern fur seal comprise the otariid species of pinniped, which are present only in the SOCAL portion of the Study Area. Otariids may be exposed to sound or energy from underwater explosions associated with testing activities throughout the year. Predicted impacts to odontocetes from testing activities under the No Action Alterative from sound or energy from explosions all occur as a result of Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft and Sonobuoy Lot Acceptance Tests in SOCAL.

As presented on Table 3.4-25, a total of 3 mortality and 11 slight lung injury to California sea lion are predicted. The explosive criteria for mortality and slight lung injury is based upon newborn calf weights, and therefore these effects are over predicted by the model, assuming most animals within the population are larger than a newborn dolphin calf. Furthermore, as explained in Section 3.4.3.1.4.8 (Mortality and Injury from Explosives), the criteria for mortality and slight lung injury are very conservative (they overestimate the effect). Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) are designed to avoid potential effects from underwater detonations, especially higher order effects such as injury and death. Nevertheless, it is possible for pinniped to be injured by an explosion in isolated instances. Considering that California sea lion for which these effects are predicted have a stock with hundreds of thousands of animals, removing several animals from the population would be unlikely to have measurable long-term consequences.

A total of 2 TTS are predicted for California sea lion. Recovery from a TTS (i.e., TTS; temporary partial hearing loss) can take a few minutes to a few days, depending on the severity of the initial shift. Threshold shifts do not necessarily affect all hearing frequencies equally, so some threshold shifts may not interfere with an animal hearing biologically relevant sounds. It is uncertain whether some permanent hearing loss over a part of a marine mammal's hearing range would have long-term consequences for that individual, although many mammals lose hearing ability as they age. Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce the predicted impacts. Acoustic modeling predicts 16 exposures to otariids in SOCAL that could result in behavioral reactions. These exposures are unlikely to cause long-term consequences for individual animals or populations.

Guadalupe Fur Seal (Endangered Species Act-Listed as Threatened)

Acoustic modeling predicts that the Mexico stock of Guadalupe fur seal would not be exposed to sound or energy from explosions associated with training activities, which would exceed the current impact thresholds. Long-term consequences for individuals or the population of Guadalupe fur seal would not be expected. Critical habitat has not been designated Guadalupe fur seal.

Mustelid (Southern Sea Otter, Translocated Colony)

The sea otter present in the Study Area (at San Nicolas Island; see Section 3.4.2.47.1, Sea Otter Status and Management) are part of a translocated colony managed by the U.S. Fish and Wildlife Service. Currently, the California stock of southern sea otter are not expected to be present in the Study Area since their range does not extend south of Santa Barbara County (this county line is approximately 78 mi. [126 km]) north of the Study Area's northern edge in SOCAL).

Because it is unlikely that a sea otter would be in waters where depths exceed 35 m (115 ft.), it is extremely unlikely that sea otters would be present in proximity to most Navy training or testing events taking place in the water. Acoustic modeling for southern sea otter at San Nicolas was not undertaken given they are far from where activities involving in water explosives are proposed to occur, they inhabit complex shallow water environments where acoustic modeling is very imprecise and therefore not representative, and they spend little time underwater thus very much limiting the potential for exposure in any case. Research indicates sea otters often remained undisturbed, quickly become tolerant of the various sounds, and even when purposefully harassed, they generally moved only a short distance (100 to 200 meters) before resuming normal activity. The U.S. Fish and Wildlife Service has determined that previous DoD actions have not posed a threat to the San Nicolas colony of southern sea otter and the average growth rate for the translocated colony has been higher than that for those inhabiting the central California coastline in recent years (U.S. Department of the Interior 2012a). Given these factors, long-term consequences for individuals or the population would not be expected.

Conclusion

Testing activities under the No Action Alternative include sound or energy from underwater explosions resulting from activities as described in Table 2.8-2 through Table 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives) and in Section 3.0.5.3.1.2 (Explosives). These activities could result in inadvertent takes of marine mammals in the Study Area.

Pursuant to the MMPA, the use of explosives during testing activities under the No Action Alternative:

- *May expose marine mammals up to 252 times annually to sound or pressure levels that would be considered Level B harassment, as defined by the MMPA*
- *May expose marine mammals up to 106 times annually to sound or pressure levels that would be considered Level A harassment, as defined by the MMPA*
- *May result in serious injury or incidental mortality to 21 small odontocetes (e.g., dolphin) or pinniped annually*

Pursuant to the ESA, the use of explosives during testing activities as described in the No Action Alternative:

- *May affect, but is not likely to adversely affect, humpback whale, sei whale, fin whale, Western North Pacific gray whale, blue whale, sperm whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.2.6 Alternative 1 – Training Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-1, and Section 3.0.5.3.1.2 (Explosives), the annual use of in-water explosions under Alternative 1 would be reduced from that under the No Action Alternative (Section 3.4.3.2.2.4, No Action Alternative – Training Activities, describes predicted impacts on marine mammals under the No Action Alternative). These activities involving in-water explosions under Alternative 1 would happen in the same general locations as described by the No Action Alternative but with the following activities having the majority of influence on changes between the No Action Alternative and Alternative 1 in the number of predicted effects from the modeling:

- Increase in number of high explosive detonations during each Mine Neutralization – Explosive Ordnance Disposal event
- Addition of new medium caliber gunnery events and missile events (rocket), increases in other gunnery and missile events and increases in the number of high explosive rounds or missiles with high explosive used in each
- Reduction in number of naval surface fire support at-sea exercises conducted in the HRC (from 28 to 12 annually) but with each event using double the number of high explosive rounds
- Reduction (81 percent) in the total number of high explosive bombs used in air to surface events in SOCAL
- Reduction in the number of air to surface events using bombs in Hawaii, but an increase in the number of high explosive bombs per event (and increase from one high explosive bomb to two)

The changes in proposed training activities under Alternative 1 over the No Action Alternative would in turn lead to an overall increase in predicted effects on marine mammals including one additional predicted mortality to California sea lion. There would also be an approximate 23 percent in Level A harassment and an approximate 35 percent in Level B harassment exposures. This could mean an increase in the number of individual animals exposed per year or an increase in the number of times per year some animals are exposed, although the types and severity of individual responses to explosions are unlikely to change. Notable results from Alternative 1 are as follows:

Predicted explosive impacts on mysticetes would increase by approximately 23 percent under Alternative 1 over the No Action Alternative due to air to surface bombing and mine neutralization – explosive ordnance disposal activities. Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce these predicted impacts, especially for the Mine Neutralization Explosive Ordnance Disposal events involving generally nearshore locations, multiple support boats, and divers in the water.

Predicted acoustic impacts on delphinids from explosions would increase by about 12 percent for Alternative 1 compared to the No Action Alternative.

Predicted acoustic impacts on phocids from explosions would increase by approximately 23 percent for Alternative 1 compared to the No Action Alternative.

Predicted acoustic impacts on otariids from explosions would increase by approximately 13 percent for Alternative 1 compared to the No Action Alternative.

As presented in Table 3.4-26, for Alternative 1 – Training, the acoustic modeling and post-modeling analyses predict 705 marine mammal exposures to impulsive sound (explosives) resulting in Level B harassment[34], 128 exposures resulting in Level A[35], and 7 mortality[36] as defined under the MMPA for military readiness activities.

[34] This is the combined summation of all non-TTS and TTS exposures (behavioral effects) for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the 12-month period).
[35] This is the combined summation of all PTS, gastro-intestinal, and slight lung injury exposures for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the same 12-month period).
[36] This is the combined summation of all 1% mortality (50% lung injury) exposures for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the same 12-month period).

Although most impacts on marine mammals due to explosive energy and sound would increase under Alternative 1 compared to the No Action Alternative, the types and severity of individual responses to explosions are unlikely to change. Increases in the number of times individual animals are exposed throughout the year could occur, which would increase the likelihood of that individual suffering long-term consequences due to repeated exposures. The number of animals exposed throughout the year could also increase, although it is uncertain how the increase in the number of individual animals predicted to receive direct impacts, and therefore the number of individuals that may suffer long-term consequences, would affect populations.

As described under the No Action Alternative, mortalities and lung injuries are over predicted by the modeling; hearing loss may affect an animal's ability to detect relevant sounds for a short period or permanently depending on the level of exposure; and behavioral reactions could occur, although occasional behavioral reactions to intermittent explosions are unlikely to cause long-term consequences. If long-term consequences for a few animals (e.g., short-beaked common dolphin and California sea lion) in populations that number in the hundreds of thousands do occur, they are unlikely to have measurable long-term consequences for marine mammal populations.

Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce the predicted impacts under Alternative 1. A majority of the exposures from use of explosives during training activities under Alternative 1 are a result of generally nearshore Mine Neutralization – Explosive Ordnance Disposal activities during which mitigation measures, including those recently improved, should greatly reduce the potential for impacts. In addition, some of the increases in Alternative 1 over the No Action Alternative are a result of additional high explosives now being used in a given event (e.g., bombing events in Hawaii using two high explosive bombs instead of one). Although not reflected by the modeling, since this is often a sequential use of high explosives, it is much less likely a second explosion at the same approximate target location would result in additional impacts as compared to two events and explosions at separate locations and times. For this reason, the model partially overestimates the increase in impacts from the No Action Alternative to those presented under Alternative 1.

Pursuant to the MMPA, the use of explosives during training activities under Alternative 1:

- *May expose marine mammals up to 705 times annually to sound or pressure levels that would be considered Level B harassment, as defined by the MMPA*
- *May expose marine mammals up to 128 times annually to sound or pressure levels that would be considered Level A harassment, as defined by the MMPA*
- *May result in serious injury or incidental mortality to 7 small odontocetes (e.g., dolphin) or pinniped annually*

Pursuant to the ESA, the use of explosives during training activities as described in Alternative 1:

- *May affect, and is likely to adversely affect, the fin whale, blue whale, sperm whale, and Hawaiian monk seal*
- *May affect, but is not likely to adversely affect, the humpback whale, Western North Pacific gray whale, sei whale, sperm whale, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

Table 3.4-26: Predicted Impacts from Explosions for Annual Training under Alternative 1

Species	Stock	Behavioral	TTS	PTS	GI Injury	Lung Injury	Mortality
Blue whale	Eastern North Pacific	1	3	0	0	0	0
	Central North Pacific	0	0	0	0	0	0
Fin whale	CA/OR/WA	0	1	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Humpback whale	CA/OR/WA	0	0	0	0	0	0
	Central North Pacific	0	0	0	0	0	0
Sei whale	Eastern North Pacific	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Sperm whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Guadalupe fur seal	Mexico	0	0	0	0	0	0
Hawaiian monk seal	Hawaiian	0	1	0	0	0	0
Bryde’s whale	Eastern Tropical Pacific	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Gray whale	Eastern North Pacific	14	23	1	0	0	0
	Western North Pacific	0	0	0	0	0	0
Minke whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Baird’s beaked whale	CA/OR/WA	0	0	0	0	0	0
Blainville’s beaked whale	Hawaiian	0	0	0	0	0	0
Bottlenose dolphin	CA/OR/WA Offshore	2	3	0	0	0	0
	California Inshore	1	2	0	0	0	0
	Hawaii Stock Complex	0	0	0	0	0	0
Cuvier’s beaked whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Dwarf sperm whale	Hawaiian	0	2	5	0	0	0
Dall’s porpoise	CA/OR/WA	14	53	9	0	1	0
False killer whale	Hawaii Pelagic	0	0	0	0	0	0
	Main Hawaiian Islands Insular	0	0	0	0	0	0
	Northwestern Hawaiian Islands	0	0	0	0	0	0
Fraser’s dolphin	Hawaiian	0	0	0	0	0	0

Table 3.4-26: Predicted Impacts from Explosions for Annual Training under Alternative 1 (continued)

Species	Stock	Behavioral	TTS	PTS	GI Injury	Lung Injury	Mortality
Killer whale	Eastern North Pacific Offshore / Transient	0	0	0	0	0	0
Killer whale	Hawaiian	0	0	0	0	0	0
Kogia spp.	CA/OR/WA	1	4	1	0	0	0
Long-beaked common dolphin	CA/OR/WA	4	9	0	0	2	0
Longman's beaked whale	Hawaiian	0	0	0	0	0	0
Melon-headed whale	Hawaiian	0	0	0	0	0	0
Mesoplodon beaked whales*	CA/OR/WA	0	0	0	0	0	0
Northern right whale dolphin	CA/OR/WA	8	10	0	0	1	0
Pacific white-sided dolphin	CA/OR/WA	5	9	0	0	1	0
Pantropical spotted dolphin	Hawaiian	0	0	0	0	0	0
Pygmy killer whale	Hawaiian	0	0	0	0	0	0
Pygmy sperm whale	Hawaiian	0	0	0	0	0	0
Risso's dolphin	CA/OR/WA	11	15	0	0	1	0
	Hawaiian	0	0	0	0	0	0
Rough-toothed dolphin	Hawaiian	0	0	0	0	0	0
Short-beaked common dolphin	CA/OR/WA	108	286	2	0	68	3
Short-finned pilot whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Spinner dolphin	Hawaiian Stock Complex	0	0	0	0	0	0
Striped dolphin	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Southern sea otter	San Nicolas Island Translocated Colony	0	0	0	0	0	0
California sea lion	U.S. Stock	0	50	10	0	15	4
Northern fur seal	San Miguel Island	0	2	2	0	3	0
Harbor seal	California	6	8	0	0	1	0
Northern elephant seal	California Breeding	18	31	4	0	1	0

3.4.3.2.2.7 Alternative 1 – Testing Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Tables 2.8-2 through 2.8-5, and Section 3.0.5.3.1.2 (Explosives), the number of annual testing activities that use explosions under Alternative 1 would increase over those described in Section 3.4.3.2.2.5, No Action Alternative – Testing Activities. Activities involving in-water explosions under Alternative 1 would happen in the same general locations as described by the No Action Alternative but with the following activities having the majority of influence on changes between the No Action Alternative and Alternative 1 in the number of predicted effects from the modeling:

- Addition of Anti-Submarine Warfare Tracking Tests – Helicopter
- Addition of Airborne Projectile-Based Mine Clearance System Test
- Addition of Mine Countermeasure/Neutralization Tests
- Addition of Mine Countermeasures Mission Package Tests
- Addition of Surface Warfare Mission Package Tests
- Additional torpedo explosive tests in the Southern California OPAREA
- Decrease in the Anti-Submarine Warfare Tracking Tests – Maritime Patrol Aircraft

The changes in proposed testing activities under Alternative 1 over the No Action Alternative would in turn lead to an overall increase in predicted effects on marine mammals including two additional predicted mortalities to California sea lion. There would, however, be fewer overall Level A harassments (a 33 percent decrease) and fewer predicted mortality driven by reduced effects predicted to short-beaked common dolphin due to a decrease in use of sonobuoys (Bin E4) during Anti-Submarine Warfare Tracking Tests – Maritime Patrol Aircraft events under Alternative 1. There would also be an approximate 88 percent increase in Level B harassment exposures, which could mean an increase in the number of individual animals exposed per year or an increase in the number of times per year some animals are exposed, although the types and severity of individual responses to explosions are unlikely to change.

As presented in Table 3.4-27, for Alternative 1 – Testing, the acoustic modeling and post-modeling analyses predict an annual total of 473 marine mammal exposures to impulsive sound (explosives), resulting in Level B harassment[37], 72 exposures resulting in Level A[38], and 17 mortality[39].

Although most impacts on marine mammals due to explosive energy and sound would increase during testing under Alternative 1 compared to the No Action Alternative, the types and severity of individual responses to explosions are unlikely to change.

[37] This is the combined summation of all non-TTS and TTS exposures (behavioral effects) for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the 12-month period).
[38] This is the combined summation of all PTS, gastro-intestinal, and slight lung injury exposures for all species and stocks in the Study Area for an annual total (all annual events occurring in the same 12-month period).
[39] This is the combined summation of all 1 percent mortality (50 percent lung injury) exposures for all species and stocks in the Study Area for an annual total (all events occurring in the same 12-month period).

Table 3.4-27: Predicted Impacts from Explosions for Annual Testing under Alternative 1

Species	Stock	Behavioral	TTS	PTS	GI Injury	Lung Injury	Mortality
Blue whale	Eastern North Pacific	0	1	0	0	0	0
	Central North Pacific	0	0	0	0	0	0
Fin whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Humpback whale	CA/OR/WA	0	0	0	0	0	0
	Central North Pacific	0	3	0	0	0	0
Sei whale	Eastern North Pacific	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Sperm whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Guadalupe fur seal	Mexico	0	0	0	0	0	0
Hawaiian monk seal	Hawaiian	0	0	0	0	0	0
Bryde’s whale	Eastern Tropical Pacific	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Gray whale	Eastern North Pacific	2	6	0	0	0	0
	Western North Pacific	0	0	0	0	0	0
Minke whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Baird’s beaked whale	CA/OR/WA	0	0	0	0	0	0
Blainville’s beaked whale	Hawaiian	0	0	0	0	0	0
Bottlenose dolphin	CA/OR/WA Offshore	3	4	0	0	0	0
	California Inshore	0	0	0	0	0	0
	Hawaii Stock Complex	1	0	0	0	0	0
Cuvier’s beaked whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Dwarf sperm whale	Hawaiian	18	2	6	0	0	0
Dall’s porpoise	CA/OR/WA	0	16	5	0	1	0
False killer whale	Hawaii Pelagic	0	0	0	0	0	0
	Main Hawaiian Islands Insular	0	0	0	0	0	0
	Northwestern Hawaiian Island	0	0	0	0	0	0
Fraser’s dolphin	Hawaiian	0	0	0	0	0	0

Table 3.4-27: Predicted Impacts from Explosions for Annual Testing under Alternative 1 (continued)

Species	Stock	Behavioral	TTS	PTS	GI Injury	Lung Injury	Mortality
Killer whale	Eastern North Pacific Offshore/Transient	0	0	0	0	0	0
Killer whale	Hawaiian	0	0	0	0	0	0
Kogia spp.	CA/OR/WA	0	3	1	0	0	0
Long-beaked common dolphin	CA/OR/WA	4	11	0	0	2	0
Longman's beaked whale	Hawaiian	0	0	0	0	0	0
Melon-headed whale	Hawaiian	0	0	0	0	0	0
Mesoplodon beaked whales[*]	CA/OR/WA	0	0	0	0	0	0
Northern right whale dolphin	CA/OR/WA	4	8	0	0	1	0
Pacific white-sided dolphin	CA/OR/WA	2	6	0	0	0	0
Pantropical spotted dolphin	Hawaiian	2	0	0	0	1	0
Pygmy killer whale	Hawaiian	0	0	0	0	0	0
Pygmy sperm whale	Hawaiian	0	0	0	0	0	0
Risso's dolphin	CA/OR/WA	7	10	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Rough-toothed dolphin	Hawaiian	1	0	0	0	0	0
Short-beaked common dolphin	CA/OR/WA	86	222	0	0	36	12
Short-finned pilot whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Spinner dolphin	Hawaiian Stock Complex	0	0	0	0	0	0
Striped dolphin	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Southern sea otter	San Nicolas Island Translocated Colony	0	0	0	0	0	0
California sea lion	U.S. Stock	0	25	2	0	14	5
Northern fur seal	San Miguel Island	0	2	0	0	2	0
Harbor seal	California	2	3	0	0	0	0
Northern elephant seal	California Breeding	7	11	1	0	0	0

As described under the No Action Alternative, mortalities and lung injuries are over predicted by the modeling; hearing loss may affect an animal's ability to detect relevant sounds for a short period or permanently depending on the level of exposure; and behavioral reactions could occur, although occasional behavioral reactions to intermittent explosions are unlikely to cause long-term consequences. If long-term consequences for a few animals (e.g., short-beaked common dolphin and California sea lion) in populations that number in the hundreds of thousands do occur, they are unlikely to have measurable long-term consequences for marine mammal populations.

Mitigation measures discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) would further reduce the predicted impacts under Alternative 1. A majority of the exposures from use of explosives during testing activities under Alternative 1 are a result of generally nearshore Mine Neutralization – Explosive Ordnance Disposal activities during which mitigation measures, including those recently improved, should greatly reduce the potential for actual impacts to occur.

Conclusion

Testing activities under the Alternative 1 include sound or energy from use of explosive sources as described in Tables 2.8-2 through 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives) and in Section 3.0.5.3.1.2 (Explosives). These activities would result in inadvertent takes of marine mammals in the Study Area.

Pursuant to the MMPA, the use of explosives during testing activities under Alternative 1:

- *May expose marine mammals up to 473 times annually to sound or pressure levels that would be considered Level B harassment, as defined by the MMPA*
- *May expose marine mammals up to 72 times annually to sound or pressure levels that would be considered Level A harassment, as defined by the MMPA*
- *May result in serious injury or incidental mortality to 17 small odontocetes (e.g., dolphin) or pinniped annually*

Pursuant to the ESA, the use of explosives during testing activities as described in Alternative 1:

- *May affect, but is not likely to adversely affect, the blue whale, humpback whale, sei whale, fin whale, Western North Pacific gray whale, sperm whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.2.8 Alternative 2 – Training Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-1, and Section 3.0.5.3.1.2 (Explosives), proposed training activities involving use of explosive sources under Alternative 2 are identical to training activities proposed under Alternative 1. Therefore, the predicted impacts for Alternative 2 (Table 3.4-28) are identical to those described above in Section 3.4.3.2.2.6 (Alternative 1 – Training).

Table 3.4-28: Predicted Impacts from Explosions for Annual Training under Alternative 2

Species	Stock	Behavioral	TTS	PTS	GI Injury	Lung Injury	Mortality
Blue whale	Eastern North Pacific	1	3	0	0	0	0
	Central North Pacific	0	0	0	0	0	0
Fin whale	CA/OR/WA	0	1	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Humpback whale	CA/OR/WA	0	0	0	0	0	0
	Central North Pacific	0	0	0	0	0	0
Sei whale	Eastern North Pacific	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Sperm whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Guadalupe fur seal	Mexico	0	0	0	0	0	0
Hawaiian monk seal	Hawaiian	0	1	0	0	0	0
Bryde’s whale	Eastern Tropical Pacific	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Gray whale	Eastern North Pacific	14	23	1	0	0	0
	Western North Pacific	0	0	0	0	0	0
Minke whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Baird’s beaked whale	CA/OR/WA	0	0	0	0	0	0
Blainville’s beaked whale	Hawaiian	0	0	0	0	0	0
Bottlenose dolphin	CA/OR/WA Offshore	2	3	0	0	0	0
	California Inshore	1	2	0	0	0	0
	Hawaii Stock Complex	0	0	0	0	0	0
Cuvier’s beaked whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Dwarf sperm whale	Hawaiian	0	2	5	0	0	0
Dall’s porpoise	CA/OR/WA	14	53	9	0	1	0
False killer whale	Hawaii Pelagic	0	0	0	0	0	0
	Main Hawaiian Islands Insular	0	0	0	0	0	0
	Northwestern Hawaiian Islands	0	0	0	0	0	0
Fraser’s dolphin	Hawaiian	0	0	0	0	0	0

Table 3.4-28: Predicted Impacts from Explosions for Annual Training under Alternative 2 (continued)

Species	Stock	Behavioral	TTS	PTS	GI Injury	Lung Injury	Mortality
Killer whale	Eastern North Pacific Offshore/Transient	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Kogia spp.	CA/OR/WA	1	4	1	0	0	0
Long-beaked common dolphin	CA/OR/WA	4	9	0	0	2	0
Longman's beaked whale	Hawaiian	0	0	0	0	0	0
Melon-headed whale	Hawaiian	0	0	0	0	0	0
Mesoplodon beaked whales*	CA/OR/WA	0	0	0	0	0	0
Northern right whale dolphin	CA/OR/WA	8	10	0	0	1	0
Pacific white-sided dolphin	CA/OR/WA	5	9	0	0	1	0
Pantropical spotted dolphin	Hawaiian	0	0	0	0	0	0
Pygmy killer whale	Hawaiian	0	0	0	0	0	0
Pygmy sperm whale	Hawaiian	0	0	0	0	0	0
Risso's dolphin	CA/OR/WA	11	15	0	0	1	0
	Hawaiian	0	0	0	0	0	0
Rough-toothed dolphin	Hawaiian	0	0	0	0	0	0
Short-beaked common dolphin	CA/OR/WA	108	286	2	0	68	3
Short-finned pilot whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	3	0	0	0	0	0
Spinner dolphin	Hawaiian Stock Complex	0	0	0	0	0	0
Striped dolphin	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Southern sea otter	San Nicolas Island Translocated Colony	0	0	0	0	0	0
California sea lion	U.S. Stock	0	50	10	0	15	4
Northern fur seal	San Miguel Island	0	2	2	0	3	0
Harbor seal	California	6	8	0	0	1	0
Northern elephant seal	California Breeding	18	31	4	0	1	0

Pursuant to the MMPA, the use of explosives during training activities under Alternative 2:

- *May expose marine mammals up to 705 times annually to sound or pressure levels that would be considered Level B harassment, as defined by the MMPA*
- *May expose marine mammals up to 128 times annually to sound or pressure levels that would be considered Level A harassment, as defined by the MMPA*
- *May result in serious injury or incidental mortality to 7 small odontocetes (e.g., dolphin) or pinniped annually*

Pursuant to the ESA, the use of explosives during training activities as described in Alternative 2:

- *May affect, and is likely to adversely affect, the fin whale, blue whale, and Hawaiian monk seal*
- *May affect, but is not likely to adversely affect, the Western North Pacific gray whale, humpback whale, sei whale, sperm whale, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.2.9 Alternative 2 – Testing Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Tables 2.8-2 through 2.8-5, and Section 3.0.5.3.1.2 (Explosives), the number of annual testing activities that use explosions under Alternative 2 would increase. As described in Section 3.4.3.2.2.5 (No Action Alternative – Testing), activities involving in-water explosions under Alternative 1 would happen in the same general locations but with the following activities having the majority of influence on changes between the No Action Alternative and Alternative 1 in the number of predicted effects from the modeling:

- Addition of Airborne Projectile-Based Mine Clearance System Test
- Addition of Mine Countermeasure/Neutralization Tests
- Addition of Mine Countermeasures Mission Package Tests
- Addition of Surface Warfare Mission Package Tests
- Additional torpedo explosive tests in SOCAL
- Decrease in the Anti-Submarine Warfare Tracking Tests – Maritime Patrol Aircraft in SOCAL
- Use of Signal Underwater Sound (Bin E3) during Anti-Submarine Warfare Tracking Tests – Helicopter

The increases in Alternative 2 above the No Action Alternative would mean an increase in the number of individual animals exposed per year or an increase in the number of times per year some animals are exposed. Notable differences between Alternative 2 and the No Action Alternative for testing involving explosions are as follows:

- Predicted effects would occur for blue whale in SOCAL with 1 TTS predicted
- Predicted acoustic impacts on delphinids would increase with the majority, approximately 82 percent, of these impacts to short-beaked common dolphin
- Predicted 28 percent decrease in mortality to short-beaked common dolphin and a 50 percent increase in mortality to California sea lion

Although the total Level B harassments under Alternative 2 could mean an increase in the number of individual animals exposed per year or an increase in the number of times per year some animals are exposed, the types and severity of individual responses to explosions are unlikely to change from that described for the No Action Alternative. Changes in the number of predicted Level A and mortalities represent long-term consequences for only a few animals with populations that number in the hundreds of thousands and are unlikely to have measurable long-term consequences for those marine mammal populations.

As presented in Table 3.4-29, for Alternative 2 – Testing, the acoustic modeling and post-modeling analyses predict 535 marine mammal exposures to impulsive sound (explosives) resulting in Level B[40] harassment, 92 exposures resulting in Level A[41], and 19 mortality[42] as defined under the MMPA for military readiness activities.

Conclusion

Testing activities under the Alternative 2 include sound or energy from underwater explosions resulting from activities as described in Tables 2.8-2 through 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives) and in Section 3.0.5.3.1.2 (Explosives). These activities would result in inadvertent takes of marine mammals in the Study Area

Pursuant to the MMPA, the use of explosives during testing activities under Alternative 2:

- *May expose marine mammals up to 535 times annually to sound or pressure levels that would be considered Level B harassment, as defined by the MMPA*
- *May expose marine mammals up to 92 times annually to sound or pressure levels that would be considered Level A harassment, as defined by the MMPA*
- *May result in serious injury or incidental mortality to 19 small odontocetes (e.g., dolphin) and pinnipeds or both annually*

Pursuant to the ESA, the use of explosives during testing activities as described in Alternative 2:

- *May affect, and is likely to adversely affect, the blue whale*
- *May affect, but is not likely to adversely affect, the humpback whale, sei whale, fin whale, Western North Pacific gray whale, sperm whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

[40] This is the combined summation of all non-TTS and TTS exposures (behavioral effects) for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the 12-month period).
[41] This is the combined summation of all PTS, gastro-intestinal, and slight lung injury exposures for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the same 12-month period).
[42] This is the combined summation of all 1 percent mortality (50 percent lung injury) exposures for all species and stocks in the Study Area for an annual total based on a maximum year (all non-annual and annual events occurring in the same 12-month period).

Table 3.4-29: Predicted Impacts from Explosions for Annual Testing under Alternative 2

Species	Stock	Behavioral	TTS	PTS	GI Injury	Lung Injury	Mortality
Blue whale	Eastern North Pacific	0	1	0	0	0	0
	Central North Pacific	0	0	0	0	0	0
Fin whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Humpback whale	CA/OR/WA	0	0	0	0	0	0
	Central North Pacific	0	6	0	0	0	0
Sei whale	Eastern North Pacific	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Sperm whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Guadalupe fur seal	Mexico	0	0	0	0	0	0
Hawaiian monk seal	Hawaiian	0	0	0	0	0	0
Bryde’s whale	Eastern Tropical Pacific	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Gray whale	Eastern North Pacific	2	7	1	0	0	0
	Western North Pacific	0	0	0	0	0	0
Minke whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Baird’s beaked whale	CA/OR/WA	0	0	0	0	0	0
Blainville’s beaked whale	Hawaiian	0	0	0	0	0	0
Bottlenose dolphin	CA/OR/WA Offshore	3	4	0	0	0	0
	California Inshore	0	0	0	0	0	0
	Hawaii Stock Complex	2	0	0	0	0	0
Cuvier’s beaked whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Dwarf sperm whale	Hawaiian	20	2	10	0	0	0
Dall’s porpoise	CA/OR/WA	1	18	6	0	1	0
False killer whale	Hawaii Pelagic	0	0	0	0	0	0
	Main Hawaiian Islands Insular	0	0	0	0	0	0
	Northwestern Hawaiian Islands	0	0	0	0	0	0
Fraser’s dolphin	Hawaiian	1	0	0	0	0	0

Table 3.4-29: Predicted Impacts from Explosions for Annual Testing under Alternative 2 (continued)

Species	Stock	Behavioral	TTS	PTS	GI Injury	Lung Injury	Mortality
Killer whale	Eastern North Pacific Offshore/Transient	0	0	0	0	0	0
	Hawaiian	0	0	0	0	0	0
Kogia spp.	CA/OR/WA	0	3	2	0	0	0
Long-beaked common dolphin	CA/OR/WA	5	12	0	0	2	0
Longman's beaked whale	Hawaiian	0	0	0	0	0	0
Melon-headed whale	Hawaiian	0	0	0	0	0	0
Mesoplodon beaked whales*	CA/OR/WA	0	0	0	0	0	0
Northern right whale dolphin	CA/OR/WA	5	9	0	0	1	0
Pacific white-sided dolphin	CA/OR/WA	3	6	0	0	1	0
Pantropical spotted dolphin	Hawaiian	3	0	0	0	2	0
Pygmy killer whale	Hawaiian	0	0	0	0	0	0
Pygmy sperm whale	Hawaiian	0	0	0	0	0	0
Risso's dolphin	CA/OR/WA	8	11	0	0	1	0
	Hawaiian	0	0	0	0	0	0
Rough-toothed dolphin	Hawaiian	2	0	0	0	0	0
Short-beaked common dolphin	CA/OR/WA	96	246	0	0	40	13
Short-finned pilot whale	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	3	0	0	0	0	0
Spinner dolphin	Hawaiian Stock Complex	1	0	0	0	1	0
Striped dolphin	CA/OR/WA	0	0	0	0	0	0
	Hawaiian	1	0	0	0	1	0
Southern sea otter	San Nicolas Island Translocated Colony	0	0	0	0	0	0
California sea lion	U.S. Stock	0	28	2	0	15	6
Northern fur seal	San Miguel Island	0	2	0	0	3	0
Harbor seal	California	2	3	0	0	0	0
Northern elephant seal	California Breeding	7	12	2	0	1	0

3.4.3.2.3 Study Area Impacts from Pile Driving

As described in Chapter 2 (Description of Proposed Action and Alternatives), there is only one event type, elevated causeway system, involving pile driving and removal. This activity only occurs as a training event, only in the SOCAL Range Complex, and the number of annual events, seasons proposed, and locations are the same under all proposed alternatives (No Action, Alternative 1, and Alternative 2). This event would occur in the nearshore waters of the SOCAL Range Complex at Camp Pendleton, at the Silver Strand Training Complex (SSTC), or at the Bravo Beach training area on the south San Diego Bay side of SSTC. Marine mammals are rarely encountered within this southern portion of San Diego Bay, and given this lack of occurrence, exposures to marine mammals during elevated causeway training in the Bay is not expected. By assuming that all elevated causeway training would occur on the oceanside of SSTC or Camp Pendleton, exposure estimates may over represent actual potential exposures. For example, the estimates may be double of what they might actually be if half of the elevated causeway training was to occur within San Diego Bay.

3.4.3.2.3.1 All Alternatives – Training Activities

Modeling for pile driving and removal was described in Section 3.4.3.1.5 (Behavioral Responses). For this assessment, and as shown on Table 3.4-30, modeling indicates that under all alternatives (which are the same for this event) there would be 854 exposures annually from sound resulting from elevated causeway pile driving and removal that may result in Level B harassment as defined under the MMPA for military readiness activities. None of the modeled exposures would exceed the onset threshold for injury or mortality as defined by the MMPA. Modeling indicates that bottlenose dolphin, gray whale (Eastern North Pacific stock), long-beaked common dolphin, Pacific white-sided dolphin, Risso’s dolphin, California sea lion, and harbor seal would be the species impacted by elevated causeway pile installation and removal. The nearshore areas where pile driving and removal are proposed are not the locations where endangered humpback whale, blue whale, sei whale, fin whale, sperm whale, Hawaiian monk seal, and the Main Hawaiian Islands insular stock of false killer whale would be present. It is very unlikely endangered Western North Pacific gray whale would be present when and where this event might occur due to the short timeframe for the event and the extremely small number of animals in this stock that may seasonally migrate past the location for the event. While unlikely, threatened Guadalupe fur seal could be present in these areas although modeling indicates no exposure to the threatened Guadalupe fur sea by elevated causeway pile installation and removal under any of the alternatives.

Pile driving activities may cause nearshore species of marine mammals (e.g., coastal stock of bottlenose dolphins) to avoid the area near the event, although the activity potentially impacts a small area and happens infrequently (up to four times per year). The elevated causeway exposure assessment methodology is an estimate of the numbers of individuals potentially exposed to the effects of elevated causeway pile driving as an annual summation without consideration of successful implementation of mitigation. While the numbers generated from the elevated causeway exposure calculations provide conservative overestimates of marine mammal exposures for consultation with NMFS, the short duration and limited geographic extent of elevated causeway training would further limit actual exposures. Given these factors, long-term consequences for individuals or populations of marine mammals would not be expected.

Table 3.4-30: Annual Exposure Summary for Pile Driving and Removal During Elevated Causeway Training – All Alternatives

Species		Impact Pile Driving		Vibratory Pile Removal		Total Predicted Exposures	
		Level B 160 dB RMS	Level A 180 dB RMS	Level B 120 dB RMS	Level A 180 dB RMS	MMPA Level B	MMPA Level A
Cetaceans	Gray whale, Eastern North Pacific	8	0	47	0	55	0
	Bottlenose dolphin, California coastal	46	0	294	0	340	0
	Long-beaked common dolphin	7	0	45	0	52	0
	Risso's dolphin	16	0	103	0	119	0
	Pacific white-sided dolphin	5	0	28	0	33	0
Pinnipeds	Harbor seal	2	0	12	0	14	0
	California sea lion	33	0	208	0	241	0
Total						854	0

Conclusion – All Alternatives, Training Activities

Under all alternatives, the use of pile driving and removal is the same and is only conducted as a training activity. This event is as described in Table 2.8-1 and Section 3.0.5.3.1 (Acoustic Stressors). This activity would result in inadvertent takes of marine mammals in the SOCAL portion of the Study Area. Long-term consequences to individuals or the populations of marine mammals are not expected to result from pile driving and removal associated with the proposed training events. No ESA-listed species or critical habitat would be affected by pile driving and removal associated with elevated causeway training.

Pursuant to the MMPA, pile driving and removal during training activities under all alternatives may expose marine mammals up to 854 times annually to sound levels that would be considered Level B harassment, as defined by the MMPA.

Pursuant to the ESA, pile driving and removal during training activities as described under all alternatives:

- *Would have no effect on humpback whale, blue whale, sei whale, fin whale, sperm whale, Hawaiian monk seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *May affect, but is not likely to adversely affect, the Western North Pacific gray whale and Guadalupe fur seal*
- *Would have no effect on designated critical habitat*

3.4.3.2.3.2 All Alternatives – Testing Activities

There are no proposed pile driving and removal testing activities under any proposed alternative.

3.4.3.2.4 Impacts from Swimmer Defense Airguns

Marine mammals could be exposed to noise from swimmer defense airguns during pierside swimmer defense and stationary source testing activities. Swimmer defense airgun testing involves a limited number (up to 100 per event) of impulses from a small (60 cubic inch [in.^{3}]) airgun. Section 3.0.5.3.1.4

(Swimmer Defense Airguns) provides additional details on the use and acoustic characteristics of swimmer defense airguns.

Activities using swimmer defense airguns were modeled using the Navy Acoustic Effects Model. Model predictions indicate that marine mammals would be exposed to sound or acoustic energy from swimmer defense airguns that could elicit a physiological or behavioral response.

3.4.3.2.4.1 All Alternatives – Training Activities

There are no training activities using swimmer defense airguns under any of the alternatives (No Action, Alternative 1, or Alternative 2).

3.4.3.2.4.2 No Action Alternative – Testing Activities

Testing under No Action Alternative includes the use of swimmer defense airguns. This event is as described in Table 2.8-3 and Section 3.0.5.3.1 (Acoustic Stressors), and is only conducted as a testing activity. Testing activities using swimmer defense airguns under the No Action Alternative in were modeled using the Navy Acoustic Effects Model. Model predictions indicate that for the No Action Alternative, five exposures in San Diego Bay to California sea lion annually resulting from sound or acoustic energy from swimmer defense airguns could result in TTS, a Level B harassment exposure.

Single, small airguns (60 in.^{3}) would not cause direct trauma to marine mammals. Impulses from airguns lack the strong shock wave and rapid pressure increase as would be expected from explosive sources that can cause primary blast injury or barotrauma.

Impulses from swimmer defense airguns could potentially cause temporary hearing loss if animals are within a few meters of the sound source. However, given the relatively low source levels requires animals to be close to the source for this to occur, likely animal avoidance of the source, and mitigation measures, temporary hearing loss resulting from use of this source is very unlikely.

Airguns produce broadband sounds with an individual impulse duration of about 0.1 second. Swimmer defense airguns could be fired up to 100 times per event but would generally be used less based on the actual testing requirements. The pierside areas where these activities are proposed are inshore, with high levels of activity and therefore high levels of ambient noise (Section 3.0.4.5, Ambient Noise). Additionally these areas have low densities of marine mammals. Therefore, auditory masking to marine mammals due to the limited testing of the swimmer defense airgun associated with integrated pierside swimmer defense is unlikely.

The behavioral response of marine mammals to airguns, especially with multiple airguns firing simultaneously and repeating at regular intervals, has been well studied in conjunction with seismic surveys (e.g., oil and gas exploration). Many of these studies are reviewed above in Section 3.4.3.1.2.6 (Behavioral Reactions). However the swimmer defense airgun testing involves the use of only one small (60 in.^{3}) airgun firing a limited number of times, so reactions from marine mammals would likely be much less than what is noted in studies of marine mammal reactions during large-scale seismic studies. Furthermore, the swimmer defense airgun has limited overall use throughout the year.

Long-term consequences for individual or the stock of California sea lion would not be expected. Swimmer defense airgun activities associated with testing under the No Action Alternative would not affect any endangered species or critical habitat.

3.4.3.2.4.3 Conclusion

This activity would result in inadvertent takes of California sea lion in the SOCAL portion of the Study Area. Long term consequences to individuals or the population of California sea lion are not expected to result from swimmer defense airguns associated with the proposed testing events. No ESA-listed species or critical habitat would be affected by airguns associated with swimmer defense airgun testing.

Pursuant to the MMPA, the use of swimmer defense airguns during testing activities under the No Action Alternative may expose California sea lion up to five times annually to sound levels that would be considered Level B harassment.

Pursuant to the ESA, the use of swimmer defense airguns during testing activities as described under the No Action Alternative would have no effect on ESA-listed species or critical habitat.

3.4.3.2.4.4 Alternative 1 – Testing Activities

Testing activities using swimmer defense airguns under the Alternative 1 in SOCAL were modeled using the Navy Acoustic Effects Model. Model predictions indicate that for the No Action Alternative, four California sea lion annually would be exposed to sound or acoustic energy from swimmer defense airguns that would result in TTS, a Level B harassment exposure. Although this is one less California sea lion exposure annually than the No Action Alternative, the conclusion is the same as presented above for the No Action Alternative. Long-term consequences for individuals or the population of California sea lion would not be expected. No ESA-listed species or critical habitat would be affected by airguns associated with swimmer defense airgun testing.

Pursuant to the MMPA, the use of swimmer defense airguns during testing activities under Alternative 1 may expose California sea lion up to four times annually to sound levels that would be considered Level B harassment.

Pursuant to the ESA, the use of swimmer defense airguns during testing activities as described under Alternative 1 would have no effect on ESA-listed species or critical habitat.

3.4.3.2.4.5 Alternative 2 – Testing Activities

Testing activities using airguns under the Alternative 2 are identical in location and number to training activities proposed under the No Action Alternative. Therefore, the predicted impacts for Alternative 2 are identical to those described above for the No Action Alternative. Long-term consequences for the stock or population of California sea lion would not be expected. No ESA-listed species or critical habitat would be affected by airguns associated with swimmer defense airgun testing.

Pursuant to the MMPA, the use of swimmer defense airguns during testing activities under Alternative 2 may expose California sea lion up to five times annually to sound levels that would be considered Level B harassment.

Pursuant to the ESA, the use of swimmer defense airguns during testing activities as described under Alternative 2 would have no effect on ESA-listed species or critical habitat.

3.4.3.2.5 Impacts from Weapons Firing, Launch, and Impact Noise

Marine mammals may be exposed to weapons firing and launch noise and sound from the impact of non-explosive ordnance on the water's surface. A detailed description of these stressors is provided in Section 3.0.5.3.1.5 (Weapons Firing, Launch, and Impact Noise). Reactions by marine mammals to these specific stressors have not been recorded, however marine mammals would be expected to react to weapons firing, launch, and non-explosive impact noise as they would other transient sounds (see Section 3.4.3.1.2.6, Behavioral Reactions).

3.4.3.2.5.1 No Action Alternative – Training Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives) and Table 2.8-1, training activities under the No Action Alternative include activities that produce in water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface. Noise associated with weapons firing and the impact of non-explosive practice munitions could happen at any location within the Study Area but generally would occur at locations greater than 12 nm from shore for safety reasons.

A gun fired from a ship on the surface of the water propagates a blast wave away from the gun muzzle into the water (see Section 3.0.5.3.1.5, Weapons Firing, Launch, and Impact Noise). Average peak sound pressure in the water measured directly below the muzzle of the gun and under the flight path of the shell (assuming it maintains an altitude of only a few meters above the water's surface) was approximately 200 dB re 1 µPa. Animals at the surface of the water, in a narrow footprint under a weapons trajectory, could be exposed to naval gunfire noise and may exhibit brief startle reactions, avoidance, diving, or no reaction at all. Due to the short term, transient nature of gunfire noise, animals are unlikely to be exposed multiple times within a short period. Behavioral reactions would likely be short term (minutes) and are unlikely to lead to substantial costs or long-term consequences for individuals or populations.

Sound due to missile and target launches is typically at a maximum at initiation of the booster rocket and rapidly fades as the missile or target travels downrange. These sounds would be transient and of short duration, lasting no more than a few seconds at any given location. Many missiles and targets are launched from aircraft, which would produce minimal noise in the water due to the altitude of the aircraft at launch. Missiles and targets launched by ships or near the water's surface may expose marine mammals to levels of sound that could produce brief startle reactions, avoidance, or diving. Due to the short term, transient nature of launch noise, animals are unlikely to be exposed multiple times within a short period. Behavioral reactions would likely be short term (minutes) and are unlikely to lead to long-term consequences for individuals or populations.

Mines, non-explosive bombs, and intact missiles and targets could impact the water's surface with great force and produce a large impulse and loud noise (see Section 3.0.5.3.1.5, Weapons Firing, Launch, and Impact Noise). Marine mammals within a few meters could experience some temporary hearing loss, although the probability is low of the non-explosive ordnance landing within this range while a marine mammal is near the surface. Animals that are within the area may hear the impact of non-explosive ordnance on the surface of the water and would likely alert, startle, dive, or avoid the immediate area. Significant behavioral reactions from marine mammals would not be expected due to non-explosive ordnance water-surface impact noise, therefore long-term consequences for the individual and population are unlikely.

In the HRC portion of the Study Area, Hawaiian monk seal spend part of their time on land and although they may travel hundreds of miles in a few days in search of food, they send most of their time in nearshore shallow water locations. Therefore, Hawaiian monk seal generally would not be exposed to noise from weapons firing, launch, and non-explosive ordnance water-surface impact associated with proposed Navy training activities that typically occur far from shore. These activities would not occur in locations designated as Hawaiian monk seal critical habitat.

In the SOCAL portion of the Study Area, Guadalupe fur seal spend part of their time on land and given their limited number, are not likely to be present to be exposed to noise from weapons firing, launch, and non-explosive ordnance water-surface impact associated with proposed Navy training activities. Similarly, Western North Pacific gray whale are not likely to be present given their small number, brief seasonal presence, and main migration routes (see Sumich and Show 2011) generally away from locations where weapons firing occurs.

Mitigation measures implemented by the Navy (see Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring) are designed to further reduce potential impacts from the firing of large caliber (5 inch gun) weapons and certain non-explosive ordnance (e.g., non explosive bombs and mine shapes) water-surface impact associated with the proposed Navy training activities. Long term consequences to individuals or populations of marine mammals are not expected to result from weapons firing, launch, and non-explosive ordnance water-surface impact associated with the proposed training events.

Pursuant to the MMPA, weapons firing launch, and non-explosive impact noise during training activities under the No Action Alternative is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, weapons firing, launch, and non-explosive impact noise from training activities as described under the No Action Alternative:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.5.2 No Action Alternative – Testing Activities

As described in Tables 2.8-2 to 2.8-5, testing activities under the No Action Alternative include activities that produce in water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface. These testing activities would occur throughout the Study Area. Although the impacts associated with these testing activities would differ in quantity from those described for training in preceding Section 3.4.3.2.5.1 (No Action Alternative – Training Activities) the types and severity of impacts would not be discernible from those described for training.

Mitigation measures implemented by the Navy (see Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring) are designed to further reduce potential impacts from the firing of large caliber (5 inch gun) weapons and certain non-explosive ordnance (non-explosive bombs and mine shapes) water-surface impact associated with the proposed Navy testing activities. Long-term consequences to individuals or populations of marine mammals are not expected to result from vessel noise associated with the proposed testing events.

Pursuant to the MMPA, weapons firing, launch, and non-explosive impact noise during testing activities under the No Action Alternative is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, weapons firing, launch, and non-explosive impact noise during testing activities as described under the No Action Alternative:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.5.3 Alternative 1 – Training Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), training activities that produce in water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface would occur. Under Alternative 1, total weapons firings would increase by 13 percent over the No Action Alternative, however, the locations, types, and severity of impacts would not be discernible from those described above in Section 3.4.3.2.5.1 (No Action Alternative – Training Activities).

Pursuant to the MMPA, weapons firing, launch, and non-explosive impact noise during training activities under Alternative 1 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, weapons firing, launch, and non-explosive impact noise during training activities as described under Alternative 1:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.5.4 Alternative 1 – Testing Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), testing activities that produce in water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface would occur. Under Alternative 1, total weapons firings would increase by 13 percent over the No Action Alternative, however, the locations, types, and severity of impacts would not be discernible from those described above in Section 3.4.3.2.5.2 (No Action Alternative – Testing Activities).

Pursuant to the MMPA, weapons firing, launch, and non-explosive impact noise during testing activities under Alternative 1 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, weapons firing, launch, and non-explosive impact noise during testing activities as described under Alternative 1:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.5.5 Alternative 2 – Training Activities

Proposed training activities under Alternative 2 are identical to training activities proposed under Alternative 1. Therefore, the predicted impacts for Alternative 2 are identical to those described above in Training Activities under Section 3.4.3.2.5.3 (Alternative 1 – Training Activities).

Pursuant to the MMPA, weapons firing, launch, and non-explosive impact noise during training activities under Alternative 2 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, weapons firing, launch, and non-explosive impact noise during training activities as described under Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.5.6 Alternative 2 – Testing Activities

Proposed testing activities under Alternative 2 are an increase from the No Action Alternative; however, the locations, types, and severity of impacts would not be discernible from those described in Section 3.4.3.2.5.2 (No Action Alternative – Testing Activities).

Pursuant to the MMPA, weapons firing, launch, and non-explosive impact noise during testing activities under Alternative 2 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, weapons firing, launch, and non-explosive impact noise during testing activities as described under Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.6 Impacts from Vessel Noise

Marine mammals may be exposed to noise from vessel movement. A detailed description of the acoustic characteristics and typical sound levels of vessel noise is provided in Section 3.0.5.3.1.6 (Vessel Noise). Vessel movements involve transits to and from ports to various locations within the Study Area, and many ongoing and proposed training and testing activities within the Study Area involve maneuvers by various types of surface ships, boats, and submarines (collectively referred to as vessels).

3.4.3.2.6.1 No Action Alternative – Training Activities

As discussed in Chapter 2 (Description of Proposed Action and Alternatives), training activities under the No Action Alternative include vessel movement in many events. Navy vessel traffic could occur anywhere within the Study Area.

Several studies have shown that marine mammals may abandon inshore and nearshore habitats with high vessel traffic, especially in areas with regular marine mammal watching (see discussion in Section

3.4.3.1.2.6, Behavioral Reactions). As discussed in Section 3.0.5.3.1.6 (Vessel Noise), Because Navy ships make up only a small proportion of the total ship traffic, even in the most concentrated port and inshore areas, proposed Navy vessel transits are unlikely to cause long-term abandonment of habitat by a marine mammal. Recent analysis by Mintz and Filadelfo (2011) demonstrated that in 2009, within the boundaries of the SOCAL Range Complex where Navy concentrates activity, there was a total of 695,615 vessel hours and the Navy accounted for 164,642 of those hours or approximately 24 percent of the total. This statistic is somewhat skewed since the SOCAL complex is relatively narrow north to south so commercial vessels in the international shipping lanes passing through are much more numerous than indicated by the non-Navy vessel hours within the complex. For the remaining Pacific U.S. Exclusive Economic Zone (the habitat for the majority of SOCAL marine mammal stocks) there was an estimated 457,817 vessel hours and Navy vessels accounted for 28,002 of those hours or slightly less that 6 percent of the total. Military vessels would comprise an even smaller proportion of total vessels if smaller vessels (less than 65 ft. [20 m] in length) were included in the Mintz and Filadelfo (2011) analysis.

Auditory masking can occur due to vessel noise, potentially masking vocalizations and other biologically important sounds (e.g., sounds of prey or predators) that marine mammals may rely upon. Marine mammals have been recorded in several instances altering and modifying their vocalizations to compensate for the masking noise from vessels or other similar sounds. Potential masking can vary depending on the ambient noise level within the environment (see Section 3.0.4.5, Ambient Noise); the received level and frequency of the vessel noise; and the received level and frequency of the sound of biological interest. In the open ocean, ambient noise levels are between about 60 and 80 dB re 1 µPa, especially at lower frequencies (below 100 Hz), and inshore noise levels, especially around busy ports, can exceed 120 dB re 1 µPa. Sounds from fish and marine mammals can also contribute to ambient noise levels. In Hawaii when humpback whales are present, at the peak period of their chorusing (mid-February to mid-March), the ambient sound level off Maui was measured by Au et al. (2000) at 120 SPL (dB re 1 µPa) and off San Clemente Island D'Spain and Batchelor (2006) measured a similar peak. When the noise level is above the sound of interest, and in a similar frequency band, auditory masking could occur (see Section 3.0.5.7.1, Conceptual Framework for Assessing Effects from Sound-Producing Activities). This analysis assumes that any sound that is above ambient noise levels and within an animal's hearing range may potentially cause masking. However, the degree of masking increases with increasing noise levels; a noise that is just-detectable over ambient levels is unlikely to actually cause any substantial masking. Masking by passing ships or other sound sources transiting the Study Area would be short-term, intermittent, and therefore unlikely to result in any substantial costs or consequences to individual animals or populations. Areas with increased levels of ambient noise from anthropogenic noise sources such as areas around busy shipping lanes and near harbors and ports (see Baumann-Pickering et al. 2010 for an example from Hawaii) may cause sustained levels of auditory masking for marine mammals, which could reduce an animal's ability to find prey, find mates, socialize, avoid predators, or navigate. However, Navy vessels make up a very small percentage of the overall traffic and the rise of ambient noise levels in these areas is a problem related to all ocean users including commercial and recreational vessels and shoreline development and industrialization.

Surface combatant ships (e.g., guided missile destroyer, guided missile cruiser, and Littoral Combat Ship) and submarines are designed to be very quiet to evade enemy detection and typically travel at speeds of 10 or more knots. Actual acoustic signatures and source levels of combatant ships and submarine are classified, however they are quieter than most other motorized ships; by comparison a typical commercial fishing vessel produces about 158 dB re 1 µPa at 1 m (see Section 3.0.5.3.1.6, Vessel Noise, for a description of typical noise from commercial and recreational vessels). Therefore, these surface combatants and submarines are likely to be detectable by marine mammals over open-ocean ambient noise levels (discussed in Section 3.0.4.5, Ambient Noise) at distances of up to a few kilometers, which could cause some auditory masking to marine mammals for a few minutes as the vessel passes by. Other Navy ships and small craft have higher source levels, similar to equivalently sized commercial ships and private vessels. Ship noise tends to be low-frequency and broadband, therefore it may have the largest potential to mask mysticetes that vocalize and hear at lower frequencies than other marine mammals. Noise from large vessels and outboard motors on small craft can produce source levels of 160 to over 200 dB re 1 µPa @ 1 m for some large commercial vessels and outboard engines. Therefore, in the open ocean, noise from non-combatant Navy vessels may be detectable over ambient levels for tens of kilometers and some auditory masking, especially for mysticetes, is possible. In noisier inshore areas around Navy ports and ranges, vessel noise may be detectable above ambient for only several hundred meters. Some auditory masking to marine mammals is likely from non-combatant Navy vessels, on par with similar commercial and recreational vessels, especially in quieter, open-ocean environments.

Vessel noise has the potential to disturb marine mammals and elicit an alerting, avoidance, or other behavioral reaction. Most studies have reported that marine mammals react to vessel noise and traffic with short-term interruption of feeding, resting, or social interactions (Magalhães et al. 2002; Richardson et al. 1995; Watkins 1981). Some species respond negatively by retreating or responding to the vessel antagonistically, while other animals seem to ignore vessel noises altogether (Watkins 1986). Marine mammals are frequently exposed to vessels due to research, ecotourism, commercial and private vessel traffic, and government activities. It is difficult to differentiate between responses to vessel noise and visual cues associated with the presence of a vessel; thus, it is assumed that both play a role in prompting reactions from animals.

Based on studies on a number of species, mysticetes are not expected to be disturbed by vessels that maintain a reasonable distance from them, which varies with vessel size, geographic location, and tolerance levels of individuals.

Odontocetes could have a variety of reactions to passing vessels including attraction, increased travelling time, decrease in feeding behaviors, diving, or avoidance of the vessel, which may vary depending on their prior experience with vessels. *Kogia* species, harbor porpoises, and beaked whales have been observed avoiding vessels, however, in the inland waters of Hood Canal and Dabob Bay (Washington state), recent surveys (October 2011) conducted documented the daily presence of harbor porpoise inhabiting these relatively restricted bodies of water where Navy vessel testing has been ongoing for decades. This is consistent with evidence from the Navy's instrumented ranges in Hawaii and the Bahamas, which have documented the presence of beaked whales through the monitoring of vocalizations, and the documented site fidelity of Cuvier's beaked whales (Falcone et al. 2009) at the instrumented range in SOCAL. Additional behavioral response studies (Aguilar de Soto et al. 2006; Tyack et al. 2011; Southall et al. 2012) have indicated that while beaked whales exposed to vessel and other anthropogenic noise will change behavior and leave the immediate area of the noise source, within 2–3 days they have reinhabited any area vacated.

For pinnipeds, data indicate tolerance of vessel approaches, especially for animals in the water. Navy vessels do not purposefully approach marine mammals and are not expected to elicit significant behavioral responses. In the inland waters of Hood Canal and Dabob Bay (Washington state), recent surveys (October 2011) conducted documented the daily presence of California sea lion, and harbor seal inhabiting these relatively restricted bodies of water where Navy vessel testing has been ongoing for decades. Reactions by pinnipeds are likely to be minor and short term, leading to no long-term consequences. Mitigation measures implemented to detect and avoid marine mammals (see Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring) would further reduce the potential for significant behavioral reactions from marine mammals due to exposure from vessel noise or presence. Vessel noise would not impact the primary constituent elements of Hawaiian monk seal critical habitat.

Sea otter in the Study area inhabit nearshore the nearshore shallow water at San Nicolas Island at the edge of the SOCAL Range Complex. Vessels will generally not be engaged in training activities in the vicinity of sea otter. Research indicates sea otters often remained undisturbed, quickly become tolerant of the various sounds, and even when purposefully harassed, they generally moved only a short distance (100 to 200 m) before resuming normal activity.

Vessel traffic related to the proposed training activity would pass near marine mammals only on an incidental basis. Navy mitigation measures include several provisions to avoid approaching marine mammals (see Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring, for a detailed description of mitigation measures) which would further reduce any potential impacts from vessel noise. Long term consequences to individuals or populations of marine mammals are not expected to result from vessel noise associated with the proposed training events.

Pursuant to the MMPA, vessel noise during training activities under the No Action Alternative is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, vessel noise during training activities as described under the No Action Alternative:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.6.2 No Action Alternative – Testing Activities

As discussed in Chapter 2 (Description of Proposed Action and Alternatives), testing activities under the No Action Alternative include vessel movement in most events. Navy vessel traffic associated with testing could take place anywhere within the Study Area. Proposed Testing Activities under the No Action Alternative that involve vessel movement differ in number from Training Activities under the No Action Alternative, however the types and severity of impacts would not be discernible from those described above in Section 3.4.3.2.6.1 (No Action Alternative – Training Activities). Long term consequences to individuals or populations of marine mammals are not expected to result from vessel noise associated with the proposed testing events.

Pursuant to the MMPA, vessel noise during testing activities under the No Action Alternative is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, vessel noise during testing activities as described under the No Action Alternative:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.6.3 Alternative 1 – Training Activities

As discussed in Chapter 2 (Description of Proposed Action and Alternatives), training activities under Alternative 1 include an increase in vessel movement over the No Action Alternative, however, the locations and types of predicted impacts would not differ. Proposed Training Activities under Alternative 1 that involve vessel movement differ in number from Training Activities proposed under the No Action Alternative, however the locations, types, and severity of impacts would not be discernible from those described above in Section 3.4.3.2.6.1 (No Action Alternative – Training Activities).

Pursuant to the MMPA, vessel noise during training activities under Alternative 1 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, vessel noise during training activities as described under Alternative 1:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.6.4 Alternative 1 – Testing Activities

As discussed in Chapter 2 (Description of Proposed Action and Alternatives), testing activities under Alternative 1 include an increase in vessel movement over the No Action Alternative, however, the locations and types of predicted impacts would not differ. Proposed Testing Activities under Alternative 1 that involve vessel movement differ in number from Testing Activities proposed under the No Action Alternative, however the locations, types, and severity of impacts would not be discernible from those described above in Section 3.4.3.2.6.2 (No Action Alternative – Testing Activities).

Pursuant to the MMPA, vessel noise during testing activities under Alternative 1 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, vessel noise during testing activities as described under Alternative 1:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.6.5 Alternative 2 – Training Activities

As discussed in Chapter 2 (Description of Proposed Action and Alternatives), training activities under Alternative 2 include an increase in vessel movement over the No Action Alternative, however, the locations and types of predicted impacts would not differ. Proposed Training Activities under Alternative 2 that involve vessel movement differ in number from Training Activities proposed under the No Action Alternative, however the locations, types, and severity of impacts would not be discernible from those described above in Section 3.4.3.2.6.1 (No Action Alternative – Training Activities).

Pursuant to the MMPA, vessel noise during training activities under Alternative 2 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, vessel noise during training activities as described under Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.6.6 Alternative 2 – Testing Activities

As discussed in Chapter 2 (Description of Proposed Action and Alternatives), testing activities under Alternative 2 include an increase in vessel movement over the No Action Alternative, however, the locations and types of predicted impacts would not differ. Proposed Testing Activities under Alternative 2 that involve vessel movement differ in number from Testing Activities proposed under the No Action Alternative, however the locations, types, and severity of impacts would not be discernible from those described above in Section 3.4.3.2.6.2 (No Action Alternative – Testing Activities).

Pursuant to the MMPA, vessel noise during testing activities under Alternative 2 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, vessel noise during testing activities as described under Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.7 Impacts from Aircraft Noise

Marine mammals may be exposed to aircraft-generated noise wherever aircraft overflights occur in the Study Area. Fixed and rotary-wing aircraft are used for a variety of training and testing activities throughout the Study Area. Most of these sounds would be concentrated around airbases and fixed ranges within each of the range complexes. Aircraft produce extensive airborne noise from either turbofan or turbojet engines. A severe but infrequent type of aircraft noise is the sonic boom, produced when the aircraft exceeds the speed of sound. Rotary-wing aircraft (helicopters) produce low-frequency sound and vibration (Pepper et al. 2003). A detailed description of aircraft noise as a stressor is provided in Section 3.0.5.3.1.7 (Aircraft Overflight Noise).

3.4.3.2.7.1 No Action Alternative – Training Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), training activities under the No Action Alternative include fixed- and rotary-wing aircraft overflights. Several of the activities the U.S. Navy proposes to conduct in the Study Area involve some level of activity from aircraft that include helicopters, maritime patrol aircraft, and fighter jets.

Marine mammals may respond to both the physical presence and to the noise generated by aircraft, making it difficult to attribute causation to one or the other stimulus. In addition to noise produced, all low-flying aircraft make shadows, which can cause animals at the surface to react. Helicopters may also produce strong downdrafts, a vertical flow of air that becomes a surface wind, which can also affect an animal's behavior at or near the surface.

Transmission of sound from a moving airborne source to a receptor underwater is influenced by numerous factors, but significant acoustic energy is primarily transmitted into the water directly below the craft in a narrow cone, as discussed in greater detail in Section 3.0.4 (Acoustic and Explosives Primer). Underwater sounds from aircraft are strongest just below the surface and directly under the aircraft. The maximum sound levels in water from an aircraft overflight are approximately 150 dB re 1µPa for an F/A-18 aircraft at 300 m altitude; approximately 125 dB re 1µPa for an H-60 helicopter hovering at 50 ft.; and under ideal conditions, sonic booms from aircraft at 1 km could reach up to 178 dB re 1µPa at the water's surface (see Section 3.0.5.3.1.7, Aircraft Overflight Noise, for additional information on aircraft noise characteristics).

See Section 3.4.3.1.2.6 (Behavioral Reactions) for a review of research and observations regarding marine mammal behavioral reactions to aircraft overflights; many of the observations cited in this section are of marine mammal reactions to aircraft flown for whale-watching and marine research purposes. Marine mammal survey aircraft are typically used to locate, photograph, track, and sometimes follow animals for long distances or for long periods of time, all of which results in the animal being much more frequently located directly beneath the aircraft (in the cone of the loudest noise and in the shadow of the aircraft) for extended periods. Navy aircraft would not follow or pursue marine mammals. In contrast to whale watching excursions or research efforts, Navy overflights would not result in prolonged exposure of marine mammals to overhead noise.

In most cases, exposure of a marine mammal to fixed-wing or rotary-wing aircraft presence and noise would last for only seconds as the aircraft quickly passes overhead. Animals would have to be at or near the surface at the time of an overflight to be exposed to appreciable sound levels. Takeoffs and landings occur at established airfields as well as on vessels at sea at unspecified locations across the Study Area. Takeoff and landings from Navy vessels could startle marine mammals, however these events only produce in-water noise at any given location for a brief period of time as the aircraft climbs to cruising altitude. Some sonic booms from aircraft could startle marine mammals, but these events are transient and happen infrequently at any given location within the Study Area. Repeated exposure to most individuals over short periods (days) is extremely unlikely, except for animals that are resident around the North Island or San Clemente Island airfields in San Diego, the airfield at PMRF in Hawaii, or resident on Navy fixed-ranges (e.g., the instrumented ranges off San Clemente Island in SOCAL and PMRF in Hawaii). No long-term consequences for individuals or populations would be expected.

Low flight altitudes of helicopters during some anti-submarine warfare and mine warfare activities, often under 100 feet, may elicit a somewhat stronger behavioral response due to the proximity to marine mammals; the slower airspeed and therefore longer exposure duration; and the downdraft created by the helicopter's rotor. Marine mammals would likely avoid the area under the helicopter. It is unlikely that an individual would be exposed repeatedly for long periods of time as these aircraft typically transit open ocean areas within the Study Area. The consensus of all the studies reviewed is that aircraft noise would cause only small temporary changes in the behavior of marine mammals. Specifically, marine mammals located at or near the surface when an aircraft flies overhead at low-altitude may startle, divert their attention to the aircraft, or avoid the immediate area by swimming away or diving. The sound from aircraft overflights resulting from training activities proposed under the No Action Alternative could expose mysticetes, odontocetes, pinnipeds, and sea otter to overflight noise. Short-term reactions to aircraft are not likely to disrupt major behavior patterns such as migrating, breeding, feeding, and sheltering, or to result in serious injury to any marine mammals. No long-term consequences for individuals or populations would be expected. Overflight noise would not impact the Hawaiian monk seal critical habitat.

Pursuant to the MMPA, aircraft noise during training activities under the No Action Alternative is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, aircraft noise during training activities as described under the No Action Alternative:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.7.2 No Action Alternative – Testing Activities

As discussed in Chapter 2 (Description of Proposed Action and Alternatives), testing activities under the No Action Alternative include fixed- and rotary-wing aircraft overflights. These events would be spread across the large marine ecosystems and open ocean areas designated within the Study Area. Proposed Testing Activities under the No Action Alternative that involve aircraft overflights differ in number and location from Training Activities under the No Action Alternative, however the types and severity of impacts would not be discernible from those described above in Section 3.4.3.2.7.1 (No Action Alternative – Training Activities).

Pursuant to the MMPA, aircraft noise during testing activities under the No Action Alternative is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, aircraft noise during testing activities as described under the No Action Alternative:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.7.3 Alternative 1 – Training Activities

Under Alternative 1, the total number of aircraft-related activities would increase by 13 percent over the No Action Alternative throughout the Study Area. An increase in training aircraft-hours would result in an overall increase in noise. Neither the locations nor the flight profiles (altitude, airspeed, and duration) would change between the No Action Alternative and Alternative 1. Even with an increase in the number of overflights, most would be flown at an elevation high enough to not cause long-term disturbance to marine mammals and, therefore, the severity of impacts would not be discernible from those described above in Section 3.4.3.2.7.1 (No Action Alternative – Training Activities).

Pursuant to the MMPA, aircraft noise during training activities under Alternative 1 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, aircraft noise during training activities as described under Alternative 1:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.7.4 Alternative 1 – Testing Activities

Under Alternative 2, total number of aircraft- related activities would increase by 13 percent over the No Action Alternative throughout the Study Area. An increase in testing aircraft-hours would result in an overall increase in noise. Neither the locations nor the flight profiles (altitude, airspeed, and duration) would change between the No Action Alternative and Alternative 1. Even with an increase in the number of overflights, most would be flown at an elevation high enough to not cause long-term disturbance to marine mammals and, therefore, the severity of impacts would not be discernible from those described above in Section 3.4.3.2.7.2 (No Action Alternative – Testing Activities).

Pursuant to the MMPA, aircraft noise during testing activities under Alternative 1 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, aircraft noise during testing activities as described under Alternative 1:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.7.5 Alternative 2 – Training Activities

Under Alternative 2, the total number of aircraft-related activities would increase over the No Action Alternative throughout the Study Area. An increase in training aircraft-hours would result in an overall increase in noise. Neither the locations nor the flight profiles (altitude, airspeed, and duration) would change between the No Action Alternative and Alternative 2. Even with an increase in the number of overflights, most would be flown at an elevation high enough to not cause long-term disturbance to marine mammals and, therefore, the severity of impacts would not be discernible from those described above in above Section 3.4.3.2.7.1 (No Action Alternative – Training Activities).

Pursuant to the MMPA, aircraft noise during training activities under Alternative 2 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, aircraft noise during training activities as described under Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.2.7.6 Alternative 2 – Testing Activities

Under Alternative 2, total number of aircraft- related activities would increase by over the No Action Alternative throughout the Study Area. An increase in testing aircraft-hours would result in an overall increase in noise. Neither the locations nor the flight profiles (altitude, airspeed, and duration) would change between the No Action Alternative and Alternative 2. Even with an increase in the number of overflights, most would be flown at an elevation high enough to not cause long-term disturbance to marine mammals and, therefore, the severity of impacts would not be discernible from those described above in the above Section 3.4.3.2.7.2 (No Action Alternative – Testing Activities).

Pursuant to the MMPA, aircraft noise during testing activities under Alternative 2 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, aircraft noise during testing activities as described under Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.3 Energy Stressors

This section analyzes the potential impacts of energy stressors used during training and testing activities within the Study Area. The detailed analysis which follows includes the potential impacts of devices that purposefully create an electromagnetic field underwater (e.g., some mine neutralization systems; see Section 2.3.5, Mine Warfare Systems). Also proposed under Alternative 1 and Alternative 2 is the Naval Sea Systems Command proposed testing of the kinetic energy weapon system on vessels off Pacific Missile Range Facility in HRC. This kinetic energy weapon would generate and electromagnetic field (within the kinetic energy weapon barrel) to launch a projectile. Since marine mammals are not exposed to the electromagnetic field from a kinetic energy weapon and would not be affected by electromagnetic energy from these test events, no further consideration of the kinetic energy weapon as a potential energy stressor is warranted.

3.4.3.3.1 Impacts from Electromagnetic Devices

For a discussion of the types of activities that purposefully create an electromagnetic field underwater, where this would occur, and how many events will occur under each alternative, please see Section 3.0.5.3.2.1 (Electromagnetic Devices). The devices producing an electromagnetic field are towed or unmanned mine countermeasure systems. The electromagnetic field is produced to simulate a vessel's magnetic field. In an actual mine clearing operation, the intent is that the electromagnetic field would trigger an enemy mine designed to sense a vessel's magnetic field.

Neither regulations nor scientific literature provide threshold criteria to determine the significance of the potential effects from actions that result in generation of an electromagnetic field. Data regarding the influence of magnetic fields and electromagnetic fields on cetaceans are inconclusive. Dolman et al. (2003) provides a literature review of the influences of marine wind farms on cetaceans. The literature focuses on harbor porpoises and dolphin species due to their nearshore habitats. Teilmann et al. (2002) evaluated the frequency of harbor porpoise presence at wind farm locations around Sweden (the electrical current conducted by undersea power cables creates an electromagnetic field around those cables). Although electromagnetic field influences were not specifically addressed, the presence of cetacean species implies that at least those species are not repelled by the presence of electromagnetic field around undersea cables associated with offshore wind farms.

Based on the available literature, no evidence of electrosensitivity in marine mammals was found except recently in the Guiana dolphin (Czech-Damal et al. 2011). Normandeau et al., (2011) reviewed available information on electromagnetic and magnetic field sensitivity of marine organisms (including marine mammals) for impact assessment of offshore wind farms for the U.S. Department of the Interior and concluded there is no evidence to suggest any magnetic sensitivity for sea lions, fur seals, or sea otters (Normandeau et al. 2011). However, Normandeau et al. (2011) concluded there was behavioral, anatomical, and theoretical evidence indicating cetaceans sense magnetic fields. Most of the evidence in this regard is indirect evidence from correlation of sighting and stranding locations suggesting that cetaceans may be influenced by local variation in the earth's magnetic field (Kirschvink 1990; Klinowska 1985; Walker et al. 1992). Results from one study in particular showed that long-finned and short-finned pilot whales, striped dolphin, Atlantic spotted dolphin, Atlantic white-sided dolphin, fin whale, common dolphin, harbor porpoise, sperm whale, and pygmy sperm whale were found to strand in areas where the earth's magnetic field was locally weaker than surrounding areas (negative magnetic anomaly) (Kirschvink 1990). Results also indicated that certain species may be able to detect total intensity changes of only 0.05 microtesla (Kirschvink et al. 1986). This gives insight into what changes in intensity levels some species are capable of detecting, but does not provide experimental evidence of levels to which animals may physiologically or behaviorally respond.

Anatomical evidence suggests the presence of magnetic material in the brain (Pacific common dolphin, Dall's porpoise, bottlenose dolphin, Cuvier's beaked whale, and the humpback whale) and in the tongue and lower jawbones (harbor porpoise) (Bauer et al. 1985; Klinowska 1990). Zoeger et al. (1981) found what appeared to be nerve fibers associated with the magnetic material in a Pacific common dolphin and proposed that it may be used as a magnetic field receptor. The only experimental study involving physiological response comes from Kuznetsov (1999), who exposed bottlenose dolphins to permanent magnetic fields and showed reactions (both behavioral and physiological) to magnetic field intensities of 32, 108 and 168 microteslas during 79 percent, 63 percent, and 53 percent of the trials, respectively (as summarized in Normandeau et. al, 2011). Behavioral reactions included sharp exhalations, acoustic activity, and movement, and physiological reactions included a change in heart rate.

Potential impacts to marine mammals associated with electromagnetic fields are dependent on the animal's proximity to the source and the strength of the magnetic field. As discussed in Section 3.0.5.3.2.1 (Electromagnetic Devices), electromagnetic fields associated with naval training and testing activities are relatively weak (only 10 percent of the earth's magnetic field at 79 ft.), temporary, and localized. Once the source is turned off or moves from the location, the electromagnetic field is gone. A marine mammal would have to be present within the electromagnetic field (approximately 656 ft. [200 m] from the source) during the activity in order to detect it.

3.4.3.3.1.1 No Action Alternative – Training Activities

As discussed in Section 3.0.5.3.2.1 (Electromagnetic Devices), under the No Action Alternative, training activities that purposefully create an electromagnetic field underwater occur within the SOCAL portion of the Study Area and have the potential to expose marine mammals to that energy stressor.

Although it is not fully understood, based on the available evidence described above, it is probable that cetacea use the earth's magnetic field for movement or migration. If an animal was exposed to the moving electromagnetic field source and if sensitive to that source, it is conceivable that this electromagnetic field could have an effect while in proximity to a cetacean and thereby impacting that animal's navigation. However, impacts would be temporary and minor, and natural behavioral patterns would not be significantly altered or abandoned based on the: (1) relatively low intensity of the magnetic fields generated (discussed above), (2) very localized potential impact area, and (3) temporary duration of the activities (hours). The use an electromagnetic field would not impact the critical habitat of the Hawaiian monk seal.

Pursuant to the MMPA, the use of electromagnetic devices during training activities under the No Action Alternative is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the use of electromagnetic devices during training activities as described under the No Action Alternative:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.3.1.2 No Action Alternative – Testing Activities

As discussed in Section 3.0.5.3.2.1 (Electromagnetic Devices), there are no testing activities under the No Action Alternative that purposefully create an electromagnetic field underwater.

3.4.3.3.1.3 Alternative 1 – Training Activities

As discussed in Section 3.0.5.3.2.1 (Electromagnetic Devices), under Alternative 1, training activities that purposefully create an electromagnetic field underwater could occur within the SOCAL and HRC portions of the Study Area and have the potential to expose marine mammals to that energy stressor. There would be an increase of one event in SOCAL (a 0.4 percent increase above the No Action Alternative) and addition one event in HRC under Alternative 1 as a new location.

Although it is not fully understood, based on the available evidence described above, it is probable that cetacea use the earth's magnetic field for movement or migration. If an animal was exposed to the moving electromagnetic field source and if sensitive to that source, it is conceivable that this electromagnetic field could have an effect while in proximity to a cetacean and thereby impacting that animal's navigation. However, impacts would be temporary and minor, and natural behavioral patterns would not be significantly altered or abandoned based on the: (1) relatively low intensity of the magnetic fields generated (discussed above), (2) very localized potential impact area, and (3) duration of the mine neutralization activity (hours for shipboard systems; minutes for airborne systems).

Research suggests that pinnipeds are not sensitive to electromagnetic fields (Normandeau et al. 2011), so it is assumed there would be no effect on endangered Hawaiian monk seal or threatened Guadalupe fur seal from use of an electromagnetic field. Use an electromagnetic field would not impact the critical habitat of the Hawaiian monk seal.

Pursuant to the MMPA, the use of electromagnetic devices during training activities under Alternative 1 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the use of electromagnetic devices during training activities as described under Alternative 1:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.3.1.4 Alternative 1 – Testing Activities

As discussed in Section 3.0.5.3.2.1 (Electromagnetic Devices), there are no testing activities under the Alternative 1 that purposefully create an electromagnetic field underwater.

3.4.3.3.1.5 Alternative 2 – Training Activities

Proposed training activities under Alternative 2 are identical to training activities proposed under Alternative 1. Therefore, the predicted impacts for Alternative 2 are identical to those described above in Training Activities under Section 3.4.3.3.1.3 (Alternative 1 – Training Activities).

Pursuant to the MMPA, the use of electromagnetic devices during training activities under Alternative 2 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the use of electromagnetic devices during training activities as described under Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.3.1.6 Alternative 2 – Testing Activities

As discussed in Section 3.0.5.3.2.1 (Electromagnetic Devices), there are no testing activities under the Alternative 2 that purposefully create an electromagnetic field underwater.

3.4.3.4 Physical Disturbance and Strike Stressors

This section analyzes the potential impacts of the various types of physical disturbance to include the potential for strike during training and testing activities within the Study Area from (1) Navy vessels, (2) in-water devices, (2) military expended materials to include non-explosive practice munitions and fragments from high-explosive munitions, and (3) seafloor devices.

The way a physical disturbance may affect a marine mammal would depend in part on the relative size of the object, the speed of the object, the location of the mammal in the water column, and reactions of marine mammals to anthropogenic activity, which may include avoidance or attraction. It is not known at what point or through what combination of stimuli (visual, acoustic, or through detection in pressure changes) an animal becomes aware of a vessel or other potential physical disturbances prior to reacting or being struck. Refer to Sections 3.4.3.2.6 (Impacts from Vessel Noise) and 3.4.3.2.7 (Impacts from Aircraft Noise) for the analysis of the potential for disturbance from acoustic stimuli.

If a marine mammal responds to physical disturbance, the individual must stop whatever it was doing and divert its physiological and cognitive attention in response to the stressor (Helfman et al. 2009). The energetic costs of reacting to a stressor are dependent on the specific situation, but one can assume that the caloric requirements of a response may reduce the amount of energy available to the mammal for other functions, such as reproduction, growth, and homeostasis (Wedemeyer et al. 1990). Given that the presentation of a physical disturbance should be very rare and brief, the cost from the response is likely to be within the normal variation experiences by an animal in its daily routine unless the animal is struck. If a strike does occur, the cost to the individual could range from slight injury to death.

3.4.3.4.1 Impacts from Vessels

Interactions between surface vessels and marine mammals have demonstrated that surface vessels represent a source of acute and chronic disturbance for marine mammals (Au and Green 2000; Bejder et al. 2006; Hewitt 1985; Lusseau et al. 2009; Magalhães et al. 2002; Nowacek et al. 2004; Nowacek et al. 2007; Richter et al. 2006; Richter et al. 2003; Watkins 1986; Wursig and Richardson 2009). While the analysis of potential impact from the physical presence of the vessel is presented here, the analysis of potential impacts in response to sounds are addressed in Section 3.4.3.2.6 (Impacts from Vessel Noise.)

These studies establish that marine mammals engage in avoidance behavior when surface vessels move toward them. It is not clear whether these responses are caused by the physical presence of a surface vessel, the underwater noise generated by the vessel, or an interaction between the two. Though the noise generated by the vessels is probably an important contributing factor to the responses of cetaceans to the vessels. In one study, North Atlantic right whales were documented to show little overall reaction to the playback of sounds of approaching vessels, but that they did respond to an alert signal by swimming strongly to the surface (Nowacek et al. 2004). While this may increase their risk of collision, neither the North Atlantic nor the North Pacific right whales are expected to be present in the Study Area. Aside from the potential for an increased risk of collision addressed below, physical disturbance from vessel use is not expected to result in more than a short-term behavioral response.

Vessel speed, size and mass are all important factors in determining potential impacts of a vessel strike to marine mammals. For large vessels, speed and angle of approach can influence the severity of a strike. Based on modeling, Silber et al. (2010) found that whales at the surface experienced impacts that increased in magnitude with the ship's increasing speed. Results of the study also indicated that potential impacts were not dependent on the whale's orientation to the path of the ship, but that vessel speed may be an important factor. At ship speeds of 15 knots or higher, there was a marked increase in intensity of centerline impacts to whales. Results also indicated that when the whale was below the surface (about one to two times the vessel draft), there was a pronounced propeller suction effect. This suction effect may draw the whale into the hull of the ship, increasing the probability of propeller strikes (Silber et al. 2010).

Vessel strikes from commercial, recreational, and Navy vessels are known to affect large whales in the Study Area and have resulted in serious injury and occasional fatalities to cetaceans (Lammers et al. 2003, Abramson et al. 2009, Laggner 2009, Berman-Kowalewski et al. 2010; National Marine Fisheries Service 2010e; Calambokidis 2012). Reviews of the literature on ship strikes mainly involve collisions between commercial vessels and whales (e.g., Laist et al. 2001; Jensen and Silber 2004). The ability of any ship to detect a marine mammal and avoid a collision depends on a variety of factors, including environmental conditions, ship design, size, speed, and manning, as well as the behavior of the animal. Differences between most Navy ships and commercial ships also include:

- Many Navy ships have their bridges positioned closer to the bow, offering good visibility ahead of the ship;
- There are often aircraft associated with the training or testing activity, which can detect marine mammals in the vicinity or ahead of a vessel's present course.
- Navy ships are generally much more maneuverable than commercial merchant vessels if marine mammals are spotted and the need to change direction necessary. Navy ships operate at the slowest speed possible consistent with either transit needs, or training or testing need. While minimum speed is intended as a fuel conservation measure particular to a certain ship class, secondary benefits include better ability to spot and avoid objects in the water including marine

mammals. In addition, a standard operating procedure also added as a mitigation measure in previous MMPA permits is for Navy vessels to maneuver to keep at least 500 yd. (457.2 m) away from any observed whale in the vessel's path and avoid approaching whales head-on, so long as safety of navigation is not imperiled.

- In many cases, Navy ships will likely move randomly or with a specific pattern within a sub-area of the HSTT for a period of time from 1 day to 2 weeks as compared to straight line point-to-point commercial shipping.
- Navy overall crew size is much larger than merchant ships allowing for more potential observers on the bridge.
- At all times when vessels are underway, trained Lookouts and bridge navigation teams are used to detect objects on the surface of the water ahead of the ship, including marine mammals. Additional Lookouts, beyond already stationed bridge watch and navigation teams, are stationed during some training events.
- Navy Lookouts receive extensive training including Marine Species Awareness Training designed to provide marine species detection cues and information necessary to detect marine mammals.

For submarines, when on the surface there are Lookouts serving the same function as they do on surface ships and thus able to detect and avoid marine mammals at the surface. When submerged, submarines are generally slow moving (to avoid detection) and therefore marine mammals at depth with a submarine are likely able to avoid collision with the submarine. The Navy's mitigation measures are detailed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring).

3.4.3.4.1.1 Mysticetes

Virtually all of the rorqual whale species have been documented to have been hit by vessels. This includes blue whales (Berman-Kowalewski et al. 2010; Van Waerebeek et al. 2007; Calambokidis 2012), fin whales (as recently as November 2011 in San Diego)(Van Waerebeek et al. 2007, Douglas et al. 2008), sei whales (Felix and Van Waerebeek 2005, Van Waerebeek et al. 2007), Bryde's whales (Felix and Van Waerebeek 2005, Van Waerebeek et al. 2007), minke whales (Van Waerebeek et al. 2007), and humpback whales (Lammers et al. 2003; Van Waerebeek et al. 2007; Douglas et al. 2008).

Recent evidence of significant mortality of species of baleen whales (mostly from data on blue, fin, and humpback whales) from commercial ship strikes in the Santa Barbara Channel of Southern California have prompted a detailed analysis of the situation and how it can be resolved. Stranding locations also appeared to be concentrated near major Southern California ports suggesting they are likely indicative of commercial vessel interactions (Berman-Kowalewski et al. 2010), likely due to injured animals coming to shore. This area appears to be highly problematic, largely because it represents an overlap of important feeding grounds for these species of whale with a major shipping lane to/from Southern California ports (see Abramson et al. 2009). Between 1988 and 2007, 21 blue whale deaths were reported along the California coast, and many of these showed evidence of ship strike (Berman-Kowalewski et al. 2010). In 2007, National Oceanic and Atmospheric Administration declared an Unusual Mortality Event for endangered blue whales in Southern California as a result of commercial vessel ship strikes in that year. Several recommendations have been put forward to reduce the potential for future ship strikes in the area of Southern California commercial ports, including: 1) continuing and expanding scientific studies, 2) considering changing shipping patterns and lanes, 3) exploring incentives for reducing shipping speeds, 4) expanding education and outreach, and 5) adaptive management approaches. Laggner (2009) also added the possibility of posting observers on commercial vessels.

3.4.3.4.1.2 Odontocetes

Sperm whales may be exceptionally vulnerable to vessel strikes as they spend extended periods of time "rafting" at the surface in order to restore oxygen levels within their tissues after deep dives (Jaquet and Whitehead 1996; Watkins et al. 1999). There were also instances in which sperm whales approached vessels too closely and were cut by the propellers (Aguilar de Soto et al. 2006). In general, odontocetes move quickly and seem to be less vulnerable to vessel strikes than other cetaceans; however, most small whale and dolphin species have at least occasionally suffered from vessel strikes including: killer whale (Van Waerebeek et al. 2007; Visser and Fertl 2000), short-finned and long-finned pilot whales (Aguilar et al. 2000; Van Waerebeek et al. 2007), bottlenose dolphin (Bloom and Jager 1994; Van Waerebeek et al. 2007; Wells and Scott 1997), white-beaked dolphin (Van Waerebeek et al. 2007), short-beaked common dolphin (Van Waerebeek et al. 2007), spinner dolphin (Camargo and Bellini 2007; Van Waerebeek et al. 2007), striped dolphin (Van Waerebeek et al. 2007), Atlantic spotted dolphin (Van Waerebeek et al. 2007), and pygmy sperm whales (*Kogia breviceps*) (Van Waerebeek et al. 2007). Beaked whales documented in vessel strikes include: Arnoux's beaked whale (Van Waerebeek et al. 2007), Cuvier's beaked whale (Aguilar et al. 2000; Van Waerebeek et al. 2007), and several species of *Mesoplodon* (Van Waerebeek et al. 2007). However, evidence suggests that beaked whales may be able to hear the low-frequency sounds of large vessels and thus avoid collision (Ketten 1998).

3.4.3.4.1.3 Pinnipeds

Pinnipeds in general appear to suffer fewer impacts from ship strikes than do cetaceans. This may be due, at least in part, to the large amount of time they spend on land (especially when resting and breeding), and their high maneuverability in the water. However, California sea lions are often attracted to fishing vessels or when food is available onboard or nearby (see Hanan et al. 1989), and this may make them somewhat more at risk of being hit by a vessel during these times. Ship strikes are not a major concern for pinnipeds in general, the threatened Guadalupe fur seal, or the endangered Hawaiian monk seal (Antonelis et al. 2006; Marine Mammal Commission 2002; National Marine Fisheries Service 2007d, National Marine Fisheries Service 2010c).

3.4.3.4.1.4 Sea Otter

Sea otter are not expected to be at risk from vessel strike since they spend the majority of time in the water in nearshore and shallow water areas were vessels generally are not present.

3.4.3.4.1.5 No Action Alternative, Alternative 1, and Alternative 2 – Training Activities

As indicated in Section 3.0.5.3.3.1 (Vessels), most training activities involve the use of vessels. These activities could be widely dispersed throughout the Study Area and the year. Under the three alternatives in HSTT, the proposed actions would not result in any appreciable changes from the manner in which the Navy has trained would remain consistent with the range of variability observed over the last decade. Consequently, the Navy is not changing the rate at vessels are used and therefore does not anticipate a change in the number of strikes expected to occur. The difference in events from the No Action Alternative to Alternative 1 and Alternative 2 is described in Section 3.0.5.3.3.1 (Vessels), is not likely to change the probability of a vessel strike in any meaningful way.

To determine the appropriate number of MMPA incidental takes for potential Navy vessel strike, the Navy assessed the probability of Navy vessels hitting individuals of different species of large whales that occur in the Study Area incidental to training and testing activities. To do this, the Navy considered unpublished ship strike data compiled and provided by NMFS' Southwest Regional Office and Pacific Island Regional Office, unpublished Navy ship strike information collected by the Navy and reported to NMFS, and information in this application regarding trends in the amount of vessel traffic related to their training and testing activities in the Study Area. Navy policy (OPNAVINST 3100.6 H) is to report all whale strikes by Navy vessels. That information has been, by informal agreement, provided to National Oceanic and Atmospheric Administration on an annual basis. Only the Navy and the U.S. Coast Guard report vessel strike in this manner so all statistics are skewed by a lack of comprehensive reporting by all vessels that may experience vessel strike.

In the SOCAL Range Complex portion of the Study Area between 1991-2011, there have been 16 Navy ship strikes in that 20-year period. There were seven mortalities and nine injuries reported. Breakdown by species was: unknown species (two mortalities and eight injuries), gray whales (three mortalities; these are assumed to have been Eastern North Pacific stock gray whales), fin whales (one mortality and one injury), and blue whale (one mortality). In two of the SOCAL strikes no animal detected following the event, so there was no confirmation that the impact felt[43] actually involved a whale being injured (other possibilities include for example whale shark and sunfish).

In the HRC portion of the Study Area, in 1998 a submarine on the surface in the Pearl Harbor channel inbound bumped into a submerged humpback whale, which upon contact with the submarine, surfaced and swam away. In 2003, a government owned contractor operated (GO-CO) 40 foot workboat used for Pacific Missile Range Facility support was returning to Port Allen, Kauai and struck a humpback whale, which swam away without apparent injury. In that same year (2003) during flight operations when approximately 400 mi. east of Oahu, personnel on an aircraft carrier felt a shudder which was presumed to be a whale strike (no animal was observed but blood was detected in the wake by a helicopter sent to investigate). In 2007, a surface ship (DDG) in transit approximately 390 mi. southwest of Kauai struck a sperm whale causing its death. In 2008, a GO-CO workboat outside the Pearl Harbor entrance channel struck what they assumed was a whale although no whale was sighted. In the 14 years of Navy reporting and recordkeeping for the Western Pacific portion of the Study Area, these are the only vessel strikes associated with Navy any activities.

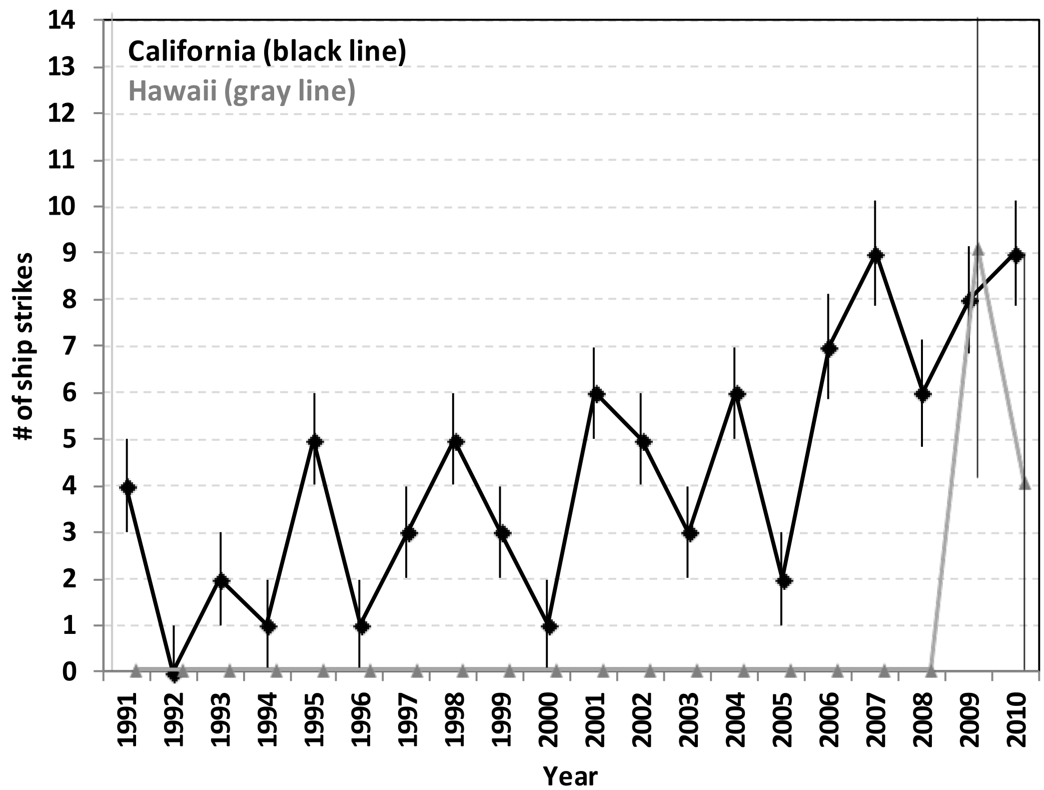
General Vessel Strike Data for the Study Area

Southern California. Figure 3.4-14 shows suspected and confirmed whale strikes by year from all ship sources (commercial, whale watching, recreational, fishing, Navy, etc.) based on data compiled by Southwest Regional Office for strikes in the waters off all of California for the 20-year period from 1991 to 2010.

By geographic strata, the highest percentage of strikes was reported off the northern portion of Southern California, an area north of the HSTT boundary to Point Conception (Figure 3.4-15). This region includes the high volume commercial ship traffic ports of Los Angeles and Long Beach. The second highest percentage of ship strikes was off of central California (an analysis strata from 80 to 300 nm north of the Study Area) which includes the commercial shipping traffic ports of San Francisco and Oakland.

On average, there were approximately four ship strikes reported per year from all sources over the entire 20-year period of the Southwest Regional Office data set. In looking at the 15-year interval from 1991 to 2005, however, average ship strikes were reported at the rate of three per year. Since 2006, and for the 5-year period from 2006 to 2010, there was an average of eight strikes reported per year. It is unclear if the differences in pre and post 2006 averages are the result of increasing commercial ship traffic, increasing animal populations, a statistical anomaly, or any combination of these factors.

[43] Described as the ship having felt a "shudder", which corresponds to records from some confirmed vessel strikes of whales for even large as large as a CVN.



Bars show +/- 95% confidence interval for the 15-year period 1991- 2005 and the 5-year period 2006-2010. (Hawaii period from 1991-2008 is time frame in which data was not collected, and not indicative of actual vessel strikes in those years)

Figure 3.4-14: Ship Strikes by Area (California, Hawaii) by Year, By All Sources from 1991 to 2010

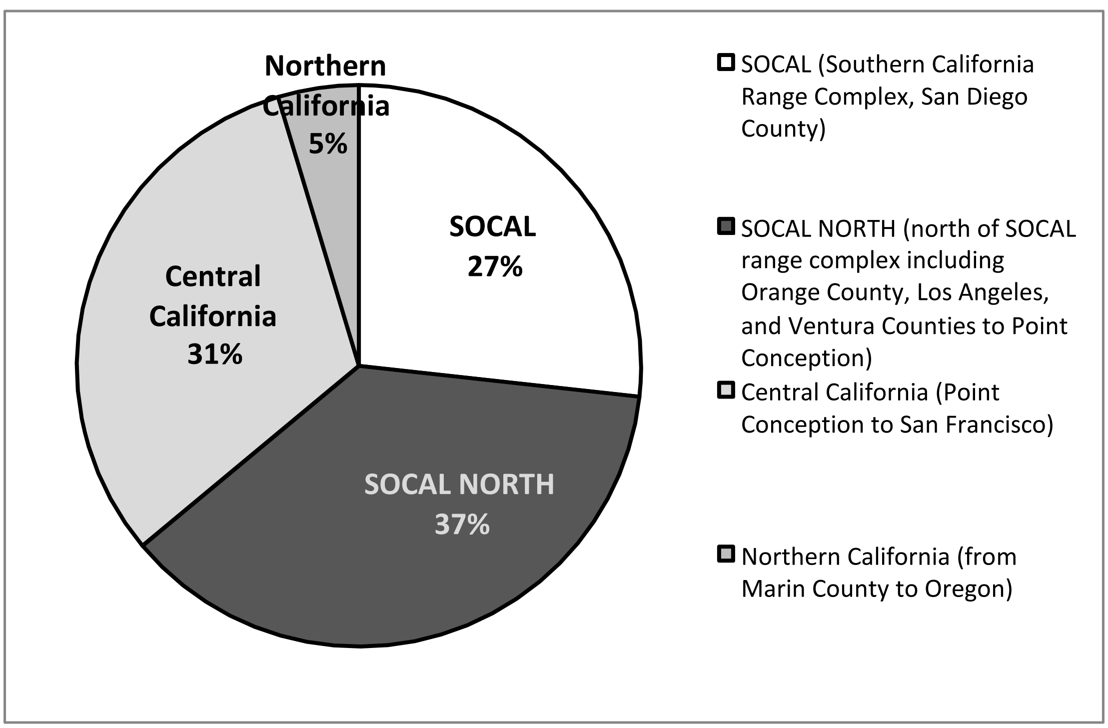


Figure 3.4-15: Ship Strikes By All Sources by California Geographic Strata from 1991 to 2010

The most common species reported struck in the Southwest Regional Office data for all of California include gray whales (35 percent, stock not identified), blue whales (16 percent), fin whales (13 percent), humpback whales (9 percent), and sperm whales (1 percent) (Figure 3.4-16). There were, however, 25 percent of total strikes where species was not identified (either unknown species or unidentified Balaenopterid) and these strikes could have been any of the above species including other large whale species (Bryde's whale, minke whale, sei whale, or sperm whale).

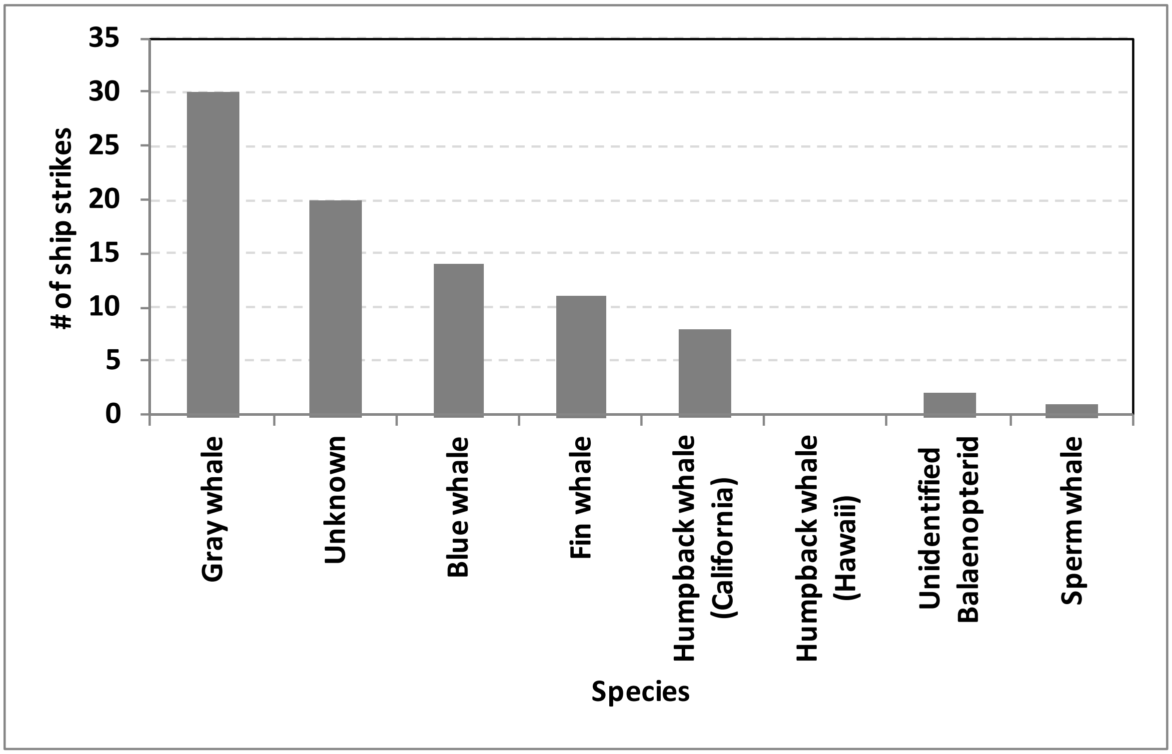


Figure 3.4-16: Ship Strikes of Individual Species in California and Hawaii from 1991 to 2010

Hawaii. Data from the NMFS Pacific Islands Regional Office only covered the years from 2009 to 2010 (Figure 3.4-14). In 2009 there were nine reported vessel strikes from all sources (commercial, whale watching, fishing, etc.) and in 2010, there were four reported strikes. The 2-year average is approximately seven whale strikes per year. There were no Navy whale strikes in Hawaii during 2009 or 2010.

The only large whale species reported struck near the main Hawaiian Islands in 2010 was the humpback whale. There was one strike to an unknown species in 2011 from a Military Sealift vessel transiting through the extreme northern portion of the HRC on the way from Guam to Oregon. This strike is not part of HRC ship strike comparison below since available NMFS data for both SOCAL and HRC only goes through 2010, and the design of the analysis in this application is structured to review the 20-year period from 1991 to 2010.

Southern California and Hawaii Range Complexes Navy Ship Strike Analysis

The following information, summarized from the above discussion and Southwest Regional Office and Pacific Island Regional Office dataset, can be used to examine a likely Navy vessel strike take estimate for which the Navy would seek MMPA authorization from NMFS:

- During the period from 1991 to 2010, there were 16 Navy vessel strikes in Southern California reported to NMFS. Of these 16 strikes, 15 occurred between 1993 and 2009 within the SOCAL Range Complex, with one strike outside of the range complex offshore of Long Beach, CA in 1995. There were five Navy vessel strikes in Hawaii (two involving small craft and one a submarine) within the HRC.
- The Navy strike data (n=16) for the SOCAL portion of HSTT represents 100 percent of all Navy strikes along the west coast. This should be contrasted with likely fewer data records in the NMFS's Southwest Regional Office and Pacific Island Regional Office databases due to under reporting from other non-Navy ship strikes sources (commercial, whale watching, fishing, work vessels, etc.).

Southern California Range Complex. In the SOCAL Range Complex portion of the Study Area (Table 3.4-31), the Navy has struck a total of 16 marine mammals in the 20-year period from 1991 through 2010 for an average of 1 per year (although statistically speaking 0.8 per year [16 strikes/20 years]). Table 3.4-31 shows the number of Navy ship strikes by 5-year increments in the SOCAL range portion of the HSTT. In 16 of the last 20 years, there were zero to one whale strikes. In 2001 and 2002, there were three whale strikes each year (all unknown species); in 1998, there were two whale strikes (both gray whales); and in 2009 there were two whale strikes (both fin whales). Thus, the average number of whale strikes in the SOCAL range portion of the HSTT is one per year.

Table 3.4-31: Number of Navy Ship Strikes by Range Complex in the Study Area by Linear Five-Year Intervals

5-year interval	SOCAL Range Complex		HRC	
	Total # of Navy Ship Strikes	Average Ship Strike Per Year	Total # of Navy Ship Strikes	Average Ship Strike Per Year
1991-1995	2	0.4	0	0
1996-2000	3	0.6	1	0.2
2001-2005	8	1.6	2	0.4
2006-2010	3	0.6	2	0.4

If the time period of 1991-2010 is considered by looking at the 16 consecutive 5-year periods within it (i.e., 1991-1995, 1992-1996, 1993-1997, etc.), the average number of whales struck in a 5-year period is 4.5. Up to eight whales were struck within 3 of the 16 consecutive 5-year periods, although this was before the 2006 reporting period, and has not been repeated since (Table 3.4-32).

Based on NMFS Southwest Regional Office data for Southern California only, gray whales have the highest number of recorded strikes (and in all of California as well, these are assumed to have been Eastern North Pacific stock) with fin and humpback whales notably less, and blue whales the least.

Of the 16 Navy ship strikes over the 20-year period in SOCAL, there were seven mortalities and nine injuries reported. Breakdown by species was: unknown species (two mortalities and eight injuries), gray whales (three mortalities), fin whales (one mortality and one injury), and blue whale (one mortality). In two of the SOCAL strikes no animal was seen following the event, so there was no confirmation of a whale being injured. The Navy is still including these records in this analysis.

The majority of the Navy ship strikes are of historic nature occurring from 1991 to 2005. There were 13 Navy ship strikes prior to 2006. Since 2006, there have been three (one unknown species in 2006, and two fin whales in 2009). There were no Navy ship strikes in 2010.

Table 3.4-32: Number of Navy Ship Strikes by Range Complex in the Study Area by Consecutive Five-Year Intervals

Count	Consecutive 5-year Intervals	# of SOCAL Navy Ship Strikes	# of HRC Navy Ship Strikes
1	1991-1995	2	0
2	1992-1996	2	0
3	1993-1997	3	0
4	1994-1998	4	1
5	1995-1999	4	1
6	1996-2000	3	1
7	1997-2001	6	1
8	1998-2002	8	1
9	1999-2003	7	2
10	2000-2004	8	2
11	2001-2005	8	2
12	2002-2006	6	2
13	2003-2007	3	3
14	2004-2008	2	2
15	2005-2009	3	2
16	2006-2010	3	2

Hawaii Range Complex. In the HRC portion of the Study Area, the Navy struck a total of five marine mammals in the 20-year period from 1991 through 2010 for an average of zero to one per year (although statistically speaking 0.25 per year [five strikes/20 years]). Table 3.4-31 shows the number of Navy ship strikes by 5-year increments in the HRC portion of the Study Area. In 16 of the last 20 years, there were no (zero) whale strikes. In 2003 there were two whales struck (one unknown species and one humpback whale). In 1998 a humpback whale was struck, in 2007 a sperm whale was struck, and 2008 an unknown species was struck. No more than two whales were struck by Navy vessels in any given year in the HRC portion of the Study Area within the last 20 years (and the average was zero to one per year).

If the time period of 1991-2010 is considered by looking at the 16 consecutive 5-year periods within it (i.e., 1991-1995, 1992-1996, 1993-1997, etc.), the average number of whales struck in a 5-year period was 1.4. Up to three whales were struck within 1 of the 16 consecutive 5-year periods, although this was before 2006 (Table 3.4-32, Figure 3.4-14).

Based on Pacific Island Regional Office data for Hawaii, ships struck humpback whales more than any other species.

Of the five Navy ship strikes over the 20-year period in the HRC, there were five injuries reported. Breakdown by species was: unknown species (two injuries), humpback whales (two injuries), and sperm whale (one injury). In one of the HRC strikes no animal was seen and in one only a fin was seen following the event, so there is no confirmation of a whale injury although the Navy is still including these records in this analysis.

There was only one 12-month period in 20 years in the HRC when two whales were struck in a single year, and these were prior to 2006. Since 2006, there have been two strikes from 2006 to 2010. There were no Navy ship strikes in 2010 and one ship strike in 2011.

Although there is annual and inter-annual variability in Navy vessel traffic based on real-world events (world crisis, disaster relief, humanitarian assistance, etc.), planned and unplanned deployments, vessel availability due to maintenance, and funding and logistic concerns, Navy vessel traffic within the HSTT is not anticipated to increase notably in the 5-year period proposed to be covered by this Letter of Authorization application.

Probability of Navy Ship Strike of Large Whale Species

The data set of Navy ship strikes for 1991-2010 can be used to determine a statistical probability of Navy ship strike as a rate parameter of a Poisson distribution to estimate the probability of 0,1,2,3,…n ship strikes involving Navy ships over an annual basis.

Southern California Range Complex. To calculate the probability of a Navy vessel striking a whale in Southern California, the Navy used the probability of a strike estimated from Navy vessel strike data from the period from 1991-2010. There were 16 reported whale strikes during this 20-year period; thus the probability of a collision between a Navy vessel and a whale = 0.8000 (16/20). The above numbers were then used as the rate parameter to calculate a series of Poisson probabilities (a Poisson distribution is often used to describe random occurrences when the probability of an occurrence is small, e.g., count data such as cetacean sighting data, or in this case strike data, are often described as a Poisson or over-dispersed Poisson distribution). While the estimated probabilities of ship strike are shown in Table 3.4-33, the derivation of these probabilities is provided below.

Table 3.4-33: Poisson Probability of Striking "X" Number of Whales Per Year in the Study Area

Number of Large Whales Per Year	SOCAL Range Complex	HRC
No strikes	45%	78%
1 strike	36%	19%
2 strikes	14%	2%
3 strikes	4%	0.2%
4 strikes	0.8%	0.01%

To estimate the Poisson probabilities of 0, 1, 2, etc. occurrences, a simple computation can be generated: $P(X) = P(X-1)\mu/X$

$P(X)$ is the probability of occurrence in a unit of time (or space) and μ is the population mean number of occurrences in a unit of time (or space). For the 20-year period from 1991-2010, μ is assumed to be μ = 0.8000. To estimate zero occurrences (in this case, no whales being struck), the below formula would apply: $P(0)=e^{-\mu}$

Plugging 0.8000 into the above equation yields a value of P(0)= 0.4493, hence the statement "there is slightly less than a 45 percent probability of a large whale of any species not being struck in a given 1-year period by a Navy vessel in the SOCAL portion of the HSTT." Thus, continuing the computation series (Table 3.4-33):

P(1) = (0.4493 * 0.8000)/1 = 0.3594 (or a 36 percent probability of striking one whale)

P(2) = (0.3594 * 0.8000)/2 = 0.1438 (or a 14 percent probability of striking two whales)
P(3) = (0.1438 * 0.8000)/3 = 0.0383 (or a 4 percent probability of striking three whales)
P(4)= (0.0383 * 0.8000)/4 = 0.0077 (or a 0.8 percent probability of striking four whales)

Hawaii Range Complex. To estimate the Poisson probability of a Navy ship strike to a large whale in Hawaii, the same formulas described above can be used. For the 20-year period from 1991-2010, if µ is based on five strikes over 20 years (5/20=0.2500) then µ = 0.2500. Plugging 0.2500 into the P(0)=e- µ yields a values of P(0)=0.7788, hence the statement "there is slightly less than a 78 percent probability of a large whale of any species <u>not</u> being struck in a given 1-year period by a Navy vessel in the HRC portion of the HSTT." Continuing the computation series (Table 3.4-33):

P(1) = (0.7788 * 0.2500)/1 = 0.1947 (or a 19 percent probability of striking one whale)
P(2) = (0.1947 * 0.2500)/2 = 0.0243 (or a 2 percent probability of striking two whales)
P(3) = (0.0243 * 0.2500)/3 = 0.0020 (or a 0.2 percent probability of striking three whales)

P(4)= (0.0020 * 0.2500)/4 = 0.0001 (or a 0.01 percent probability of striking four whales)

3.4.3.4.1.6 Conclusion – No Action Alternative, Alternative 1, and Alternative 2 for Training

The Navy does not anticipate ship strikes to marine mammals within the HSTT as a result of training activities under any of the alternatives. However, in order to account for the accidental nature of ship strikes in general, and potential risk from any vessel movement within the HSTT, the Navy is seeking take authorization in the event a Navy ship strike does occur within the Study Area during the 5-year period of NMFS' final authorization. Based on the probabilities of whale strikes suggested by the data the Navy is requesting takes by morality or injury of 12 large marine mammals over the course of the five years of the HSTT regulations from either training activities of no more than 12 large whales from either training activities over the course of the five years of the HSTT regulations. This would consist of no more than four large whales in any given year.

The number of Navy and commercial whale strikes for which the species has been positively identified suggests that the probability of striking a gray whale in the SOCAL Range Complex and humpback whale in the HRC is greater than striking other species. Based on information presented in Section 3.4.2.11 (Gray Whale), the Eastern North Pacific gray whale were most likely involved in these strikes given their abundance (19,126) in comparison to the small Western North Pacific gray whale population (estimated to number 155), with as few as 23 potentially migrating along the Pacific coast. Additionally, individual gray whales would only be within the Southern California portion of the Study Area for approximately 24 to 36 hours, twice a year during their annual southbound and northbound migration legs. Impacts to Western North Pacific gray whales would therefore be discountable based on small numbers of Western North Pacific gray whales likely to be present in Southern California waters in general and the relatively short time likely spent within the Southern California portion of the Study Area when transiting that area.

Because of the number of incidents in which the species of the stricken animal has remained unidentified, the Navy cannot quantifiably predict that the proposed takes (either the four per year or the 12 over the course of five years) would be of any particular species, and therefore the take may be any combination of large whale species (Eastern North Pacific gray whale, fin whale, blue whale, humpback whale, Bryde's whale, sei whale, minke whale, or sperm whale), but of the four takes per year no more than two of blue whale, fin whale, humpback whale, sei whale, or sperm whale is requested. However, for ESA designated large whale species within the Study Area, the Navy is requesting take of no more than two fin whales, two humpback whales, two blue whales, two sei whales, or two sperm whales within any given year. As discussed in the probability of striking two large whales in the SOCAL portion of the Study Area is only 14 percent per year, and the probability of striking two large whales in the HRC portion of the Study Area is only two percent.

Pursuant to the MMPA, the use of vessels during training activities under the No Action Alternative, Alternative 1, and Alternative 2 is expected to result in Level A harassment or mortality to species of large whales in the Study Area, including Eastern North Pacific stock of gray whale, fin whale, blue whale, humpback whale, Bryde's whale, sei whale, minke whale, and sperm whale. Impact of vessel strikes is not expected to result in Level B harassment of marine mammals.

Pursuant to the ESA, the use of vessels during training activities as described in the No Action Alternative, Alternative 1, and Alternative 2:

- *May affect, and is likely to adversely affect, the ESA-listed fin whale, blue whale, humpback whale, sei whale, and sperm whale*
- *Would have no effect on the Western North Pacific stock of gray whale, Main Hawaiian Islands insular stock of false killer whale, Hawaiian monk seal, or Guadalupe fur seal*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.4.1.7 Conclusion – No Action Alternative, Alternative 1, and Alternative 2 for Testing

The Navy does not anticipate ship strikes to marine mammals within the Study Area as a result of testing activities under any of the alternatives. However, in order to account for the accidental nature of ship strikes in general, and potential risk from any vessel movement within the Study Area, the Navy is seeking take authorization in the event a Navy ship strike does occur within the Study Area during the 5-year period of NMFS' final authorization. Navy is requesting takes by morality or injury by vessel strike during testing activities in any given year of no more than two large whales total of any combination of species including Eastern North Pacific gray whale, fin whale, blue whale, humpback whale, Bryde's whale, sei whale, minke whale, or sperm whale. The two takes per year requested would be no more than one of any species of blue whale, fin whale, humpback whale, sei whale, or sperm whale in any given year. This would consist of no more than three large whales from testing activities over the course of the five years of the HSTT regulations.

Pursuant to the MMPA, the use of vessels during testing activities under the No Action Alternative, Alternative 1, and Alternative 2 is expected to result in Level A harassment or mortality to species of large whales in the Study Area, including Eastern North Pacific stock of gray whale, fin whale, blue whale, humpback whale, Bryde's whale, sei whale, minke whale, and sperm whale. The use of vessels during testing activities is not expected to result in Level B harassment of marine mammals.

Pursuant to the ESA, the use of vessels during testing activities during testing activities as described in the No Action Alternative, Alternative 1, and Alternative 2:

- *May affect, and is likely to adversely affect, the ESA-listed fin whale, blue whale, humpback whale, sei whale, and sperm whale*
- *Would have no effect on the Western North Pacific stock of gray whale, Main Hawaiian Islands insular stock of false killer whale, Hawaiian monk seal, or Guadalupe fur seal*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.4.2 Impacts from In-water Devices

In-water devices are generally smaller (several inches to 111 ft. [34 m]) than most Navy vessels. For a discussion of the types of activities that use in-water devices, where they are used and how many events would occur under each alternative, see Section 3.0.5.3.3.2 (In-Water Devices).

Devices that could pose a collision risk to marine mammals are those operated at high speeds and are unmanned. These are mainly limited to the unmanned surface vehicles such as high-speed targets and unmanned undersea vehicles such as light and heavy weight torpedoes. The Navy reviewed torpedo design features and a large number of previous anti-submarine warfare torpedo exercises to assess the potential of torpedo strikes on marine mammals. The acoustic homing programs of U.S. Navy torpedoes are sophisticated would not confuse the acoustic signature of a marine mammal with a submarine/target. All exercise torpedoes are recovered and refurbished for eventual re-use. Review of the exercise torpedo records indicates there has never been an impact on a marine mammal or other marine organism. In thousands of exercises in which torpedoes were fired or in-water devices used, there have been no recorded or reported instances of a marine species strike from a torpedo or any other in-water device.

Since some in-water devices are identical to support craft, marine mammals could respond to the physical presence of the device as discussed in Section 3.4.3.4.1 (Impacts from Vessels). Physical disturbance from the use of in-water devices is not expected to result in more than a momentary behavioral response.

Devices such as unmanned underwater vehicles that move slowly through the water are highly unlikely to strike marine mammals because the mammal could easily avoid the object. Towed devices are unlikely to strike a marine mammal because of the observers on the towing platform and other standard safety measures employed when towing in-water devices.

In-water devices as a physical disturbance and strike stressor would not affect Hawaiian monk seal critical habitat.

3.4.3.4.2.1 No Action Alternative, Alternative 1 and Alternative 2 – Training Activities

In-water device use for training activities could occur in the Study Area listed in Section 3.0.5.3.3.2 (In-Water Devices) at any time of year under all the alternatives.

Pursuant to the MMPA, use of in-water devices during training activities under the No Action Alternative, Alternative 1, or Alternative 2 is not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, use of in-water devices during training activities as described under the No Action Alternative, Alternative 1, or Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.4.2.2 No Action Alternative, Alternative 1 and Alternative 2 – Testing Activities

In-water device use for testing activities could occur in the Study Area listed in Section 3.0.5.3.3.2 (In-Water Devices) at any time of year under all the alternatives.

Pursuant to the MMPA, use of in-water devices during testing activities under the No Action Alternative, Alternative 1, or Alternative 2 is not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, use of in-water devices during testing activities as described under the No Action Alternative, Alternative 1, or Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.4.3 Impacts from Military Expended Materials

This section analyzes the strike potential to marine mammals from the following categories of military expended materials: (1) non-explosive practice munitions, (2) fragments from high-explosive munitions and (3) expended materials other than ordnance, such as sonobuoys, ship hulks, expendable targets and aircraft stores (fuel tanks, carriages, dispensers, racks, carriages, or similar types of support systems on aircraft that could be expended or recovered). For a discussion of the types of activities that use military expended materials, where they are used, and how many events would occur under each alternative, see Section 3.0.5.3.3.3 (Military Expended Materials).

While disturbance or strike from an item falling through the water column is possible, it is not very likely because the objects generally sink slowly through the water and can be avoided by most marine mammals. Therefore, the discussion of military expended materials strikes will focus on the potential of a strike at the surface of the water. For expended materials other than ordnance, potential strike is limited to expendable torpedo targets, sonobuoys, pyrotechnic buoys and aircraft stores.

While no strike from military expended materials has ever been reported or recorded, the possibility of a strike still exists. Therefore, the potential for marine mammals to be struck by military expended materials was evaluated using statistical probability modeling to estimate the likelihood. Specific details of the modeling approach including model selection and calculation methods are presented in Appendix G (Statistical Probability Analysis for Estimating Direct Strike Impact and Number of Potential Exposures).

To estimate the likelihood of a strike, a worst-case scenario was calculated using the marine mammal with the highest average density in areas with the highest military expended material expenditures. These highest estimates would provide reasonable comparisons for all other areas and species. For estimates of expended materials in all areas, see Section 3.0.5.3.3.3 (Military Expended Materials).

For all the remaining marine mammals with lesser densities, this highest likelihood would overestimate the likelihood or probability of a strike. Because the ESA has a specific standards for understanding the likelihood of impacts to each endangered species, estimates were made for all endangered marine mammals found in the areas where the highest levels of military expended materials would be expended. In this way, the appropriate ESA conclusions could be based on the highest estimated probabilities of a strike for those species.

Input values include munitions data (frequency, footprint and type), size of the training or testing area, marine mammal density data and size of the animal. To estimate the potential of military expended materials to strike a marine mammal, the impact area of all bomb, projectiles, acoustic countermeasures, expendable torpedo targets, sonobuoys and pyrotechnic buoys was totaled over 1 year in the area for each of the alternatives.

The potential for a marine mammal strike is influenced by the following assumptions:

- The model is two-dimensional and assumes that all marine mammals would be at or near the surface 100 percent of the time, when in fact, marine mammals spend up to 90 percent of their time under the water (Costa and Block 2009).
- The model also does not take into account the fact that most of the projectiles fired during training and testing activities are fired at targets, and most projectiles hit those targets, so only a very small portion of those would hit the water with their maximum velocity and force.
- The model assumes the animal is stationary and does not account for any movement of the marine mammal or any potential avoidance of the training or testing activity.

The potential of fragments from high explosive munitions or expended material other than ordnance to strike a marine mammal is likely lower than for the worst-case scenario calculated above as those events happen with much lower frequency. Fragments may include metallic fragments from the exploded target, as well as from the exploded ordnance.

Marine mammal species that occur in the Study Area may be exposed to the risk of military expended material strike. The Hawaiian monk seal critical habitat would not be impacted by military expended materials as a physical disturbance and strike stressor. The model output provides a reasonably high level of certainty that marine mammals would not be struck by military expended materials. See Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) for a description of mitigation measures proposed to help further reduce the potential impacts of military expended material strikes on marine mammals.

3.4.3.4.3.1 No Action Alternative, Alternative 1 and Alternative 2 – Training Activities

The analysis presented in Appendix G (Statistical Probability Analysis for Estimating Direct Strike Impact and Number of Potential Exposures) present the probability of a strike as percent for training activities under the No Action Alternative, Alternative 1, and Alternative 2. The results indicate with a reasonable level of certainty that marine mammals would not be struck by non-explosive practice munitions and expended materials other than ordnance during training activities. Results range from zero, or a zero percent chance of a strike by a military expended material over the course of a year, to a high of approximately eight one-hundredths of one percent (0.08 percent) chance of being struck by a military expended material. However, as discussed above, this does not take into account assumptions that likely overestimate impact probability and the behavior of the species (e.g., short-beaked common dolphins generally occur in large pods and are relatively easy to spot), which would make the risk of a strike even lower. Furthermore, Navy mitigation measures for some active sonobuoy (a large portion of the Military Expended Materials), require the area be clear of marine mammals before being deployed (see Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring).

Alternatives 1 and 2 have an increased amount of expended materials from training activities compared to the No Action Alternative. The increase in expended materials from the No Action Alternative to Alternatives 1 and 2 result in a corresponding increase of the risk of a strike as shown in Appendix G (Statistical Probability Analysis for Estimating Direct Strike Impact and Number of Potential Exposures) but does not change the underlying conclusion that physical disturbance or a strike of a marine mammals is not expected to occur.

Pursuant to the MMPA, use of military expended material during training activities under the No Action Alternative, Alternative 1, or Alternative 2 is not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, use of military expended material during training activities as described under the No Action Alternative, Alternative 1, or Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.4.3.2 No Action Alternative, Alternative 1 and Alternative 2 – Testing Activities

The model results presented in Appendix G (Statistical Probability Analysis for Estimating Direct Strike Impact and Number of Potential Exposures) present the probability of a strike as percent for testing activities under the No Action Alternative, Alternative 1, and Alternative 2. The results indicate with a reasonable level of certainty that marine mammals would not be struck by non-explosive practice munitions and expended materials other than ordnance during testing activities. Results range from zero, or a zero percent chance of a strike by a military expended material over the course of a year, to a high of approximately one ten-thousandth of one percent (0.0001 percent) chance of being struck by a military expended material. However, as discussed above, this does not take into account the assumptions that likely overestimate impact probability and the behavior of the species (e.g., short-beaked common dolphins generally occur in large pods and are relatively easy to spot), which would make the risk of a strike even lower. Furthermore, Navy mitigation measures for some active sonobuoy (a large portion of the Military Expended Material), require the area be clear of marine mammals before being deployed (see Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring).

Alternatives 1 and 2 have an increased amount of expended materials from testing activities compared to the No Action Alternative. The increase in expended materials from the No Action Alternative to Alternatives 1 and 2 result in a corresponding increase of the risk of a strike as shown in Appendix G (Statistical Probability Analysis for Estimating Direct Strike Impact and Number of Potential Exposures) but does not change the conclusion that physical disturbance or a strike of a marine mammals is not expected to occur.

Pursuant to the MMPA, use of military expended material during testing activities under the No Action Alternative, Alternative 1, or Alternative 2 is not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, use of military expended material during testing activities as described under the No Action Alternative, Alternative 1, or Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.4.4 Impacts from Seafloor Devices

For a discussion of the types of activities that use seafloor devices, where they are used, and how many events would occur under each alternative, see Section 3.0.5.3.3.4 (Seafloor Devices). These include items placed on, dropped on or moved along the seafloor such as mine shapes, anchor blocks, anchors, bottom-placed instruments, and bottom-crawling unmanned underwater vehicles. As discussed in Section 3.4.3.4.3 (Impacts from Military Expended Material), objects falling through the water column will slow in velocity as they sink toward the bottom and could be avoided by most marine mammals. The only seafloor device used during training and testing activities that has the potential to strike a marine mammal at or near the surface is an aircraft deployed mine shape, which is used during aerial mine laying activities. These devices are identical to non-explosive practice bombs, therefore the analysis of the potential impacts from those devices are covered in the military expended material strike section.

3.4.3.4.4.1 No Action Alternative, Alternative 1 and Alternative 2 – Training Activities

As indicated in Section 3.0.5.3.3.4 (Seafloor Devices), some training activities under the No Action Alternative, Alternative 1, and Alternative 2 make use of seafloor devices. It is likely that these devices could be avoided by most marine mammals.

Proposed training activities involving the use of seafloor devices would not affect Hawaiian monk seal critical habitat.

Pursuant to the MMPA, use of seafloor devices during training activities under the No Action Alternative, Alternative 1, or Alternative 2 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, use of seafloor devices during training activities as described under the No Action Alternative, Alternative 1, or Alternative 2:

- *Would have no effect on blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.4.4.2 No Action Alternative, Alternative 1 and Alternative 2 – Testing Activities

As indicated in Section 3.0.5.3.3.4 (Seafloor Devices), some testing activities under the No Action Alternative, Alternative 1, and Alternative 2 make use of seafloor devices. It is likely that these devices could be avoided by most marine mammals

Proposed testing activities involving the use of seafloor devices would not affect Hawaiian monk seal critical habitat.

Pursuant to the MMPA, use of seafloor devices during testing activities under the No Action Alternative, Alternative 1, or Alternative 2 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, use of seafloor devices during testing activities as described under the No Action Alternative, Alternative 1, or Alternative 2:

- *Would have no effect on blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.5 Entanglement Stressors

This section analyzes the potential for entanglement of marine mammals as the result of proposed training and testing activities within the Study Area. This analysis includes the potential impacts from two types of military expended materials: (1) fiber optic cables and guidance wires, and (2) parachutes. The number and location of training and testing events that involve the use of items that may pose an entanglement risk are provided in Section 3.0.5.3.4 (Entanglement Stressors).

These materials may have the potential to entangle and could be encountered by marine mammals in the Study Area at the surface, in the water column, or along the seafloor; thought the properties and size of these military expended materials makes entanglement unlikely. In addition, there has never been a reported or recorded instance of a marine mammal entangled in military expended materials; however, the possibility still exists. Since potential impacts depend on how a marine mammal encounters and reacts to items that pose an entanglement risk, the following subsections discuss research relevant to specific groups or species. Most entanglements discussed in the following sections are attributable to marine mammal encounters with fishing gear or other non-military materials that float or are suspended at the surface.

3.4.3.5.1 Mysticetes

The minimal estimate of the percentage of whales that have been non-lethally entangled in their lifetime is 52 percent with a maximal estimate of 78 percent (Neilson et al. 2009). Cassoff et al. (2011) report that in the western North Atlantic, mortality entanglement has slowed the recovery of some populations of Mysticetes. Included in their analysis of 21 entanglement related mortalities were minke, Bryde's, North Atlantic right whale, and humpback whales. In the 1980s and for the stocks of marine mammals in the HSTT Study Area, an estimated 78 baleen whales were killed annually in the offshore Southern California/Oregon drift gillnet fishery (Heyning and Lewis 1990). From 1998-2005, based on observer records, five fin whales (CA/OR/WA stock), 12 humpback whales (Eastern North Pacific stock), and six sperm whales (CA/OR/WA stock) were either seriously injured or killed in fisheries off the mainland West Coast of the U.S. (National Marine Fisheries Service 2011b). More recent examination of the data indicates that from 1982 to Feb 2012 in the California, Oregon, Washington areas inhabited by stocks of large whale there were 279 reported whale entanglements (Saez et al. 2012). In this area, gray whale and humpback whale have been reported as the most frequently entangled large whale species with trap/pot, bottom set longline, and gillnets as the identified gear found entangled on large whales in this area.

In the Hawaiian Islands in 2006 and 2007, there were 26 entanglements in each of those 2 years (National Marine Fisheries Service 2007a). In 2008 there were 15 entanglements (National Marine Fisheries Service 2008a) and in the Hawaiian Islands during the 2009-2010-humpback season, the Hawaiian Islands Large Whale Entanglement Response Network received 32 reports of entangled humpback whales with 19 of these reports were confirmed and amounted to 11 different animals entangled in various types of gear (National Marine Fisheries Service 2010e).

On March 18, 2011, the Hawaiian Islands Entanglement Response Network responded to a report of an entangled subadult sei whale off Maui. The whale was found to be entangled in a heavy gauge 30 ft. in length ending in a bundle of fishing gear (National Marine Fisheries Service 2011c). An attempt to disentangle the whale was unsuccessful although a telemetry buoy attached to the entangled gear was reported to be tracking the whale over 21 days as it moved north and over 250 nm from the Hawaiian Islands.

Military expended material is expected to sink to the ocean floor. Mysticete species that feed off the bottom in the areas where activities make use of military expended materials could encounter them. Seasonally present when migrating through the SOCAL portion of the HSTT Study area, gray whale is the only mysticete occurring in the Study Area that regularly feeds at the seafloor, but it does so in relatively shallow water soft sediment seafloor area where these military expended material entanglement stressors are less likely to be present.

3.4.3.5.2 Odontocetes

Heezen (1957) reported two confirmed instances of sperm whales entangled in the slack lengths of telegraph cable near cable repair sites along the seafloor. These whales likely became entangled while feeding along the bottom, as the cables were most often found wrapped around the jaw. Juvenile harbor porpoise exposed to 0.5 in. diameter (13 millimeters [mm] diameter) white nylon ropes in both vertical and horizontal planes treated the ropes as barriers, more frequently swimming under than over them. However, harbor porpoise feeding on fish in the area crossed the ropes more frequently and became less cautious, suggesting that rope poses a greater risk in a feeding area than in a transit area. For harbor porpoise feeding on the bottom, rope suspended near the seafloor is more likely to entangle than rope higher in the water column because the animals' natural tendency is to swim beneath barriers (Kastelein et al. 2005b).

Known cases of entanglement to odontocetes within the HSTT Study area are common (here considered along with fishery bycatch and interaction). Data from NMFS Pacific Science Center indicate in the five years including 2006-2010 on average fisheries observers on have documented 18-21 marine mammals injured and an additional one to two animals dead annually as a result of commercial longline fishing. Since these observations were for a fraction of the fishing effort, the total impact is not known. In addition to commercial fishing in Hawaiian waters, recreational fishery interactions with odontocetes have been documented. In 2006, a spinner dolphin was observed off Oahu entangled in a gill net (National Marine Fisheries Service 2006) but not able to be freed. In 2009, a hooked bottlenose dolphin was observed off Kona (National Marine Fisheries Service 2009f) and a hooked spinner dolphin was observed off Maui (National Marine Fisheries Service 2009g). Similar longline data from the SOCAL portion of the HSTT Study Area are not available.

Walker and Coe (1990) provided data on the stomach contents from of 16 species of odontocetes, some of which occur or had stranded in Southern California waters with evidence of debris ingestion. Of the odontocete species occurring in the Study Area, only sperm whale, Baird's beaked whale, and Cuvier's beaked whale had ingested items (likely incidentally) that do not float and are thus indicative of foraging at the seafloor.

3.4.3.5.3 Pinnipeds

Fur seals (such as those otariid present in the SOCAL portion of the Study Area; California sea lion, Northern fur seal, and Guadalupe fur seal) appear to be attracted to floating debris and consequently suffer a high rate of entanglement in derelict fishing lines and nets (Derraik 2002) than other pinniped species. Their unique habit of rolling on the surface of the water leads to complex entanglement. A young pup may become so entangled that its body becomes constricted by the material as it grows. Death may occur by strangulation or severing of the arteries (Derraik 2002). Hawaiian monk seals have one of the highest documented entanglement rates of any pinniped species (National Marine Fisheries Service 2010f). This most often includes derelict fishing gear including nets, fish line, and fishhooks; there are no known cases of Hawaiian monk seal being entangled in military expended material. The Hawaii Stranding Response Network frequently undertakes dehooking of monk seals (removing embedded fishhooks) and two monk seals are known to have died from entanglement in gill nets; one on Oahu in 2006 (National Marine Fisheries Service 2006) and another on Maui in 2007 (National Marine Fisheries Service 2007a; Honolulu Advertiser 2007). It is not known if, in addition to Hawaiian monk seal, other phocid seals in the Study Area (Northern elephant and harbor seals) have similar entanglement occurrence.

While pinnipeds in the Study Area feed primarily in the water column, Hawaiian monk seal, which occur in HRC portion of the Study Area, are opportunistic feeders and also forage on the seafloor. It is unlikely that Hawaiian monk seal would be impacted by entanglement stressors if exposed on the seafloor.

3.4.3.5.3.1 Sea Otter

Sea Otter at San Nicolas Island would not encounter entanglement stressors because the shallow water near shore area they inhabit is not an area where entanglement stressors would occur as a result of Navy training and testing activities evaluated in this analysis.

3.4.3.5.4 Impacts from Fiber Optic Cables and Guidance Wires

For a discussion of the types of activities that use fiber optic cables and guidance wires, where they are used, and how many events would occur under each alternative, see Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires). The likelihood of a marine mammal encountering and becoming entangled in a fiber optic cable depends on several factors. The amount of time that the cable is in the same vicinity as a marine mammal can increase the likelihood of it posing an entanglement risk. Since the cable will only be within the water column during the activity and while it sinks, the likelihood of a marine mammal encountering and becoming entangled within the water column is extremely low. The length of the cable varies (up to about 900 ft. [3,000 m]), and greater lengths may increase the likelihood that a marine mammal could become entangled. The behavior and feeding strategy of a species can determine whether they may encounter items on the seafloor, where cables will be available for longer periods of time. There is potential for those species that feed on the seafloor to encounter cables and potentially become entangled, however the relatively few cables being expended within the Study Area limits the potential for encounters. The physical characteristics of the fiber optic material render the cable brittle and easily broken when kinked, twisted, or bent sharply (i.e., to a radius greater than 360 degrees). Thus, the physical properties of the fiber optic cable would not allow the cable to loop, greatly reducing or eliminating any potential issues of entanglement with regard to marine life.

Similar to fiber optic cables discussed above, guidance wires may pose an entanglement threat to marine mammals either in the water column or after the wire has settled to the sea floor. The likelihood of a marine mammal encountering and becoming entangled in a guidance wire depends on several factors. With the exception of a chance encounter with the guidance wire while it is sinking to the seafloor (at an estimated rate of 0.7 ft. [0.2 m] per second), it is most likely that a marine mammal would only encounter a guidance wire once it had settled on the sea floor. Since the guidance wire will only be within the water column during the activity and while it sinks, the likelihood of a marine mammal encountering and becoming entangled within the water column is extremely low. In addition, based on degradation times the guide wires would break down within one to two years and therefore no longer pose an entanglement risk. The length of the guidance wires vary, but greater lengths increase the likelihood that a marine mammal could become entangled. The behavior and feeding strategy of a species can determine whether they may encounter items on the seafloor, where guidance wires will most likely be available. There is potential for those species that feed on the seafloor to encounter guidance wires and potentially become entangled; however, the relatively few guidance wires being expended within the Study Area limits the potential for encounters.

Marine mammal species that occurs within the Study Area were evaluated based on the likelihood of encountering these items. Mysticete species that occur where these training activities take place could encounter these items once they settle to the seafloor if they feed off the bottom in the areas where these activities occur. Odontocete and pinniped species, that occur in these areas and that forage on the bottom, could potentially encounter these items.

The chance that an individual animal would encounter expended cables or wires is most likely low based on the distribution of both the cables and wires expended, the fact that the wires and cables will sink upon release and the relatively few marine mammals that are likely to feed on the bottom in the deeper waters where these would be expended. It is probably very unlikely that an animal would get entangled even if it encountered a cable or wire while it was sinking or upon settling to the seafloor. An animal would have to swim through loops or become twisted within the cable or wire to become entangled, and given the properties of the expended cables and wires (low breaking strength and sinking rates) this seems unlikely. Furthermore, an animal may initially become entangled in a cable or wire but easily become free, and therefore no long-term impacts would occur. Based on the estimated concentration of expended cables and wires, impacts from cables or wires are extremely unlikely to occur.

3.4.3.5.4.1 No Action Alternative – Training Activities

As presented in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), training activities under the No Action Alternative would expend cables or guidance wires. Fiber optic cable would only be expended in SOCAL; guidance wires would be expended in both SOCAL and HRC.

Pursuant to the MMPA, use of fiber optic cables and guidance wires during training activities under the No Action Alternative is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, use of fiber optic cables and guidance wires during training activities as described under the No Action Alternative:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.5.4.2 No Action Alternative – Testing Activities

As presented in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), testing activities under the No Action Alternative would expend fiber optic cables or guidance wires. Fiber optic cable would only be expended in SOCAL; guidance wires would be expended in both SOCAL and HRC.

Pursuant to the MMPA, use of fiber optic cables and guidance wires during testing activities under the No Action Alternative is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, use of fiber optic cables and guidance wires during testing activities as described under the No Action Alternative:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.5.4.3 Alternative 1 – Training Activities

As presented in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), training activities under Alternative 1 would expend cables or guidance wires and would be a slight increase in the use of fiber optic cables and a slight decrease in use of guidance wire compared to their proposed use under the No Action Alternative.

Pursuant to the MMPA, use of fiber optic cables and guidance wires during training activities under Alternative 1 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, use of fiber optic cables and guidance wires during training activities as described under Alternative 1:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.5.4.4 Alternative 1 – Testing Activities

As presented in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), testing activities under Alternative 1 would expend cables or guidance wires and would increase by one the use of fiber optic cables and an approximate 20 percent increase in use of guidance wire compared to their proposed use under the No Action Alternative.

Pursuant to the MMPA, use of fiber optic cables and guidance wires during testing activities under Alternative 1 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, use of fiber optic cables and guidance wires during testing activities as described under Alternative 1:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.5.4.5 Alternative 2 – Training Activities

As presented in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), training activities under Alternative 2 are identical to those under Alternative 1. Therefore, the predicted impacts for Alternative 2 are identical to those described above in Alternative 1 – Training Activities.

3.4.3.5.4.6 Alternative 2 – Testing Activities

As presented in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), testing activities under Alternative 2 would expend cables or guidance wires and would increase by one the use of fiber optic cables and an approximate 100 percent increase in use of guidance wire compared to their proposed use under the No Action Alternative.

Pursuant to the MMPA, use of fiber optic cables and guidance wires during testing activities under Alternative 2 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, use of fiber optic cables and guidance wires during testing activities as described under Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.5.5 Impacts from Parachutes

Refer to Section 3.0.5.3.4.2 (Parachutes) for the number of training and testing events that involve the use of parachutes and the geographic areas where they would be expended. Training and testing activities that introduce parachutes into the water column can occur anywhere in the Study Area.

Entanglement of a marine mammal in a parachute assembly at the surface or within the water column would be unlikely, since the parachute would have to land directly on an animal, or an animal would have to swim into it before it sinks. Once on the seafloor, if bottom currents are present, the canopy may temporarily billow and pose an entanglement threat to marine animals with bottom-feeding habits; however, the probability of a marine mammal encountering a parachute assembly on the seafloor and accidental entanglement in the canopy or suspension lines is unlikely.

The chance that an individual animal would encounter expended parachutes is low based on the distribution of the parachutes expended, the fact that parachute assemblies are designed to sink upon release, and the relatively few animals that feed on the bottom. If a marine mammal did become entangled in a parachute, it could easily become free of the parachute because the parachutes are made of very light-weight fabric. Based on the information summarized above within the introduction to Section 3.4.3.5 (Entanglement Stressors) and mysticetes found within the Study Area are not expected to encounter parachutes on the seafloor because with the exception of gray whale during seasonal migrations through the SOCAL portion of the HSTT Study Area, mysticetes do not feed there.

The possibility of odontocetes (sperm whale, Blainville's beaked whale, Cuvier's beaked whale), and pinnipeds (Hawaiian monk seal) becoming entangled exists when they are feeding on the bottom in areas where parachutes have been expended. This is unlikely as parachutes are used in events that generally occur in deeper waters where these species are not likely to be feeding on the bottom, though even if momentarily entangled, a marine mammal would likely be able to free themselves of the light-weight fabric of a parachute. There has never been any recorded or reported instance of a marine mammal becoming entangled in a parachute.

3.4.3.5.5.1 No Action Alternative – Training Activities

Parachutes could be expended anywhere in the Study Area during training activities. Refer to Table 3.0-84 for the approximate number of events and locations where parachutes would be expended under the No Action Alternative.

To estimate a worst-case scenario, calculations were made for the area where parachutes would be expended with greatest concentration. For training events under the No Action Alternative, this is in the SOCAL Range Complex with a concentration of approximately one parachute per 7 nm^2 of this area.

Pursuant to the MMPA, use of parachutes during training activities under the No Action Alternative is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, use of parachutes during training activities as described under the No Action Alternative:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.5.5.2 No Action Alternative – Testing Activities

Parachutes could be expended anywhere in the Study Area during testing activities. Refer to Table 3.0-84 for the approximate number of events and locations where parachutes would be expended under the No Action Alternative.

To estimate a worst-case scenario, calculations were made for the area where parachutes would be expended with greatest concentration. For testing events under the No Action Alternative, this is in the SOCAL Range Complex with a concentration of approximately one parachute per 22 nm^2 of this area.

Pursuant to the MMPA, use of parachutes during testing activities under the No Action Alternative is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, use of parachutes during testing activities as described under the No Action Alternative:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.5.5.3 Alternative 1 – Training Activities

Parachutes could be expended anywhere in the Study Area during training activities. Refer to Table 3.0-84 for the approximate number of events and locations where parachutes would be expended under Alternative 1.

To estimate a worst-case scenario, calculations were made for the area where parachutes would be expended with greatest concentration. For training events under Alternative 1, this is in the SOCAL Range Complex with a concentration of approximately one parachute per 4 nm^2 of this area.

Pursuant to the MMPA, the use of parachutes during training activities under Alternative 1 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the use of parachutes during training activities as described under Alternative 1:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.5.5.4 Alternative 1 – Testing Activities

Parachutes could be expended anywhere in the Study Area during testing activities. Refer to Table 3.0-84 for the approximate number of events and locations where parachutes would be expended under Alternative 1.

To estimate a worst-case scenario, calculations were made for the area where parachutes would be expended with greatest concentration. For testing events under Alternative 1, this is in the SOCAL Range Complex with a concentration of approximately one parachute per 14 nm^2 of this area.

Pursuant to the MMPA, the use of parachutes during testing activities under Alternative 1 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the use of parachutes during testing activities as described under Alternative 1:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.5.5.5 Alternative 2 – Training Activities

Parachutes could be expended anywhere in the Study Area during training activities. As shown on Table 3.0-84 the proposed use of parachutes during training is the same under Alternative 1 and Alternative 2. Therefore, the predicted impacts for Alternative 2 are identical to those described above in Alternative 1 – Training Activities

Pursuant to the MMPA, the use of parachutes during training activities under Alternative 2 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the use of parachutes during training activities as described under Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.5.5.6 Alternative 2 – Testing Activities

Parachutes could be expended anywhere in the Study Area during testing activities under Alternative 2. Refer to Table 3.0-84 for the approximate number of test events and locations where parachutes would be expended under Alternative 2.

To estimate a worst-case scenario, calculations were made for the area where parachutes would be expended with greatest concentration. For testing events under Alternative 1, this is in the SOCAL Range Complex with a concentration of approximately one parachute per 13 nm^2 of this area.

Pursuant to the MMPA, the use of parachutes during testing activities under Alternative 2 is not expected to result in Level A or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the use of parachutes during testing activities as described under Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.6 Ingestion Stressors

This section analyzes the potential impacts of the various types of ingestion stressors used during training and testing activities within the Study Area. This analysis includes the potential impacts from two categories of military expended materials: (1) munitions (both non explosive practice munitions and fragments from high explosive munitions, and (2) materials other than ordnance including fragments from targets, chaff, flares, and parachutes. For a discussion of the types of activities that use these materials, where they are used, and how many events would occur under each alternative, please see Section 3.0.5.3.5 (Ingestion Stressors).

The distribution and density of expended items plays a central role in the likelihood of impact on marine mammals. The Navy conducts training and testing activities in throughout the Study Area and are widely distributed and low in density. As suggested by the seafloor survey reported in Watters et al. (2010), even in areas such as Southern California (within the SOCAL Range Complex) where Navy has been undertaking trained training and testing activities for decades, the density of materials expended by Navy is negligible in comparison to commercial fishing and urban refuse resulting in marine debris available on seafloor. Watters et al. (2010) found an estimated 320 anthropogenic items per square kilometer on Southern California seafloor and encountered only one item (identified as “artillery”) that was of likely military origin. The majority of material expended during Navy training and testing would likely penetrate into the seafloor and not be accessible to most marine mammals.

Since potential impacts depend on where these items are expended and how a marine mammal feeds, the following subsections discuss important information for specific groups or species.

3.4.3.6.1 Mysticetes

Species that feed at the surface or in the water column include blue, fin, Bryde’s, and sei whales. While humpback whales feed predominantly by lunging through the water after krill and fish, there are instances of humpback whales disturbing the bottom in an attempt to flush prey, the northern sand lance (*Ammodytes dubius*) (Hain et al. 1995). Humpback whales are not known to feed while in Hawaiian waters. Humpback whales may forage while present in the SOCAL portion of the Study Area although are not likely to forage at the seafloor in this area. Gray whales are also seasonally present when migrating through the SOCAL portion of the Study Area. Gray whale is the only mysticete occurring in the Study Area that regularly feeds at the seafloor, but it does so in relatively shallow water and soft sediment areas where ingestion stressors are less likely to be present (fewer activities take place in shallow water and expended materials are more likely to bury in soft sediment and be less accessible). In a comprehensive review of documented ingestion of debris by marine mammals, there are two species of mysticetes (bowhead and minke whale) with records of having ingested debris items that included plastic sheeting and a polythene bag (Laist 1997). Based on the available evidence, since gray whale and humpback whale are known to forage at the seafloor, it is possible but unlikely they may ingest items found on the seafloor.

3.4.3.6.2 Odontocetes

Beaked whales use suction feeding to ingest benthic prey and may incidentally ingest other items (MacLeod et al. 2003). Both sperm whales and beaked whales are known to incidentally ingest foreign objects while foraging; however, this does not always result in negative consequences to health or vitality (Laist 1997; Walker and Coe 1990). While this incidental ingestion has led to sperm mortality in some cases, Whitehead (2003) suggested the scale to which this affects sperm whale populations was not substantial. Sperm whales are recorded as having ingested fishing net scraps, rope, wood, and plastic debris such as plastic bags and items from the seafloor (Walker and Coe 1990; Whitehead 2003).

Recently weaned juveniles, who are investigating multiple types of prey items, may be particularly vulnerable to ingesting non-food items as found in a study of juvenile harbor porpoise (Baird and Hooker 2000). A male pygmy sperm whale reportedly died from blockage of two stomach compartments by hard plastic, and a Blainville’s beaked whale (*Mesoplodon densirostris*) washed ashore in Brazil with a ball of plastic thread in its stomach (Derraik 2002). In a comprehensive review of documented ingestion of debris by marine mammals, odontocetes had the most ingestion records with 21 species represented (Laist 1997). Walker and Coe (1990) provided data on the stomach contents from of 16 species of odontocetes (Table 3.4-34) some of which occur or had stranded in Southern California waters with evidence of debris ingestion. Of these odontocete species, only sperm whale, Blainville’s beaked whale, Cuvier’s beaked whale had ingested non-floating items (i.e., stones, concrete, metal, glass) presumably while foraging from the seafloor.

Table 3.4-34: Odontocete Marine Mammal Species That Occur in the Study Area and are Documented to Have Ingested Marine Debris (from Walker and Coe 1990)

Baird's beaked whale	Pacific white-sided dolphin
Blainville's beaked whale	Pygmy sperm whale
Bottlenose dolphin	Risso's dolphin
Cuvier's beaked whale	Rough toothed dolphin
Dall's porpoise	Short-beaked common dolphin
Dwarf sperm whale	Short-finned pilot whale
Harbor porpoise	Sperm whale
Northern right whale dolphin	Striped dolphin

3.4.3.6.3 Pinnipeds

Pinnipeds primarily feed within the water column. In a comprehensive review of documented ingestion of debris by marine mammals, for pinnipeds in the Study Area, only northern elephant seal are recorded as having ingested Styrofoam cup debris (Laist 1997). Guadalupe fur seal in the SOCAL portion of the Study Area are unlikely to encounter or ingestion stressors as a result of training activities. Hawaiian monk seal, which occur in HRC portion of the Study Area, are opportunistic feeders and also forage on the seafloor. It is unlikely that Hawaiian monk seal would encounter and incidentally or mistakenly consume ingestion stressors resulting from the proposed Navy activities if those items remain exposed on the seafloor.

3.4.3.6.4 Sea Otter

Sea Otter would not encounter ingestion stressors because the shallow water area they inhabit (at San Nicolas Island in the SOCAL portion of the HSTT Study Area) is not a proposed location for activities involving ingestion stressors.

3.4.3.6.5 Impacts from Munitions

Many different types of explosive and non-explosive practice munitions are expended at sea during training and testing activities. This section analyzes the potential for marine mammals to ingest non-explosive practice munitions and fragments from high explosive munitions.

Types of non-explosive practice munitions generally include projectiles, missiles, and bombs. Of these, only small or medium caliber projectiles would be small enough for a marine mammal to ingest. Small and medium caliber projectiles include all sizes up to and including 2.25 in. (57 mm) in diameter. These solid metal materials would quickly move through the water column and settle to the sea floor. Ingestion of non-explosive practice munitions is not expected to occur in the water column because the ordnance sinks quickly. Instead, they are most likely to be encountered by species that forage on the bottom.

Types of high explosive munitions that can result in fragments include demolition charges, grenades, projectiles, missiles, and bombs. Fragments would result from fractures in the munitions casing and would vary in size depending on the size of the net explosive weight and munitions type; however, typical sizes of fragments are unknown. These solid metal materials would quickly move through the water column and settle to the seafloor; therefore, ingestion is not expected by most species. Fragments are primarily encountered by species that forage on the bottom.

Based on the information summarized above in 3.4.3.5.1 (Mysticetes), mysticetes found within the Study Area, with the exception of bottom-feeding gray whale and potentially humpback whales, are not expected to encounter non-explosive practice munitions on the seafloor. Ingestion of non-explosive practice munitions by odontocetes is likely to be incidental, with items being potentially consumed along with bottom-dwelling prey. Although incidental ingestion of non-explosive practice munitions by pinnipeds is not likely based on records of ingestion from stranded animals, it is possible based on the fact that they feed on the seafloor.

3.4.3.6.5.1 No Action Alternative – Training Activities

Non-explosive practice munitions

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under the No Action Alternative, training activities involving small- and medium-caliber non-explosive practice munitions occur in the Study Area. The amount of small and medium caliber projectiles that an individual animal would encounter is generally low based on the patchy distribution of both the projectiles and an animal's feeding habitat. In addition, an animal would not likely ingest every projectile it encountered. Furthermore, an animal may attempt to ingest a projectile and then reject it when it realizes it is not a food item. Even ingestion of certain items (hooks), if they do not become embedded in tissue, do not end up resulting in injury or mortality to the individual (Wells et al. 2008). Therefore potential impacts of non-explosive practice munitions ingestion would be limited to the unlikely event where a marine mammal might suffer a negative response from ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system.

Fragments from high-explosive munitions

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under the No Action Alternative, training activities involving high explosive munitions including bombs, medium- and large-caliber projectiles, missiles, and rockets would be used in the Study Area. The amount of high explosive munitions fragments that an individual animal would encounter is generally low based on the patchy distribution of both the munitions and an animal's feeding habitat. In addition, an animal would not likely ingest every fragment it encountered. Furthermore, an animal may attempt to ingest a fragment and then reject it when it realizes it is not a food item. Even ingestion of certain items (hooks), if they do not become embedded in tissue, do not end up resulting in injury or mortality to the individual (Wells et al. 2008). Therefore, potential impacts of high explosive munitions fragment ingestion would be limited to the unlikely event where a marine mammal might suffer a negative response from ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system.

Pursuant to the MMPA, the ingestion of munitions used during training activities under the No Action Alternative is not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the ingestion of munitions used during training activities as described under the No Action Alternative:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.6.5.2 No Action Alternative – Testing Activities

Non-explosive practice munitions

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under the No Action Alternative, testing activities involving small- and medium-caliber non-explosive practice munitions occur in the Study Area. The amount of small and medium-caliber projectiles that an individual animal would encounter is generally low based on the patchy distribution of both the projectiles and an animal's feeding habitat. In addition, an animal would not likely ingest every projectile it encountered. Furthermore, an animal may attempt to ingest a projectile and then reject it when it realizes it is not a food item. Even ingestion of certain items (hooks), if they do not become embedded in tissue, do not end up resulting in injury or mortality to the individual (Wells et al. 2008). Therefore potential impacts of non-explosive practice munitions ingestion would be limited to the unlikely event where a marine mammal might suffer a negative response from ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system.

Fragments from high-explosive munitions

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under the No Action Alternative, testing activities involving high explosive munitions including bombs, medium- and large-caliber projectiles, missiles, and rockets would be used in the Study Area. The amount of high explosive munitions fragments that an individual animal would encounter is generally low based on the patchy distribution of both the munitions and an animal's feeding habitat. In addition, an animal would not likely ingest every fragment it encountered. Furthermore, an animal may attempt to ingest a fragment and then reject it when it realizes it is not a food item. Even ingestion of certain items (hooks), if they do not become embedded in tissue, do not end up resulting in injury or mortality to the individual (Wells et al. 2008). Therefore, potential impacts of high explosive munitions fragment ingestion would be limited to the unlikely event where a marine mammal might suffer a negative response from ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system.

Pursuant to the MMPA, the ingestion of munitions used during testing activities under the No Action Alternative is not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the ingestion of munitions used during testing activities as described under the No Action Alternative:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.6.5.3 Alternative 1 – Training Activities

Non-explosive practice munitions

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under Alternative 1, training activities involving small- and medium-caliber non-explosive practice munitions occur in the Study Area and increase by approximately 163 percent as compared to the No Action Alternative. The amount of small and medium caliber projectiles that an individual animal would encounter is generally low based on the patchy distribution of both the projectiles and an animal's feeding habitat. In addition, an animal would not likely ingest every projectile it encountered. Furthermore, an animal may attempt to ingest a projectile and then reject it when it realizes it is not a food item. Even ingestion of certain items (hooks), if they do not become embedded in tissue, do not end up resulting in injury or mortality to the individual (Wells et al. 2008). Therefore potential impacts of non-explosive practice munitions ingestion would be limited to the unlikely event where a marine mammal might suffer a negative response from ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system.

Fragments from high-explosive munitions

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under the Alternative 1, training activities involving high explosive munitions including bombs, medium- and large-caliber projectiles, missiles, and rockets would be used in the Study Area and decrease by approximately 30 percent as compared to the No Action Alternative. The amount of high explosive munitions fragments that an individual animal would encounter is generally low based on the patchy distribution of both the munitions and an animal's feeding habitat. In addition, an animal would not likely ingest every fragment it encountered. Furthermore, an animal may attempt to ingest a fragment and then reject it when it realizes it is not a food item. Even ingestion of certain items (hooks), if they do not become embedded in tissue, do not end up resulting in injury or mortality to the individual (Wells et al. 2008). Therefore, potential impacts of high explosive munitions fragment ingestion would be limited to the unlikely event where a marine mammal might suffer a negative response from ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system.

Pursuant to the MMPA, the ingestion of munitions used during training activities under Alternative 1 is not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the ingestion of munitions used during training activities as described under Alternative 1:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.6.5.4 Alternative 1 – Testing Activities

Non-explosive practice munitions

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under Alternative 1, testing activities involving small- and medium-caliber non-explosive practice munitions occur in the Study Area and increase by approximately 791 percent as compared to the No Action Alternative. The amount of small and medium caliber projectiles that an individual animal would encounter is generally low based on the patchy distribution of both the projectiles and an animal's feeding habitat. In addition, an animal would not likely ingest every projectile it encountered. Furthermore, an animal may attempt to ingest a projectile and then reject it when it realizes it is not a food item. Even ingestion of certain items (hooks), if they do not become embedded in tissue, do not end up resulting in injury or mortality to the individual (Wells et al. 2008). Therefore potential impacts of non-explosive practice munitions ingestion would be limited to the unlikely event where a marine mammal might suffer a negative response from ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system.

Fragments from high-explosive munitions

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under Alternative 1, testing activities involving high explosive munitions including bombs, medium- and large-caliber projectiles, missiles, and rockets would be used in the Study Area and increase by approximately 260 percent as compared to the No Action Alternative. The amount of high explosive munitions fragments that an individual animal would encounter is generally low based on the patchy distribution of both the munitions and an animal's feeding habitat. In addition, an animal would not likely ingest every fragment it encountered. Furthermore, an animal may attempt to ingest a fragment and then reject it when it realizes it is not a food item. Even ingestion of certain items (hooks), if they do not become embedded in tissue, do not end up resulting in injury or mortality to the individual (Wells et al. 2008). Therefore, potential impacts of high explosive munitions fragment ingestion would be limited to the unlikely event where a marine mammal might suffer a negative response from ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system.

Pursuant to the MMPA, the ingestion of munitions used during testing activities under Alternative 1 is not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the ingestion of munitions used during testing activities as described under Alternative 1:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.6.5.5 Alternative 2 – Training Activities

Non-explosive practice munitions

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under Alternative 2, training activities involving small- and medium-caliber non-explosive practice munitions occur in the Study Area and increase by approximately 163 percent as compared to the No Action Alternative. The amount of small and medium caliber projectiles that an individual animal would encounter is generally low based on the patchy distribution of both the projectiles and an animal's feeding habitat. In addition, an animal would not likely ingest every projectile it encountered. Furthermore, an animal may attempt to ingest a projectile and then reject it when it realizes it is not a food item. Even ingestion of certain items (hooks), if they do not become embedded in tissue, do not end up resulting in injury or mortality to the individual (Wells et al. 2008). Therefore potential impacts of non-explosive practice munitions ingestion would be limited to the unlikely event where a marine mammal might suffer a negative response from ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system.

Fragments from high-explosive munitions

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under the Alternative 2, training activities involving high explosive munitions including bombs, medium- and large-caliber projectiles, missiles, and rockets would be used in the Study Area and decrease by approximately 30 percent as compared to the No Action Alternative. The amount of high explosive munitions fragments that an individual animal would encounter is generally low based on the patchy distribution of both the munitions and an animal's feeding habitat. In addition, an animal would not likely ingest every fragment it encountered. Furthermore, an animal may attempt to ingest a fragment and then reject it when it realizes it is not a food item. Even ingestion of certain items (hooks), if they do not become embedded in tissue, do not end up resulting in injury or mortality to the individual (Wells et al. 2008). Therefore, potential impacts of high explosive munitions fragment ingestion would be limited to the unlikely event where a marine mammal might suffer a negative response from ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system.

Pursuant to the MMPA, the ingestion of munitions used during training activities under Alternative 2 is not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the ingestion of munitions used during training activities as described under Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.6.5.6 Alternative 2 – Testing Activities

Non-explosive practice munitions

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under Alternative 2, testing activities involving small- and medium-caliber non-explosive practice munitions occur in the Study Area and increase by approximately 862 percent as compared to the No Action Alternative. The amount of small and medium-caliber projectiles that an individual animal would encounter is generally low based on the patchy distribution of both the projectiles and an animal's feeding habitat. In addition, an animal would not likely ingest every projectile it encountered. Furthermore, an animal may attempt to ingest a projectile and then reject it when it realizes it is not a food item. Even ingestion of certain items (hooks), if they do not become embedded in tissue, do not end up resulting in injury or mortality to the individual (Wells et al. 2008). Therefore potential impacts of non-explosive practice munitions ingestion would be limited to the unlikely event where a marine mammal might suffer a negative response from ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system.

Fragments from high-explosive munitions

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under Alternative 2, testing activities involving high explosive munitions including bombs, medium- and large-caliber projectiles, missiles, and rockets would be used in the Study Area and increase by approximately 291 percent as compared to the No Action Alternative. The amount of high explosive munitions fragments that an individual animal would encounter is generally low based on the patchy distribution of both the munitions and an animal's feeding habitat. In addition, an animal would not likely ingest every fragment it encountered.

Furthermore, an animal may attempt to ingest a fragment and then reject it when it realizes it is not a food item. Even ingestion of certain items (hooks), if they do not become embedded in tissue, do not end up resulting in injury or mortality to the individual (Wells et al. 2008). Therefore, potential impacts of high explosive munitions fragment ingestion would be limited to the unlikely event where a marine mammal might suffer a negative response from ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system.

Pursuant to the MMPA, the ingestion of munitions used during testing activities under Alternative 2 is not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the ingestion of munitions used during testing activities as described under Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.6.6 Impacts from Military Expended Materials Other than Munitions

Several different types of materials other than ordnance are expended at sea during training and testing activities. The following military expended materials other than ordnance have the potential to be ingested by marine mammals:

Target-Related Materials

At-sea targets are usually remotely operated airborne, surface, or subsurface traveling units, most of which are designed to be recovered for reuse. If they are severely damaged or displaced, targets may sink before they can be retrieved. Expendable targets include air-launched decoys, marine markers (smoke floats), cardboard boxes, and 10 ft. diameter red balloons tethered by a sea anchor. Most target fragments would sink quickly in the sea. Floating material, such as Styrofoam, may be lost from target boats and remain at the surface for some time.

Chaff

Chaff is an electronic countermeasure designed to reflect radar waves and obscure aircraft, vessels, and other equipment from radar tracking sources. Chaff is composed of an aluminum alloy coating on glass fibers of silicon dioxide (U.S. Air Force 1997). Chaff is released or dispensed in cartridges or projectiles that contain millions of chaff fibers. When deployed, a diffuse cloud of fibers undetectable to the human eye is formed. Chaff is a very light material that can remain suspended in air anywhere from 10 minutes to 10 hours and can travel considerable distances from its release point, depending on prevailing atmospheric conditions (Arfsten et al. 2002; U.S. Air Force 1997). Doppler radar has tracked chaff plumes containing approximately 900 grams of chaff drifting 200 mi. (322 km) from the point of release, with the plume covering greater than 400 $mi.^3$ (1,667 km^3) (Arfsten et al. 2002).

The chaff concentrations that marine mammals could be exposed to following release of multiple cartridges (e.g., following a single day of training) is difficult to accurately estimate because it depends on several unknown factors. First, specific release points are not recorded and tend to be random, and chaff dispersion in air depends on prevailing atmospheric conditions. After falling from the air, chaff fibers would be expected to float on the sea surface for some period, depending on wave and wind action. The fibers would be dispersed further by sea currents as they float and slowly sink toward the bottom. Chaff concentrations in benthic habitats following release of a single cartridge would be lower than the values noted in this section, based on dispersion by currents and the enormous dilution capacity of the receiving waters.

Several literature reviews and controlled experiments have indicated that chaff poses little risk, except at concentrations substantially higher than those that could reasonably occur from military training (Arfsten et al. 2002; Hullar et al. 1999; U.S. Air Force 1997). Nonetheless, some marine mammal species within the Study Area could be exposed to chaff through direct body contact and ingestion. Chemical alteration of water and sediment from decomposing chaff fibers is not expected to result in exposure. Based on the dispersion characteristics of chaff, it is likely that marine mammals would occasionally come in direct contact with chaff fibers while at the water's surface and while submerged, but such contact would be inconsequential. Chaff is similar to fine human hair (U.S. Air Force 1997). Because of the flexibility and softness of chaff, external contact would not be expected to impact most wildlife (U.S. Air Force 1997) and the fibers would quickly wash off shortly after contact. Given the properties of chaff, skin irritation is not expected to be a problem (U.S. Air Force 1997). Arfsten et al. (2002), Hullar et al. (1999), and U.S. Air Force (1997) reviewed the potential effects of chaff inhalation on humans, livestock, and animals and concluded that the fibers are too large to be inhaled into the lung. The fibers are predicted to be deposited in the nose, mouth, or trachea and are either swallowed or expelled; however, these reviews did not specifically consider marine mammals.

Based on the small size of chaff fibers, it appears unlikely that marine mammals would confuse the fibers with prey or purposefully feed on chaff fibers. However, marine mammals could occasionally ingest low concentrations of chaff incidentally from the surface, water column, or seafloor. While no studies were conducted to evaluate the effects of chaff ingestion on marine mammals, the effects are expected to be negligible, based on the low concentrations that could reasonably be ingested, the small size of chaff fibers, and available data on the toxicity of chaff and aluminum. In laboratory studies conducted by the University of Delaware (Hullar et al. 1999), blue crabs and killifish were fed a food-chaff mixture daily for several weeks and no significant mortality was observed at the highest exposure treatment. Similar results were found when chaff was added directly to exposure chambers containing filter-feeding menhaden. Histological examination indicated no damage from chaff exposures. A study on calves that were fed chaff found no evidence of digestive disturbance or other clinical symptoms (U.S. Air Force 1997).

Chaff cartridge plastic end caps and pistons would also be released into the marine environment, where they would persist for long periods and could be ingested by marine mammals. Chaff end caps and pistons sink in saltwater (Spargo 2007), which reduces the likelihood of ingestion by marine mammals at the surface or in the water column.

Flares

Flares are designed to burn completely. The only material that would enter the water would be a small, round, plastic end cap and piston (approximately 1.4 in. [3.6 cm] in diameter).

An extensive literature review and controlled experiments conducted by the U.S. Air Force demonstrated that self-protection flare use poses little risk to the environment or animals (U.S. Air Force 1997). Nonetheless, marine mammals within the vicinity of flares could be exposed to light generated by the flares. Pistons and end caps from flares would have the same impact on marine mammals as discussed under chaff cartridges. It is unlikely that marine mammals would be exposed to any chemicals that produce either flames or smoke since these components are consumed in their entirety during the burning process. Animals are unlikely to approach or get close enough to the flame to be exposed to any chemical components.

Parachutes

Aircraft-launched sonobuoys, lightweight torpedoes (such as the MK 46 and MK 54) and targets use nylon parachutes ranging in size from 18 to 48 in. (46 to 122 cm) in diameter. Parachutes are made up of cloth and nylon, with weights attached to the lines for rapid sinking upon impact with the water. At water impact, the parachute assembly is expended, and it sinks away from the unit. The parachute assembly may remain at the surface for a short time before it and its housing sink to the seafloor, where it becomes flattened (Environmental Sciences Group 2005). Some parachutes are weighted with metal clips to hasten their descent to the seafloor.

Ingestion of a parachute by a marine mammal at the surface or within the water column would be unlikely, since the parachute would not be available for very long before it sinks. Once on the seafloor, if bottom currents are present, the canopy may temporarily billow and be available for potential ingestion by marine animals with bottom-feeding habits.

Based on the information summarized above within the introduction to Section 3.4.3.5.1 (Mysticetes), mysticetes found within the Study Area, with the exception of bottom-feeding gray whales and humpback whales, are not expected to encounter parachutes on the seafloor because they do not feed there. Ingestion of parachutes by odontocetes and pinnipeds is unlikely but is possible if individuals are feeding on the bottom. Sea otter are not expected to be present in areas where parachutes may be released.

3.4.3.6.6.1 No Action Alternative – Training Activities

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under the No Action Alternative, training activities involving military expended materials other than munitions takes place in the Study Area. Target-related material, chaff, flares, parachutes, and their subcomponents have the potential to be ingested by a marine mammal, although most of these materials would quickly drop through the water column and settle on the seafloor, some Styrofoam, plastic endcaps, and other small items may float for some time before sinking.

While the smaller items discussed here may pose a hazard to marine mammals, as discussed for non-explosive practice munitions ingestion, the impacts of ingesting these forms of expended materials on marine mammals would be minor because of the following factors:

- The limited geographic area where materials and other than ordnance are expended during a given event
- Limited period of time these military expended materials would remain in the water column
- Unlikely chance that a marine mammal might encounter and swallow these items on the sea floor
- The ability of many marine mammals to reject and not swallow nonfood items incidentally ingested

The impacts of ingesting military expended materials other than ordnance would be limited to cases where an individual marine mammal might eat an indigestible item too large to be passed through the gut. The marine mammals would not be preferentially attracted to these military expended materials, with the possible exception of parachutes that may appear similar to the prey of some species such as sperm whales and beaked whales. For the most part, these military expended materials would most likely only be incidentally ingested by individuals feeding on the bottom in the precise location where these items were deposited. Non-munition military expended materials that would remain floating on the surface are too small to pose a risk of intestinal blockage to any marine mammal that happened to encounter it.

Pursuant to the MMPA, the use of military expended materials other than munitions used during training activities under the No Action Alternative is not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the use of military expended materials other than munitions used during training activities as described under the No Action Alternative:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.6.6.2 No Action Alternative – Testing Activities

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under the No Action Alternative, testing activities involving military expended materials other than munitions takes place in the Study Area. Target-related material, chaff, flares, parachutes, and their subcomponents have the potential to be ingested by a marine mammal, although most of these materials would quickly drop through the water column and settle on the seafloor, some Styrofoam, plastic endcaps, and other small items may float for some time before sinking.

While the smaller items discussed here may pose a hazard to marine mammals, as discussed for non-explosive practice munitions ingestion, the impacts of ingesting these forms of expended materials on marine mammals would be minor because of the following factors:

- The limited geographic area where materials and other than ordnance are expended during a given event
- Limited period of time these military expended materials would remain in the water column
- Unlikely chance that a marine mammal might encounter and swallow these items on the sea floor
- The ability of many marine mammals to reject and not swallow nonfood items incidentally ingested

The impacts of ingesting military expended materials other than ordnance would be limited to cases where an individual marine mammal might eat an indigestible item too large to be passed through the gut. The marine mammals would not be preferentially attracted to these military expended materials, with the possible exception of parachutes that may appear similar to the prey of some species such as sperm whales and beaked whales. For the most part, these military expended materials would most likely only be incidentally ingested by individuals feeding on the bottom in the precise location where these items were deposited. Non-munition military expended materials that would remain floating on the surface are too small to pose a risk of intestinal blockage to any marine mammal that happened to encounter it.

Pursuant to the MMPA, the use of military expended materials other than munitions used during testing activities under the No Action Alternative is not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the use of military expended materials other than munitions used during testing activities as described under the No Action Alternative:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.6.6.3 Alternative 1 – Training Activities

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under Alternative 1, training activities involving military expended materials other than munitions takes place in the Study Area and increase by approximately 16 percent as compared to the No Action Alternative. Target-related material, chaff, flares, parachutes, and their subcomponents have the potential to be ingested by a marine mammal, although most of these materials would quickly drop through the water column and settle on the seafloor, some Styrofoam, plastic endcaps, and other small items may float for some time before sinking.

While the smaller items discussed here may pose a hazard to marine mammals, as discussed for non-explosive practice munitions ingestion, the impacts of ingesting these forms of expended materials on marine mammals would be minor because of the following factors:

- The limited geographic area where materials and other than ordnance are expended during a given event
- Limited period of time these military expended materials would remain in the water column
- Unlikely chance that a marine mammal might encounter and swallow these items on the sea floor
- The ability of many marine mammals to reject and not swallow nonfood items incidentally ingested

The impacts of ingesting military expended materials other than ordnance would be limited to cases where an individual marine mammal might eat an indigestible item too large to be passed through the gut. The marine mammals would not be preferentially attracted to these military expended materials, with the possible exception of parachutes that may appear similar to the prey of some species such as sperm whales and beaked whales. For the most part, these military expended materials would most likely only be incidentally ingested by individuals feeding on the bottom in the precise location where these items were deposited. Non-munition military expended materials that would remain floating on the surface are too small to pose a risk of intestinal blockage to any marine mammal that happened to encounter it.

Pursuant to the MMPA, the use of military expended materials other than munitions used during training activities under Alternative 1 is not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the use of military expended materials other than munitions used during training activities as described under Alternative 1:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.6.6.4 Alternative 1 – Testing Activities

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under Alternative 1, testing activities involving military expended materials other than munitions takes place in the Study Area and increase by approximately 83 percent as compared to the No Action Alternative. Target-related material, chaff, flares, parachutes, and their subcomponents have the potential to be ingested by a marine mammal, although most of these materials would quickly drop through the water column and settle on the seafloor, some Styrofoam, plastic endcaps, and other small items may float for some time before sinking.

While the smaller items discussed here may pose a hazard to marine mammals, as discussed for non-explosive practice munitions ingestion, the impacts of ingesting these forms of expended materials on marine mammals would be minor because of the following factors:

- The limited geographic area where materials and other than ordnance are expended during a given event
- Limited period of time these military expended materials would remain in the water column
- Unlikely chance that a marine mammal might encounter and swallow these items on the sea floor
- The ability of many marine mammals to reject and not swallow nonfood items incidentally ingested

The impacts of ingesting military expended materials other than ordnance would be limited to cases where an individual marine mammal might eat an indigestible item too large to be passed through the gut. The marine mammals would not be preferentially attracted to these military expended materials, with the possible exception of parachutes that may appear similar to the prey of some species such as sperm whales and beaked whales. For the most part, these military expended materials would most likely only be incidentally ingested by individuals feeding on the bottom in the precise location where these items were deposited. Non-munition military expended materials that would remain floating on the surface are too small to pose a risk of intestinal blockage to any marine mammal that happened to encounter it.

Pursuant to the MMPA, the use of military expended materials other than munitions used during testing activities under Alternative 1 is not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the use of military expended materials other than munitions used during testing activities as described under Alternative 1:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.6.6.5 Alternative 2 – Training Activities

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under Alternative 2, training activities involving military expended materials other than munitions takes place in the Study Area and increase by approximately 16 percent as compared to the No Action Alternative. Target-related material, chaff, flares, parachutes, and their subcomponents have the potential to be ingested by a marine mammal, although most of these materials would quickly drop through the water column and settle on the seafloor, some Styrofoam, plastic endcaps, and other small items may float for some time before sinking.

While the smaller items discussed here may pose a hazard to marine mammals, as discussed for non-explosive practice munitions ingestion, the impacts of ingesting these forms of expended materials on marine mammals would be minor because of the following factors:

- The limited geographic area where materials and other than ordnance are expended during a given event
- Limited period of time these military expended materials would remain in the water column
- Unlikely chance that a marine mammal might encounter and swallow these items on the sea floor
- The ability of many marine mammals to reject and not swallow nonfood items incidentally ingested

The impacts of ingesting military expended materials other than ordnance would be limited to cases where an individual marine mammal might eat an indigestible item too large to be passed through the gut. The marine mammals would not be preferentially attracted to these military expended materials, with the possible exception of parachutes that may appear similar to the prey of some species such as sperm whales and beaked whales. For the most part, these military expended materials would most likely only be incidentally ingested by individuals feeding on the bottom in the precise location where these items were deposited. Non-munition military expended materials that would remain floating on the surface are too small to pose a risk of intestinal blockage to any marine mammal that happened to encounter it.

Pursuant to the MMPA, the use of military expended materials other than munitions used during training activities under Alternative 2 is not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the use of military expended materials other than munitions used during training activities as described under Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.6.6.6 Alternative 2 – Testing Activities

As discussed in Section 3.0.5.3.5 (Ingestion Stressors), under Alternative 2, testing activities involving military expended materials other than munitions takes place in the Study Area and increase by approximately 105 percent as compared to the No Action Alternative. Target-related material, chaff, flares, parachutes, and their subcomponents have the potential to be ingested by a marine mammal, although most of these materials would quickly drop through the water column and settle on the seafloor, some Styrofoam, plastic endcaps, and other small items may float for some time before sinking.

While the smaller items discussed here may pose a hazard to marine mammals, as discussed for non-explosive practice munitions ingestion, the impacts of ingesting these forms of expended materials on marine mammals would be minor because of the following factors:

- The limited geographic area where materials and other than ordnance are expended during a given event
- Limited period of time these military expended materials would remain in the water column
- Unlikely chance that a marine mammal might encounter and swallow these items on the sea floor
- The ability of many marine mammals to reject and not swallow nonfood items incidentally ingested

The impacts of ingesting military expended materials other than ordnance would be limited to cases where an individual marine mammal might eat an indigestible item too large to be passed through the gut. The marine mammals would not be preferentially attracted to these military expended materials, with the possible exception of parachutes that may appear similar to the prey of some species such as sperm whales and beaked whales. For the most part, these military expended materials would most likely only be incidentally ingested by individuals feeding on the bottom in the precise location where these items were deposited. Non-munition military expended materials that would remain floating on the surface are too small to pose a risk of intestinal blockage to any marine mammal that happened to encounter it.

Pursuant to the MMPA, the use of military expended materials other than munitions used during testing activities under Alternative 2 is not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, the use of military expended materials other than munitions used during testing activities as described under Alternative 2:

- *May affect, but is not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.7 Secondary Stressors

This section analyzes potential impacts to marine mammals exposed to stressors indirectly through impacts to their habitat (sediment or water quality) or prey. For the purposes of this analysis, indirect impacts to marine mammals via sediment or water that do not require trophic transfer (e.g., bioaccumulation) in order to be observed are considered here. It is important to note that the terms "indirect" and "secondary" do not imply reduced severity of environmental consequences, but instead describe how the impact may occur in an organism. Additionally, the transportation of marine mammals to Hawaii in association with Navy's marine mammal system is presented to detail the lack of potential for the introduction of disease and/or parasites to marine mammals and in particular the endangered Hawaiian monk seal. The potential for impacts from all these secondary indirect stressors are discussed below.

Stressors from Navy training and testing activities could pose indirect impacts to marine mammals via habitat or prey. These include (1) explosives and by-products, (2) metals, (3) chemicals, and (4) transmission of disease and parasites. Analyses of the potential impacts to sediment and water quality are discussed in Section 3.1 (Sediments and Water Quality).

3.4.3.7.1 Explosives

In addition to directly impacting marine mammals, underwater explosions could impact other species in the food web including prey species that marine mammals feed upon. The impacts of explosions would differ depending upon the type of prey species in the area of the blast.

In addition to physical effects of an underwater blast, prey might have behavioral reactions to underwater sound. For instance, prey species might exhibit a strong startle reaction to explosions that might include swimming to the surface or scattering away from the source. This startle and flight response is the most common secondary defense among animals (Hanlon and Messenger 1996). The abundances of prey species near the detonation point could be diminished for a short period of time before being repopulated by animals from adjacent waters. Alternatively, any prey species that would be directly injured or killed by the blast could draw-in scavengers from the surrounding waters that would feed on those organisms, and in-turn could be susceptible to becoming directly injured or killed by subsequent explosions. Any of these scenarios would be temporary, only occurring during activities involving explosives, and no lasting effect on prey availability or the pelagic food web would be expected.

3.4.3.7.2 Explosion By-Products and Unexploded Ordnance

High-order explosions consume most of the explosive material, creating typical combustion products. In the case of Royal Demolition Explosive, 98 percent of the products are common seawater constituents and the remainder is rapidly diluted below threshold effect level (Section 3.1, Sediments and Water Quality, Table 3.1-10). Explosion by-products associated with high order detonations present no indirect stressors to marine mammals through sediment or water. However, low order detonations and unexploded ordnance present elevated likelihood of impacts to marine mammals.

Deposition of undetonated explosive materials into the marine environment can be reasonably well estimated by the known failure and low-order detonation rates of high explosives (Section 3.1, Sediments and Water Quality, Table 3.1-11). Marine mammals may be exposed by contact with the explosive, contact with contaminants in the sediment or water, and ingestion of contaminated sediments.

Indirect impacts of explosives and unexploded ordnance to marine mammals via sediment is possible in the immediate vicinity of the ordnance. Degradation of explosives proceeds through several pathways as discussed in Section 3.1.3.1 (Explosives and Explosion Byproducts). Degradation products of Royal Demolition Explosive are not toxic to marine organisms at realistic exposure levels (Rosen and Lotufo 2010). Relatively low solubility of most explosives and their degradation products means that concentrations of these contaminants in the marine environment are relatively low and readily diluted. Furthermore, while explosives and their degradation products were detectable in marine sediment approximately 6 to 12 in. (0.15 to 0.3 m) away from degrading ordnance, the concentrations of these compounds were not statistically distinguishable from background beyond 3 to 6 ft. (1 to 2 m) from the degrading ordnance (Section 3.1.3.1, Explosives and Explosion Byproducts). Taken together, it is possible that marine mammals could be exposed to degrading explosives, but it would be within a very small radius of the explosive (1 to 6 ft. [0.3 to 2 m]).

In 2010, an investigation of a World War II underwater munitions disposal site in Hawaii (University of Hawai'i 2010) provides information in this regard. Among the purposes of the investigation were to determine whether these munitions, which had been on the seafloor for approximately 75 years, had released constituents (including explosive components and metals) that could be detected in sediment, seawater, or marine life nearby and whether there were significant ecological differences between the dump site and a "clean" reference site. Samples analyzed showed no confirmed detection for explosives. For metals, although there were localized elevated levels of arsenic and lead in several biota samples and in the sediment adjacent to the munitions, the origin of those metals could not be definitively linked to the munitions since comparison of sediment between the clean reference site and the disposal site both had relatively little anthropogenic component, and especially in comparison to samples for ocean disposed dredge spoils sites (locations where material taken from the dredging of harbors on Oahu was disposed). Observations and data collected also did not indicate any adverse impact on the ecology of the dump site.

Given that the concentration of munitions/explosions, expended material, or devices would never exceed that of a World War II dump site in any of the proposed actions, the water quality effects from the use of munitions, expended material, or devices would be negligible and would have no long-term effect on water quality and therefore would not constitute a secondary indirect stressor for marine mammals.

3.4.3.7.3 Metals

Metals are introduced into seawater and sediments as a result of training and testing activities involving ship hulks, targets, ordnance, munitions, and other military expended materials (Section 3.1.3.2, Metals). Some metals bioaccumulate and physiological impacts begin to occur only after several trophic transfers concentrate the toxic metals (see Section 3.3, Marine Habitats, and Chapter 4, Cumulative Impacts). Indirect impacts of metals to marine mammals via sediment and water involve concentrations several orders of magnitude lower than concentrations achieved via bioaccumulation. Marine mammals may be exposed by contact with the metal, contact with contaminants in the sediment or water, and ingestion of contaminated sediments. Concentrations of metals in sea water are orders of magnitude lower than concentrations in marine sediments. It is extremely unlikely that marine mammals would be indirectly impacted by metals via the water and few marine mammal species feed primarily on the seafloor where they would come into contact with marine sediments.

3.4.3.7.4 Chemicals

Several Navy training and testing activities introduce potentially harmful chemicals into the marine environment; principally, flares and propellants for rockets, missiles, and torpedoes. Properly functioning flares missiles, rockets, and torpedoes combust most of their propellants; leaving benign or readily diluted soluble combustion by-products (e.g., hydrogen cyanide). Operational failures allow propellants and their degradation products to be released into the marine environment. The greatest risk to marine mammals from flares, missile, and rocket propellants that operationally fail is perchlorate, which is highly soluble in water, persistent, and impacts metabolic processes in many plants and animals. Marine mammals may be exposed by contact with contaminated water. However, rapid dilution would occur and toxic concentrations are unlikely to be encountered in seawater.

3.4.3.7.5 Transmission of Marine Mammal Diseases and Parasites

The U.S. Navy deploys trained Atlantic bottlenose dolphins (*Tursiops truncatus*) and California sea lions (*Zalophus californianus*) for integrated training involving two primary mission areas; to find objects such as inert mine shapes, and to detect swimmers or other intruders around Navy facilities such as piers. When deployed, the animals are part of what the Navy refers to as Marine Mammal Systems. These Marine Mammal Systems include one or more motorized small boats, several crew members, and a trained marine mammal. Based on the standard procedures with which these systems are deployed, it is not reasonably foreseeable that use of these marine mammals systems would result in the transmission of disease or parasites to cetacea or pinnipeds in the Study Area based on the following.

Each trained animal is deployed under behavioral control to find the intruding swimmer or submerged object. Upon finding the 'target' of the search, the animal returns to the boat and alerts the animal handlers that an object or swimmer has been detected. In the case of a detected object, the human handlers give the animal a marker that the animal can bite onto and carry down to place near the detected object. In the case of a detected swimmer, animals are given a localization marker or leg cuff that they are trained to deploy via a pressure trigger. After deploying the localization marker or leg cuff the animal swims free of the area to return to the animal support boat. For detected objects, human divers or remote vehicles are deployed to recover the item. Swimmers that have been marked with a leg cuff are reeled-in by security support boat personnel via a line attached to the cuff.

Marine mammal systems deploy approximately 1 to 2 weeks before the beginning of a training exercise to allow the animals to acclimate to the local environment. There are 4 to 12 marine mammals involved per exercise. Systems typically participate in object detection and recovery, both participating in mine warfare events, and assisting with the recovery of inert mine shapes at the conclusion of an event. Marine Mammal Systems may also participate in port security and anti-terrorism/force protection events.

During the past 40 years, the Navy Marine Mammal Program has deployed globally. To date, there have been no known instances of deployment-associated disease transfer to or from Navy marine mammals.

Navy animals are maintained under the control of animal handlers and are prevented from having sustained contact with indigenous animals.

When not engaged in the training event, Navy Marine Mammals are either housed in temporary enclosures or aboard ships involved in training exercises. All marine mammal waste is disposed of in a manner approved for the specific holding facilities. When working, sea lions are transported in boats and dolphins are transferred in boats or by swimming along-side the boat under the handler’s control. Their open-ocean time is under stimulus control and is monitored by their trainers.

Navy marine mammals receive excellent veterinarian care (per SECNAVINST 3900.41E). Appendix A, Section 8, of the Swimmer Interdiction Security System Final EIS (U.S. Department of the Navy 2009b) provides an overview of the veterinary care provided for the Navy's marine mammals. Appendix B, Section 2, of the Swimmer Interdiction Security System Final EIS provides detailed information on the health screening process for communicable diseases. The following is a brief summary of the care received by all of the Navy's marine mammals:

1. Qualified veterinarians conduct routine and pre-deployment health examinations on the Navy's marine mammals; only animals determined as healthy are allowed to deploy.
2. Restaurant-quality frozen fish are fed to prevent diseases that can be caused by ingesting fresh fish (e.g., parasitic diseases).
3. Navy animals are routinely dewormed to prevent parasitic and protozoal diseases.
4. If a valid and reliable screening test is available for a regionally relevant pathogen (e.g., polymerase chain reaction assays for morbillivirus), such tests are run on appropriate animal samples to ensure that animals are not shedding these pathogens.

The Navy Marine Mammal Program routinely does the following to further mitigate the low risk of disease transmission from captive to wild marine mammals during training events:

1. Marine mammal waste is disposed of in an approved system dependent upon the animal's specific housing enclosure and location.
2. Onsite personnel are made aware of the potential for disease transfer, and report any sightings of wild marine mammals so that all personnel are alert to the presence of the animal.
3. Marine mammal handlers visually scan for indigenous marine animals, for at least 5 minutes before animals are deployed and maintain a vigilant watch while the animal is working in the water. If a wild marine mammal is seen approaching or within 100 m, the animal handler will hold the marine mammal in the boat or recall the animal immediately if the animal has already been sent on the mission.
4. The Navy obtains appropriate state agriculture and other necessary permits and strictly adheres to the conditions of the permit.

Due to the very small amount of time that the Navy marine mammals spend in the open ocean; the control that the trainers have over the animals; the collection and proper disposal of marine mammal waste; the exceptional screening and veterinarian care given to the Navy's animals; the visual monitoring for indigenous marine mammals; and an over forty year track record with zero known incidents, there is no scientific basis to conclude that the use of Navy marine mammals during training activities would have an impact on wild marine mammals.

Secondary stressors (impacts to habitat or prey from explosives and byproducts, metals, chemicals, and transmission of disease and parasites) are not expected to result in Level A or Level B harassment of any marine mammals.

3.4.3.7.6 No Action Alternative, Alternative 1, and Alternative 2 – Training Activities

Pursuant to the MMPA, secondary stressors from training activities under the No Action Alternative, Alternative 1, and Alternative 2 are not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, secondary stressors from training activities under the No Action Alternative, Alternative 1, or Alternative 2:

- *May affect, but are not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.3.7.7 No Action Alternative, Alternative 1, and Alternative 2 – Testing Activities

Pursuant to the MMPA, secondary stressors from testing activities under the No Action Alternative, Alternative 1, and Alternative 2 are not expected to result in mortality, Level A, or Level B harassment of marine mammals, as defined by the MMPA.

Pursuant to the ESA, secondary stressors from testing activities under the No Action Alternative, Alternative 1, or Alternative 2:

- *May affect, but are not likely to adversely affect, blue whale, sei whale, sperm whale, humpback whale, fin whale, Western North Pacific stock of gray whale, Hawaiian monk seal, Guadalupe fur seal, and the Main Hawaiian Islands insular stock of false killer whale*
- *Would have no effect on Hawaiian monk seal critical habitat*

3.4.4 Summary of Impacts (Combined Impacts of all Stressors) on Marine Mammals

As described in Section 3.0.5.5 (Resource-Specific Impacts Analysis for Multiple Stressors), this section evaluates the potential for combined impacts of all the stressors from the proposed action. The analysis and conclusions for the potential impacts from each of the individual stressors are discussed in the analyses of each stressor in the sections above and summarized in Sections 3.4.6 (Marine Mammals Protection Act Determinations) and 3.4.7 (Endangered Species Act Determinations).

There are generally two ways that a marine mammal could be exposed to multiple stressors. The first would be if a marine mammal were exposed to multiple sources of stress from a single event or activity (e.g., a mine warfare event may include the use of a sound source and a vessel). The potential for a combination of these impacts from a single activity would depend on the range to effects of each of the stressors and the response or lack of response to that stressor. Most of the activities as described in the proposed action involve multiple stressors; therefore it is likely that if a marine mammal were within the potential impact range of those activities, they may be impacted by multiple stressors simultaneously. This would be even more likely to occur during large-scale exercises or events that span a period of days or weeks (such as a sinking exercise or composite training unit exercise).

Secondly, a marine mammal could be exposed to a combination of stressors from multiple activities over the course of its life, however, combinations are unlikely to co-occur because training and testing activities are generally separated in space and time in such a way that it would be very unlikely that any individual marine mammal would be exposed to stressors from multiple activities. However, animals with a home range intersecting an area of concentrated Navy activity have elevated exposure risks relative to animals that simply transit the area through a migratory corridor. The majority of the proposed activities are unit level. Unit level events occur over a small spatial scale (one to a few square miles) and with few participants (usually one or two) or short duration (the order of a few hours or less). Time is factor with respect to the probability of exposure. Because most Navy stressors persist for a time shorter than or equal to the duration of the activity, the odds of exposure to combined stressors is lower than would be the case for persistent stressors. For example, strike stressors cease with the passage of the object; ingestion stressors cease (mostly) when the object settles to the seafloor. The animal would have to be present during each of the brief windows that the stressors exist.

Multiple stressors may also have synergistic effects. For example, marine mammals that experience temporary hearing loss or injury from acoustic stressors could be more susceptible to physical strike and disturbance stressors via a decreased ability to detect and avoid threats. Marine mammals that experience behavioral and physiological consequences of ingestion stressors could be more susceptible to entanglement and physical strike stressors via malnourishment and disorientation. These interactions are speculative, and without data on the combination of multiple Navy stressors, the synergistic impacts from the combination of Navy stressors are difficult to predict in any meaningful way. Navy research and monitoring efforts include data collection through conducting long-term studies in areas of Navy activity, occurrence surveys over large geographic areas, biopsy of animals occurring in areas of Navy activity, and tagging studies where animals are exposed to Navy stressors. These efforts are intended to contribute to the overall understanding of what impacts may be occurring overall to animals in these areas.

3.4.5 Summary of Observations During Previous Navy Activities

Since 2006 the Navy, non-Navy marine mammal scientists, and research institutions have conducted scientific monitoring and research in and around ocean areas in the Atlantic and Pacific where Navy has been and proposes to continue training and testing. Data collected from Navy monitoring, scientific research findings, and annual reports provided to NMFS[44] may be informative to the analysis of impacts to marine mammals for a variety of reasons, including species distribution, habitat use, and evaluating potential responses to Navy activities. Monitoring is performed using a variety of methods, including visual surveys from surface vessels and aircraft, as well as passive acoustics. Navy monitoring can generally be divided into two types of efforts: (1) collecting long-term data on distribution, abundance, and habitat use patterns within Navy activity areas; and (2) collecting data during individual training or testing activities. The Navy also contributes to funding of basic research, including behavioral response studies specifically designed to determine the effects to marine mammals from the Navy's main mid-frequency surface ship anti-submarine warfare active acoustic (sonar) system.

The majority of the training and testing activities the Navy is proposing for the next five years are similar, if not identical, to activities that have been occurring in the same locations for decades. For example, the mid-frequency sonar system on the cruisers, destroyers, and frigates have the same sonar system components in the water as was first deployed in the 1970s. While the signal analysis and

[44] Navy monitoring reports are available at http://www.navymarinespeciesmonitoring.us/ and also at the NMFS website; www.nmfs.noaa.gov/pr/permits/incidental.htm#applications.

computing processes onboard these ships have been upgraded with modern technology, the power and output of the sonar transducer, which puts signals into the water, have not changed. For this reason, the history of past marine mammal observations, research, and monitoring reports remain applicable to the analysis of effects from the proposed future training and testing activities. In addition, because there is a longer (6-year) record of monitoring Navy activities in the Pacific and because there is more available science specific to the areas where Navy has historically trained and tested in the HSTT area, the research and monitoring record from those areas is informative with regard to assessing the effects of Navy training and testing in general.

In the Hawaii portion of the Study Area between 2006 and 2012, there were 21 scientific marine mammal surveys conducted before, during, or after major exercises. In the Southern California and Hawaii portions of HSTT from 2009 to 2012, Navy-funded marine mammal monitoring research has completed over 5,000 hours of visual survey effort covering over 65,000 nm, sighted over 256,000 individual marine mammals, taken over 45,600 digital photos and 36 hours of digital video, attached 70 satellite tracking tags to individual marine mammals, and collected over 40,000 hours of passive acoustic recordings. The Navy also co-funded additional visual surveys conducted by the NMFS' Pacific Island Fisheries Science Center and Southwest Fisheries Science Center. Finally, there were an additional 1,532 sightings of an estimated 16,224 marine mammals made and reported by Navy Lookouts aboard Navy ships within the Study Area from 2009 to 2012.

Based on this research, monitoring before, during, and after training and testing events since 2006, and the reports that have been submitted to and reviewed by NMFS, the Navy's assessment is that it is unlikely there will be impacts to populations of marine mammals (such as whales, dolphins and porpoise, seals and sea lions) having any long term consequences as a result of the proposed continuation of training and testing in the ocean areas historically used by the Navy.

This assessment of likelihood is based on four indicators from areas in the Pacific where Navy training and testing has been ongoing for decades: (1) evidence suggesting or documenting increases in the numbers of marine mammals present, (2) examples of documented presence and site fidelity of species and long-term residence by individual animals of some species, (3) use of training and testing areas for breeding and nursing activities, and (4) six years of comprehensive monitoring data indicating a lack of any observable effects to marine mammal populations as a result of Navy training and testing activities[45]. Citations to evidence indicative of increases and/or viability of marine mammal populations are not meant to suggest that Navy training and testing events are beneficial to marine mammals. There is, however, no direct evidence from Hawaii or Southern California suggesting Navy training and testing has had or may have any long term consequences to marine mammals and therefore baring any evidence to the contrary, what limited and preliminary evidence there is should be considered. This is especially the case given the widespread public misperception that Navy training and testing, especially involving use of mid-frequency sonar, will cause countless numbers of marine mammals to be injured or die. Examples to the contrary where the Navy has conducted training and testing activities for decades include the following.

Work by Moore and Barlow (2011) indicate that since 1991, there is strong evidence of increasing fin whale abundance in the California Current area, which includes the Southern California Range Complex. They predict continued increases in fin whale numbers over the next decade, and that perhaps fin whale

[45] Monitoring of Navy activities began in July 2006 as a requirement under issuance of an Incidental Harassment Authorization by NMFS for the Rim of the Pacific exercise and has continued to the present for Major Training Events in the HRC and SOCAL as well as other monitoring as part of the coordinated efforts under the Navy's Integrated Comprehensive Monitoring Plan developed in coordination with NMFS and others.

densities are reaching "current ecosystem limits" (Moore and Barlow 2011). For humpback whales that winter in the Hawaiian Islands, research has confirmed that the overall humpback whale population in the North Pacific has continued to increase and is now greater than some prior estimates of prewhaling abundance (Barlow et al. 2011). The Hawaiian Islands, the location of the HRC for decades, continue to function as a critical breeding, calving, and nursing area for this endangered species. In a similar manner, the beaches and shallow water areas within the Pacific Missile Range Facility (PMRF) at Kauai (in the main Hawaiian Islands) continue to be an important haul-out and nursing area for endangered Hawaiian Monk Seal. While there has been a decline in the population of Hawaiian monk seals in the northwestern Hawaiian Islands, in the main Hawaiian Islands the numbers have continued to increase (Littnan 2011); the main Hawaiian Islands is where the Navy trains and tests. Likewise for southern sea otter at the Navy managed San Nicolas Island, the animals residing there tend to be larger and heavier than those along the coast, and on average the population has been increasing at approximately 9 percent annually from the early 1990s to the mid-2000s that has not been matched by sea otter along the central California coastline (U.S. Department of the Interior 2012b).

As increases in population would seem to indicate, evidence for the presence and/or residence of marine mammal individuals and populations would also seem to suggest a lack of long term consequences or detrimental effects from Navy training and testing historically occurring in the same locations. For example, photographic records spanning more than two decades demonstrated there had been re-sightings of individual beaked whales (from two species; Cuvier's and Blainville's beaked whales) suggesting long-term site fidelity to the area west of the Island of Hawaii (McSweeney et al. 2007). This is specifically an area in the Hawaiian Islands where the Navy has been using mid-frequency sonar during anti-submarine warfare training (including relatively intense swept channel events) over many years. Similar findings of high site fidelity have been reported for this same area involving pygmy killer whales (*Feresa attenuata*) (McSweeney et al. 2009). Similarly, the intensively used instrumented range at PMRF remains the foraging area for a resident pod of spinner dolphins that was the focus for part of the monitoring effort during the 2006 Rim of the Pacific Exercise. More recently at PMRF, Martin and Kok (2011) reported on the presence of minke whales, humpback whales, beaked whales, pilot whales, and sperm whales on or near the range during a Submarine Commander Course involving three surface ships and a submarine using mid-frequency sonar over the span of the multiple day event. The analysis by Martin and Kok (2011) showed it was possible to evaluate the behavioral response of minke whale and found there did not appear to be a significant reaction by the minke whale to the mid-frequency sonar transmissions and the training activity in general did not appear to affect the presence of other detected species on or near the range.

In Southern California, based on a series of surveys from 2006 to 2008 and the high number encounter rate, Falcone et al. (2009) proposed that their observations suggested the ocean basin west of San Clemente Island may be an important region for Cuvier's beaked whales. For over three decades, this ocean area west of San Clemente has been the location of the Navy's instrumented training range and is one of the most intensively used training and testing areas in the Pacific, given the proximity to the Naval installations in San Diego. The long term presence of beaked whales at the Navy range off Southern California is consistent with that for a similar Navy instrumented range (the Atlantic Undersea Test and Evaluation Center) located off Andros Island in the Bahamas where Blainville's beaked whales (*Mesoplodon densirostris*) are routinely acoustically detected (see Tyack et al.2011; McCarthy et al. 2011). Moore and Barlow (2013) have noted a decline in beaked whales in a broad area of the Pacific Ocean area out to 300 nm from the coast and extending from the Canadian-U.S. border to the tip of Baja Mexico. There are scientific caveats and limitations to the data used for that analysis, as well as oceanographic and species assemblage changes on the U.S. West Coast not thoroughly addressed in the

Moore and Barlow (2013). Interestingly, however, in the small portion of that area overlapping the Navy's Southern California Range Complex, long-term residency by individual Cuvier's beaked whales and higher densities provide indications that the proposed decline of beaked whales off the United States west coast is not apparent where the Navy has been intensively training and testing with sonar and other systems for decades. Data documenting the presence of Cuvier's beaked whales for the ocean basin west of San Clemente Island (Falcone et al. 2009) is consistent with concurrent results from passive acoustic monitoring that estimated regional Cuvier's beaked whale densities were higher than indicated by the NMFS's broad scale visual surveys for the United States west coast (Hildebrand and McDonald 2009). The Navy's use of the Southern California Range Complex has not precluded beaked whales from continuing to inhabit the area, nor has there been documented declines or beaked whale mortalities associated with Navy training and testing activities. Navy funding for monitoring of beaked whale and other marine species (involving visual survey, passive acoustic recording, and tagging studies) will continue in Southern California to develop additional data towards a clearer understanding of marine mammals inhabitating the Navy's range complexes, but current albeit limited evidence does not indicate a decline of beaked whales in the Navy's Southern California Range Complex.

To reiterate, while the evidence is limited to a few species and only suggestive of the general viability of those species, there is no direct evidence that routine Navy training and testing spanning decades in the Study Area has negatively impacted those species. Therefore, based on the best available science (Barlow et al.2011; Falcone et al. 2009; Littnan 2011; Martin and Kok 2011; McCarthy et al. 2011; McSweeney et al. 2007; McSweeney et al. 2009; Moore and Barlow 2011; Southall et al. 2012), the Navy believes that long-term consequences for individuals or populations are unlikely to result from Navy training and testing activities.

Although potential impacts to certain marine mammal species from the Proposed Action may include injury or mortality, impacts are not expected to decrease the overall fitness of any given population. In cases where potential impacts rise to the level that warrants mitigation, mitigation measures designed to reduce the potential impacts are discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring).

Although potential impacts to certain marine mammal species from the Proposed Action may include injury or mortality, impacts are not expected to decrease the overall fitness of any given population. In cases where potential impacts rise to the level that warrants mitigation, mitigation measures designed to reduce the potential impacts are discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring).

3.4.6 Marine Mammal Protection Act Determinations

Pursuant to the MMPA, the Navy is seeking two 5-year Letters of Authorization from the NMFS for stressors associated with certain training and testing activities (the use of sonar and other active acoustic sources, explosives, pile driving, and vessels), as described under the Preferred Alternative (Alternative 2). The use of sonar, other active sources and explosives may result in Level A harassment, Level B harassment, or in mortality of certain marine mammals; pile driving and the use of swimmer defense airguns are not expected to result in Level A harassment, but may result in Level B harassment of marine mammals. The use of vessels may result in mortality or Level A harassment of certain marine mammal species. Refer to Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources) for details on the estimated impacts from acoustic sources (sonar and other active acoustic sources), Section 3.4.3.2.2 (Impacts from Explosives) for impacts from explosives, Section 3.4.3.2.3 (Impacts from

Pile Driving) for impacts from pile driving, Section 3.4.3.2.4 (Impacts from Swimmer Defense Airguns) for airguns, and 3.4.3.4.1 (Impacts from Vessels) for details on the estimated impacts from vessels.

Navy training and testing activities involving weapons firing noise, vessel noise, aircraft noise, energy sources, the use of in-water devices, expending military materials, and secondary stressors are not expected to result in Level A or Level B harassment of any marine mammals.

3.4.7 Endangered Species Act Determinations

The NMFS administers the ESA for marine mammals in the Study Area. The guidelines followed to make a determination of no effect; may affect, not likely to adversely affect; or may affect, likely to adversely affect can be found in the *ESA Consultation Handbook* (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998).

In accordance with ESA requirements, the Navy has undertaken Section 7 consultation with NMFS for the proposed and ongoing activities in the Study Area under Alternative 2 as the preferred alternative. A summary of the Navy's findings are provided in Table 3.4-35, which has the determinations made for each substressor and ESA-listed marine mammal species pursuant to the ESA from the analysis presented in the sections previously. For all substressors, training and testing activities would have no effect on Hawaiian monk seal critical habitat.

Table 3.4-35: Endangered Species Act Effects Determinations for Training and Testing Activities for the Preferred Alternative (Alternative 2)

Activity		Species								
		Humpback Whale	Sei Whale	Fin Whale	Blue Whale	Gray Whale, Western North Pacific stock	Sperm Whale	False Killer Whale, Main Hawaiian Islands Insular stock	Hawaiian Monk Seal	Guadalupe Fur Seal
Acoustic Stressors										
Sonar and Other Active Acoustic Sources	Training Activities	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
	Testing Activities	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Explosives	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, not likely to adversely affect	May affect, likely to adversely affect	May affect, not likely to adversely affect	May affect, likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Pile Driving	Training Activities	No effect	No effect	No effect	No effect	May affect, not likely to adversely affect	No effect	No effect	No effect	No effect
	Testing Activities	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Swimmer Defense Airguns	Training Activities	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	Testing Activities	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect

Table 3.4-35: Endangered Species Act Effects Determinations for Training and Testing Activities for the Preferred Alternative (Alternative 2) (continued)

Activity		Species								
		Humpback Whale	Sei Whale	Fin Whale	Blue Whale	Gray Whale, Western North Pacific stock	Sperm Whale	False Killer Whale, Main Hawaiian Islands Insular stock	Hawaiian Monk Seal	Guadalupe Fur Seal
Acoustic Stressors (continued)										
Weapons Firing, Launch, and Impact Noise	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Aircraft Noise	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Vessel Noise	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect

Table 3.4-35: Endangered Species Act Effects Determinations for Training and Testing Activities for the Preferred Alternative (Alternative 2) (continued)

Activity		Species								
		Humpback Whale	Sei Whale	Fin Whale	Blue Whale	Gray Whale, Western North Pacific stock	Sperm Whale	False Killer Whale, Main Hawaiian Islands Insular stock	Hawaiian Monk Seal	Guadalupe Fur Seal
Energy Stressors										
Electromagnetic	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Physical Disturbance and Strike Stressors										
Vessels	Training Activities	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, not likely to adversely affect	May affect, likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, not likely to adversely affect	May affect, likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
In-water Devices	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect

Table 3.4-35: Endangered Species Act Effects Determinations for Training and Testing Activities for the Preferred Alternative (Alternative 2) (continued)

Activity		Species								
		Humpback Whale	Sei Whale	Fin Whale	Blue Whale	Gray Whale, Western North Pacific stock	Sperm Whale	False Killer Whale, Main Hawaiian Islands Insular stock	Hawaiian Monk Seal	Guadalupe Fur Seal
Physical Disturbance and Strike Stressors (continued)										
Military Expended Materials	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Seafloor Devices	Training Activities	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
	Testing Activities	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Entanglement Stressors										
Fiber Optic Cables and Guidance Wires	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Parachutes	Training Activities	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect

Table 3.4-35: Endangered Species Act Effects Determinations for Training and Testing Activities for the Preferred Alternative (Alternative 2) (continued)

Activity		Species								
		Humpback Whale	Sei Whale	Fin Whale	Blue Whale	Gray Whale, Western North Pacific stock	Sperm Whale	False Killer Whale, Main Hawaiian Islands Insular stock	Hawaiian Monk Seal	Guadalupe Fur Seal
Ingestion Stressors										
Munitions	Training Activities	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Military Expended Materials other than Munitions	Training Activities	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Secondary Stressors										
Secondary Stressors	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect

REFERENCES

Abramson, L., Polefka, S., Hastings, S., & Bor, K. (2009). *Reducing the Threat of Ship Strikes on Large Cetaceans in the Santa Barbara Channel Region and Channel Islands National Marine Sanctuary: Recommendations and Case Studies* (pp. 1-73). Channel Islands National Marine Sanctuary Advisory Council. Retrieved from http://channelislands.noaa.gov/sac/pdf/sscs10-2-09.pdf

Aburto, A., Rountry, D. J. & Danzer, J. L. (10208). (1997). Behavioral response of Blue Whales to active signals. (Vol. TR 1746, pp. 1-75). San Diego, CA: Naval Research and Development.

Acevedo, A. (1991). Interactions between boats and bottlenose dolphins, Tursiops truncatus, in the entrance to Ensenada De La Paz, Mexico. Aquatic Mammals 17(3): 120-124.

Acevedo-Gutiérrez, A., D. A. Croll, and B. R. Tershy. (2002). "High feeding costs limit dive time in the largest whales." Journal of Experimental Biology 205: 1747-1753.

Afsal, V. V., P. P. Manojkumar, K. S. S. M. Yousuf, B. Anoop and E. Vivekanandan (2009). "The first sighting of Longman's beaked whale, *Indopacetus pacificus* in the southern Bay of Bengal." Marine Biodiversity Records 2: 1-3.

Aguayo, L. A. and T. R. Sanchez. (1987). "Sighting records of Fraser's dolphin in the Mexican Pacific waters." Scientific Reports of the Whales Research Institute 38: 187-188.

Aguilar, A. (2000). Population biology, conservation threats and status of Mediterranean striped dolphins (Stenella coeruleoalba). Journal of Cetacean Research and Management, 2(1), 17-26.

Aguilar, A. (2008). Fin whale *Balaenoptera physalus*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen. Amsterdam, Academic Press**:** 433-437.

Aguilar, N., Carrilllo, M., Delgado, I., Diaz, F., & Brito, A. (2000). Fast ferries impact on cetacean in Canary Islands: Collisions and displacement. [Abstract]. *European Research on Cetaceans, 14*, 164.

Aguilar de Soto, N.A., M. Johnson, P.T. Madsen, P. L. Tyack, A. Bocconcelli, J.F. Borsani (2006). Does Intense Ship Noise Disrupt Foraging in Deep-Diving Cuvier's Beaked Whales (*Ziphius cavirostris*)? Marine Mammal Science 22(3):690-699).

Aguilar Soto, N., M. P. Johnson, P. T. Madsen, F. Diaz, I. Dominguez, A. Brito and P. Tyack. (2008). "Cheetahs of the deep sea: Deep foraging sprints in short-finned pilot whales off Tenerife (Canary Islands)." Journal of Animal Ecology 77(5): 936-947.

Aissi, M., A. Celona, G. Comparetto, R. Mangano, M. Wurtz and A. Moulins. (2008). "Large-scale seasonal distribution of fin whales (Balaenoptera physalus) in the central Mediterranean Sea." Journal of the Marine Biological Association of the United Kingdom 88: 1253-1261.

Allen, B. M. and R. P. Angliss. (2010). *Alaska Marine Mammal Stock Assessments 2009*. Seattle, WA. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center**:** 276.

Allen, B. M. and R. P. Angliss (2013). *Alaska Marine Mammal Stock Assessments 2012*. NOAA Technical Memorandum NMFS-AFSC-245, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center**:** 282.

Alonso, M. K., S. N. Pedraza, A. C. M. Schiavini, R. N. P. Goodall and E. A. Crespo. (1999). "Stomach contents of false killer whales (*Pseudorca crassidens*) stranded on the coasts of the Strait of Magellan, Tierra del Fuego." Marine Mammal Science 15(3): 712-724.

Alter, S. E., S. F. Ramirez, S. Nigenda, J. U. Ramirez, L. R. Bracho and S. R. Palumbi. (2009). "Mitochondrial and nuclear genetic variation across calving lagoons in eastern North Pacific gray whales (*Eschrichtius robustus*)." Journal of Heredity 100(1): 34-46.

Alter, S. E., Simmonds, M. P. & Brandon, J. R. (2010). Forecasting the consequences of climate-driven shifts in human behavior on cetaceans. *Marine Policy, 34*(5), 943-954. doi: 10.1016/j.marpol.2010.01.026

Alves, F., A. Dinis, I. Cascao and L. Freitas. (2010). "Bryde's whale (Balaenoptera brydei) stable associations and dive profiles: New insights from foraging behavior." Marine Mammal Science 26(1): 202-212.

Anderson, R. C., R. Clark, P. T. Madsen, C. Johnson, J. Kiszka and O. Breysse. (2006). "Observations of Longman's beaked whale (*Indopacetus pacificus*) in the Western Indian Ocean." Aquatic Mammals 32(2): 223-231.

Antonelis, G. A., J. D. Baker, T. C. Johanos, R. C. Braun and A. L. Harting. (2006). "Hawaiian monk seal (*Monachus schauinslandi*): Status and conservation issues." Atoll Research Bulletin 543: 75-101.

Antonelis, G. A., M. S. Lowry, C. H. Fiscus, B. S. Stewart and R. L. DeLong (1994). Diet of the northern elephant seal. In. Elephant seals: Population ecology, behavior, and physiology. B. J. L. Boeuf and R. M. Laws, University of California Press**:** 211-226.

Arcangeli, A. & R. Crosti. (2009). The short-term impact of dolphin-watching on the behaviour of bottlenose dolpjhins (*Tursiops truncatus*) in western Australia. *Journal of Marine Animals and Their Ecology* 2(1): 3-9.

Archer, F. I. (2009). Striped dolphin *Stenella coeruleoalba*. In. Encyclopedia of Marine Mammals (Second Edition). W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 1127-1129.

Archer, F. I. and W. F. Perrin. (1999). "Stenella coeruleoalba." Mammalian Species 603: 1-9.

Archer, F. I. Redfern, J. V. Gerrodette, T. Chivers, S. J. Perrin, W. F. (2010a). Estimation of relative exposure of dolphins to fishery activity. Marine Ecology Progress Series Vol. 410: 245-255.

Archer, F. I. Mesnick, S. L. Allen, A. C. (2010b). Variation and Predictors of Vessel-Response Behavior in a Tropical Dolphin Community. NOAA Technical Memorandum NMFS, NOAA-TM-NMFS-SWFSC-457, 1-60.

Arfsten, D. (2002). Radio Frequency Chaff: The Effects of Its Use in Training on the Environment. Ecotoxicology and Environmental Safety, 53(1), 1-11. doi: 10.1006/eesa.2002.2197

Arnould, J. P. Y. (2009). Southern fur seals *Arctocephalus* spp. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 1079-1084.

Au, D. & W.L. Perryman. (1982). Movement and speed of dolphin schools responding to an approaching ship. Fishery Bulletin, 80(2), 371-372.

Au, D. W. K. and W. L. Perryman. (1985). "Dolphin habitats in the eastern tropical Pacific." Fishery Bulletin 83: 623-643.

Au, W. W. L. (1993). The Sonar of Dolphins. (pp. 277). New York, NY: Springer-Verlag.

Au, W. W. L. & Green, M. (2000). Acoustic interaction of humpback whales and whale-watching boats. [doi: 10.1016/S0141-1136(99)00086-0]. Marine Environmental Research, 49(5), 469-481.

Au, W. W. L., J. Mobley, W.C. Burgess, M.O. Lammers, & P. E. Nachtigall. (2000). Seasonal and Diurnal Trends of Chorusing Humpback Whales Wintering in Waters off Western Maui. Marine Mammal Science 16(3):530-544.

Au, W. W. L. & Pawloski, D. A. (1989). A comparison of signal detection between an echolocating dolphin and an optimal receiver. Journal of Comparative Physiology A, 164(4), 451-458.

Au, W. W. L., Floyd, R. W., Penner, R. H. & Murchison, A. E. (1974). Measurement of echolocation signals of the Atlantic bottlenose dolphin, Tursiops truncatus Montagu, in open waters. Journal of the Acoustical Society of America, 56(4), 1280-1290.

Aurioles-Gamboa, D. and F. J. Camacho-Rios. (2007). "Diet and feeding overlap of two otariids, *Zalophus californianus* and *Arctocephalus townsendi*: Implications to survive environmental uncertaintly." Aquatic Mammals 33(3): 315-326.

Aurioles, G. D. and J. Urban-Ramirez. (1993). "Sexual dimorphism in the skull of the pygmy beaked whale (*Mesoplodon peruvianus*)." Revista de Investigacion Cientifica 1: 39-52.

Awbrey, F. T., Norris, J. C., Hubbard, A. b. & Evans, W. E. (1979). The bioacoustics of the Dall porpoise-Salmon drift net interaction (pp. 1-37). San Diego: Hubbs/Sea World Research Institute.

Ayres, K. l. R. K. Booth, J. A. Hempelmann, K. L. Koski, C. K. Emmons, R. W. Baird, K. Balcomb-Bartok, M. B. Hanson, M. J. Ford, S. K. Wasser (2012). Distinguishing the Impacts of Inadequate Prey and Vessel Traffic on an Endangered Killer Whale (Orcinus orca) Population. PLoS ONE:7(6), pp 12.

Azzellino, A., S. Gaspari, S. Airoldi and B. Nani (2008). "Habitat use and preferences of cetaceans along the continental slope and the adjacent pelagic waters in the western Ligurian Sea." Deep Sea Research I 55: 296–323.

Babushina, E. S., Zaslausky, G. L. & Yurkevich, L. I. (1991). Air and underwater hearing of the northern fur seal audiograms and auditory frequency discrimination. Biofizika, 36(5), 904-907.

Bailey, H., B. R. Mate, D. M. Palacios, L. Irvine, S. J. Bograd and D. P. Costa (2009). "Behavioural estimation of blue whale movements in the Northeast Pacific from state-space model analysis of satellite tracks." Endangered Species Research 10: 93-106.

Bain, D.E. (2002). A model linking energetic effects of whale watching to killer whale (Orcinus orca) population dynamicas. Friday Harbor Laboratories, University of Washington, Friday Harbor, WA. A Report Sponsored by the Orca Relief Citizens Alliance.

Baird, R. W. (2001). "Status of harbour seals, *Phoca vitulina*, in Canada." Canadian Field-Naturalist 115(4): 663-675.

Baird, R. W. (2005). "Sightings of dwarf (Kogia sima) and pygmy (K. breviceps) sperm whales from the main Hawaiian Islands." Pacific Science 59: 461-466.

Baird, R. W. (2006). "Hawai'i's other cetaceans." Whale and Dolphin Magazine 11: 28-31.

Baird, R. W. (2008). Risso's dolphin *Grampus griseus*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen. San Diego, CA, Academic Press**:** 975-976.

Baird, R. W. (2009a). *A review of false killer whales in Hawaiian waters: Biology, status, and risk factors*. Olympia, WA, Cascadia Research Collective**:** 41.

Baird, R. W. (2009b). False killer whale *Pseudorca crassidens*. In. Encyclopedia of Marine Mammals (Second Edition). W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 405-406.

Baird, R. W. 2012. Preliminary results from photo-identification and satellite tagging of false killer whales off the island of Kauai in June 2012.

Baird, R. W. and A. M. Gorgone (2005). "False Killer Whale Dorsal Fin Disfigurements as a Possible Indicator of Long-Line Fishery Interactions in Hawaiian Waters." Pacific Science 59(4): 593-601.

Baird, R. W. and B. Hanson (1997). "Status of the northern fur seal, *Callorhinus ursinus*, in Canada." Canadian Field-Naturalist 111: 263-269.

Baird, R. W. and Hooker, S. K. (2000). Ingestion of plastic and unusual prey by a juvenile harbour porpoise. " Marine Pollution Bulletin 40(8): 719-720.

Baird, R. W., Ligon, A. D., Hooker, S. K. & Gorgone, A. M. (2001). Subsurface and nighttime behaviour of pantropical spotted dolphins in Hawai'i. *Canadian Journal of Zoology, 79*(6), 988-996.

Baird, R. W., M. B. Hanson, E. E. Ashe, M. R. Heithaus and G. J. Marshall (2003a). *Studies of Foraging in "Southern Resident" Killer Whales during July 2002: Dive Depths, Bursts in Speed, and the Use of a "Crittercam" System for Examining Sub-surface Behavior*. Seattle, WA, U.S. Department of Commerce, National Marine Fisheries Service, National Marine Mammal Laboratory**:** 18.

Baird, R. W., D. J. McSweeney, D. L. Webster, A. M. Gorgone and A. D. Ligon (2003b). Studies of odontocete population structure in Hawaiian waters: Results of a survey through the main Hawaiian Islands in May and June 2003. Seattle, WA, NOAA**:** 25.

Baird, R. W., A. M. Gorgone, D. L. Webster, D. J. McSweeney, J. W. Durban, A. D. Ligon, D. R. Salden and M. H. Deakos. 2005. False killer whales around the main Hawaiian Islands: An assessment of inter-island movements and population size using individual photo-identification (*Pseudorca crassidens*).

Report prepared under Order No. JJ133F04SE0120 from the Pacific Islands Fisheries Science Center, National Marine Fisheries Service, 2570 Dole Street, Honolulu, HI 96822. 24pgs. 2005.

Baird, R. W., M. B. Hanson and L. M. Dill. (2005a). "Factors influencing the diving behaviour of fish-eating killer whales: Sex differences and diel and interannual variation in diving rates." Canadian Journal of Zoology 83: 257-267.

Baird, R. W., D. L. Webster, D. J. McSweeney, A. D. Ligon and G. S. Schorr. (2005b). Diving behavior and ecology of Cuvier's (*Ziphius cavirostris*) and Blainville's beaked whales (*Mesoplodon densirostris*) in Hawai'i. La Jolla, CA.

Baird, R., D. McSweeney, C. Bane, J. Barlow, D. Salden, L. Antoine, R. LeDuc and D. Webster. (2006a). "Killer whales in Hawaiian waters: Information on population identity and feeding habits." Pacific Science 60(4): 523–530.

Baird, R. W., G. S. Schorr, D. L. Webster, D. J. McSweeney and S. D. Mahaffy. (2006b). Studies of beaked whale diving behavior and odontocete stock structure in Hawai'i in March/April 2006**:** 31.

Baird, R. W., D. L. Webster, D. J. McSweeney, A. D. Ligon, G. S. Schorr and J. Barlow. (2006c). "Diving behaviour of Cuvier's (*Ziphius cavirostris*) and Blainville's (*Mesoplodon densirostris*) beaked whales in Hawai'i." Canadian Journal of Zoology 84(8): 1120-1128.

Baird, R. W., D. J. McSweeney, A. D. Ligon and D. L. Webster. (2004). Tagging feasability and diving of Cuvier's beaked whales (*Ziphius cavirostris*) and Blainville's beaked whales (*Mesoplodon densirostris*) in Hawai'i. La Jolla, CA.

Baird, R. W., D. L. Webster, S. D. Mahaffy, D. J. McSweeney, G. S. Schorr and A. D. Ligon. (2008a). "Site fidelity and association patterns in a deep-water dolphin: Rough-toothed dolphins (*Steno bredanensis*) in the Hawaiian Archipelago." Marine Mammal Science 24(3): 535-553.

Baird, R.; D.L. Webster,.; G. S. Schorr, and D. J.McSweeney. (2008b). Diel variation in beaked whale diving behavior. Agency report number: NPS-OC-08-001. Prepared for U.S. Navy Chief of Naval Operations. 32 pp. Available from: http://hdl.handle.net/10945/697

Baird, R. W., A. M. Gorgone, D. J. McSweeney, A. D. Ligon, M. H. Deakos, D. L. Webster, G. S. Schorr, K. K. Martien, D. R. Salden and S. D. Mahaffy (2009a). "Population structure of island-associated dolphins: Evidence from photo-identiifcation of common bottlenose dolphins (*Tursiops truncatus*) in the main Hawaiian Islands." Marine Mammal Science 25(2): 251-274.

Baird, R. W., D. J. McSweeney, G. S. Schorr, S. D. Mahaffy, D. L. Webster, J. Barlow, M. B. Hanson, J. P. Turner and R. D. Andrews. (2009b). Studies of beaked whales in Hawai'i: Population size, movements, trophic ecology, social organization, and behaviour. In. Beaked Whale Research. S. J. Dolman, C. D. MacLeod and P. G. H. Evans, European Cetacean Society**:** 23-25.

Baird, R., G. Schorr, D. Webster, D. McSweeney, M. Hanson and R. Andrews (2010a). Movements and habitat use of Cuvier's and Blainville's beaked whales in Hawaii: results from satellite tagging in 2009/2010. C. Research. La Jolla, CA.

Baird, R. W., G. S. Schorr, D. L. Webster, D. J. McSweeney, M. B. Hanson and R. D. Andrews (2010b). "Movements and habitat use of satellite-tagged false killer whales around the main Hawaiian Islands." Endangered Species Research 10: 107-121.

Baird, R.W., D. L. Webster, G. S. Schorr, J. M. Aschettino, A. M. Gorgone, and S. D. Mahaffy (2012). "Movements and Spatial Use of Odontocetes in the Western Main Hawaiian Islands: Results from Satellite-Tagging and Photo-Identification off Kauai and Niihau in July/August 2011". Technical Report: NPS-OC-12-003CR; http://hdl.handle.net/10945/13855

Baird, R.W., M.B. Hanson, G.S. Schorr, D.L. Webster, D.J. McSweeney, A.M. Gorgone, S.D. Mahaffy, D. Holzer, E.M. Oleson and R.D. Andrews. 2012. Assessment of range and primary habitats of Hawaiian insular false killer whales: informing determination of critical habitat. Endangered Species Research 18:47-61.

Baker, A. N. and B. Madon (2007). "Bryde's whales (Balaenoptera cf. brydei Olsen 1913) in the Hauraki Gulf and northeastern New Zealand waters." Science for Conservation 272: 4-14.

Baker, J. D. (2004). "Evaluation of closed capture-recapture methods to estimate abundance of Hawaiian monk seals." Ecological Applications **14**: 987-998.

Baker, J. D. (2008). "Variation in the relationship between offspring size and survival provides insight into causes of mortality in Hawaiian monk seals." Endangered Species Research 5: 55-64.

Baker, J. D., A. L. Harting and T. C. Johanos (2006). "Use of discovery curves to assess abundance of Hawiian monk seals." Marine Mammal Science 22(4): 847-861.

Baker, J. D. and T. C. Johanos (2004). "Abundance of the Hawaiian monk seal in the main Hawaiian Islands." Biological Conservation 116(1): 103-110.

Baker, C. S., L. M. Herman, B. G. Bays and G. Bauer (1983). The impact of vessel traffic on the behavior of humpback whales in southeast Alaska: 1982 season. Honolulu, Hawaii, Kewalo Basin Marine Mammal Laboratory, University of Hawaii: 1-86.

Baker, C. S., & Herman, L. M. (1984). Aggressive behavior between humpback whales (Megaptera novaeangliae) wintering in Hawaiian waters. Canadian Journal of Zoology, 62, 1922-1937.

Balcomb, K.C. (1987). The whales of Hawaii, including all species of marine mammals in Hawaiian and adjacent waters. San Francisco: Marine Mammal Fund.

Baldwin, R. M., M. Gallagher and K. Van Waerebeek. (1999). A review of cetaceans from waters off the Arabian Peninsula. In. The Natural History of Oman: A Festschrift for Michael Gallagher. M. Fisher, S. A. Ghazanfur and J. A. Soalton, Backhuys Publishers**:** 161-189.

Ballance, L. T. and R. L. Pitman (1998). "Cetaceans of the western tropical Indian Ocean: Distribution, relative abundance, and comparisons with cetacean communities of two other tropical ecosystems." Marine Mammal Science 14(3): 429-459.

Barlow, J. (1988). Harbor porpoise, *Phocoena Phoconea*, abundacne estimation for California, Oregon, and Washington: I. Ship surveys. Fishery Bulletion: Volumn 86, No. 8.

Barlow, J. (1994). "Abundance of large whales in California coastal waters: A comparison of ship surveys in 1979/80 and in 1991." Report of the International Whaling Commision 44: 399-406.

Barlow, J. (1995). "The abundance of cetaceans in California waters. Part I: Ship surveys in summer and fall of 1991." Fishery Bulletin 93: 1-14.

Barlow, J. (1997). *Preliminary Estimates of Cetacean Abundance off California, Oregon and Washington Based on a 1996 Ship Survey and Comparisons of Passing and Closing Modes*. La Jolla, CA, Southwest Fisheries Science Center, National Marine Fisheries Service.

Barlow, J. (2003). *Cetacean Abundance in Hawaiian Waters During Summer/Fall 2002*. La Jolla, CA, Southwest Fisheries Science Center, National Marine Fisheries Service and NOAA**:** 22.

Barlow, J. (2006). "Cetacean abundance in Hawaiian waters estimated from a summer/fall survey in 2002." Marine Mammal Science 22(2): 446-464.

Barlow, J. (2010). Cetacean abundance in the California Current estimated from a 2008 ship-based line-transect survey. NOAA Technical Memorandum NMFS-SWFSC-456. National Oceanic and Atmospheric Administration.

Barlow, J. and B. L. Taylor (2001). *Estimates of Large Whale Abundance off California, Oregon, Washington, and Baja California based on 1993 and 1996 Ship Surveys*. La Jolla, CA, Southwest Fisheries Science Center, National Marine Fisheries Service and NOAA**:** 15.

Barlow, J. and B. L. Taylor (2005). "Estimates of sperm whale abundance in the northeastern temperate Pacific from a combined acoustic and visual survey." Marine Mammal Science 21(3): 429-445.

Barlow, J. & Gisiner, R. (2006). Mitigating, monitoring and assessing the effects of anthropogenic sound on beaked whales. Journal of Cetacean Research and Management, 7(3), 239-249.

Barlow, J. and K. A. Forney (2007). "Abundance and population density of cetaceans in the California Current ecosystem." Fishery Bulletin 105: 509-526.

Barlow, J., S. Rankin, E. Zele and J. Appler (2004). *Marine Mammal Data Collected During the Hawaiian Islands Cetacean and Ecosystem Assessment Survey (HICEAS) Conducted Aboard the NOAA ships McArthur and David Starr Jordan, July-December 2002*, NOAA**:** 32.

Barlow, J., M. C. Ferguson, W. F. Perrin, L. Ballance, T. Gerrodette, G. Joyce (2006). "Abundance and densities of beaked and bottlenose whales (family Ziphiidae)." Journal of Cetacean Research and Management 7(3): 263-270.

Barlow, J., S. Rankin, A. Jackson and A. Henry. (2008). *Marine Mammal Data Collected During the Pacific Islands Cetacean and Ecosystem Assessment Survey (PICEAS) Conducted Aboard the NOAA Ship McArthur II, July- November 2005*, NOAA**:** 27.

Barlow, J., M. Ferguson, E. Becker, J. Redfern, K. Forney, I. Vilchis, P. Fiedler, T. Gerrodette and L. Ballance (2009). Predictive Modeling of Cetacean Densities in the Eastern Pacific Ocean. NOAA-TM-NMFS-SWFSC-444, Southwest Fisheries Science Center, La Jolla, California.

Barlow, J. Calambokidis, J. Falcone, E. A. Baker, C. S. Burdin, A. M. Clapham, P. J. Ford, J. K. B. Gabriele, C. M. LeDuc, R. Mattila, D. K. Quinn, T. J. II Rojas-Bracho, L. Straley, J. M. Taylor, B. L. Urban, J. R. Wade, P. Weller, D. Witteveen, B. H. Yamaguchi, M. (2011). Humpback whale abundance in the North Pacific estimated by photographic capture-recapture with bias correction from simulation studies. Marine Mammal Science, 1-26.

Barros, N. B. and A. A. Myrberg (1987). "Prey detection by means of passive listening in bottlenose dolphins (Tursiops truncatus)." Journal of the Acoustical Society of America 82: S65.

Barros, N. B. and R. S. Wells (1998). "Prey and feeding patterns of resident bottlenose dolphins (*Tursiops truncatus*) in Sarasota Bay, Florida." Journal of Mammalogy 79(3): 1045-1059.

Bassett, H. R., Baumann, S., Campbell, G. S., Wiggins, S. M. & Hildebrand, J. A. (2009). Dall's porpoise (*Phocoenoides dalli*) echolocation click spectral structure. Journal of the Acoustical Society of America, 125(4), 2677-2677.

Basset, C. Thomson, J. Polagye, B. (2010). Characteristics of Underwater Ambient Noise at a Proposed Tidal Energy Site in Puget Sound. Northwest National Marine Renewable Energy Center. University of Washington.

Bauer, G. B., Fuller, M., Perry, A., Dunn, J. R. & Zoeger, J. (1985). Magnetoreception and biomineralization of magnetite in cetaceans Magnetite biomineralization and magnetoreception in organisms: a new biomagnetism (pp. 487-507).

Baumann-Pickering, S. Baldwin, L. K. Simonis, A. E. Roche, M. A. Melcon, M. L. Hildebrand, J. A. Oleson, E. M. Baird, R. W. Schorr, G. S. Webster, D. L. McSweeney, D. J. (2010). Characterization of Marine Mammal Recordings from the Hawaii Range Complex. Naval Postgraduate School, NPS-OC-10-004CR.

Baumann-Pickering, S., Simonis, A.E., Roch, M.A., McDonald, M.A., Solsona-Berga, A., Oleson, E.M., Wiggins, S.M., Brownell, R.L., Jr., Hildebrand, J.A. (2012). "Spatio-temporal patterns of beaked whale echolocation signals in the North Pacific. 2012 Marine Mammal & Biology Program Review, Office of Naval Research. Available at: http://www.onr.navy.mil/Science-Technology/Departments/Code-32/All-Programs/Atmosphere-Research-322/~/media/Files/32/MMB-Program-Review-2012.ashx

Baumgartner, M. F. (1997). "The distribution of Risso's dolphin (*Grampus griseus*) with respect to the physiography of the northern Gulf of Mexico." Marine Mammal Science 13(4): 614-638.

Bearzi, M. (2003). Behavioral ecology of the marine mammals of Santa Monica Bay, California Ph.D. dissertation, University of California at Los Angeles.

Bearzi, M. (2005a). "Aspects of the ecology and behavior of bottlenose dolphins (*Tursiops truncatus*) in Santa Monica Bay, California." Journal of Cetacean Research and Management **7**(1): 75-83.

Bearzi, M. (2005b). "Habitat partitioning by three species of dolphins in Santa Monica Bay, California." Bulletin of the Southern California Academy of Sciences 104(3): 113-124.

Bearzi, M., C. A. Saylan and A. Hwang (2009). "Ecology and comparison of coastal and offshore bottlenose dolphins (*Tursiops truncatus*) in California." Marine and Freshwater Research 60: 584-593.

Beatson, E. (2007). "The diet of pygmy sperm whales, Kogia breviceps, stranded in New Zealand: Implications for conservation." Reviews in Fish Biology and Fisheries 17: 295-303.

Becker, E.A., K.A. Forney, D.G. Foley, J. Barlow (2012). "Density and spatial distribution patterns of cetaceans in the central North Pacific based on habitat models." U.S. Department of Commerce NOAA Technical Memorandum NMFS-SWFSC-490, 34 p.

Bejder, L. Samuels, A. Whitehead, H. Gales, N. (2006). Interpreting short-term behavioural responses to disturbance within a longitudinal perspective. Animal Behaviour, 72, 1149-1158.

Belcher, R. I. and T. E. Lee, Jr. (2002). "*Arctocephalus townsendi*." Mammalian Species 700: 1-5.

Benoit-Bird, K. J. (2004). "Prey caloric value and predator energy needs: Foraging predictions for wild spinner dolphins." Marine Biology 145: 435-444.

Benoit-Bird, K. J., W. W. Au, R. E. Brainard and M. O. Lammers (2001). "Diel horizontal migration of the Hawaiian mesopelagic boundary community observed acoustically." Marine Ecology Progress Series 217: 1-14.

Benoit-Bird, K. J. and W. W. L. Au (2003). "Prey dynamics affect foraging by a pelagic predator (Stenella longirostris) over a range of spatial and temporal scales." Behavioral Ecology and Sociobiology 53: 364-373.

Benoit-Bird, K. J. and W. W. L. Au (2004). "Diel migration dynamics of an island-associated sound-scattering layer." Deep-Sea Research I 51: 707-719.

Berman-Kowalewski, M., Gulland, F. M. D., Wilkin, S., Calambokidis, J., Mate, B., Cordaro, J., . . . Dover, S. (2010). Association Between Blue Whale (<I>Balaenoptera musculus</I>) Mortality and Ship Strikes Along the California Coast. Aquatic Mammals, 36(1), 59-66. doi: 10.1578/am.36.1.2010.59

Bernaldo de Quiros, Y., Gonzalez-Diaz, O., Arbelo, M., Sierra, E., Sacchini, S. & Fernandex, A. (2012). Decompression vs. decomposition: distribution, amount, and gas composition of bubbles in stranded marine mammals. [Original Research Article]. Frontiers in Physiology, 3 Article 177, 19. 10.3389/fPhys.2012.0177.

Bernard, H. J. and S. B. Reilly (1999). Pilot whales *Globicephala* Lesson, 1828. In. Handbook of Marine Mammals. S. H. Ridgway and R. Harrison. San Diego, CA, Academic Press. 6**:** 245-280.

Berrow, S. D. & B. Holmes (1999). Tour boats and dolphins: A note on quantifying the activities of whalewatching boats in the Shannon Estuary, Ireland. *Journal of Cetacean Research and Management* 1(2): 199-204.

Berta, A., J. L. Sumich and K. M. Kovacs. (2006). *Marine Mammals: Evolutionary Biology*. Burlington, MA, Elsevier.

Berzin, A. A. and V. L. Vladimirov (1981). "Changes in abundance of whalebone whales in the Pacific and Antarctic since the cessation of their exploitation." Reports of the International Whaling Commission 31: 495-499.

Best, P. B. (1996). "Evidence of migration by Bryde's whales from the offshore population in the southeast Atlantic." Reports of the International Whaling Commission 46: 315-322.

Best, P. B., D. S. Butterworth and L. H. Rickett. (1984). "An assessment cruise for the South African inshore stock of Bryde's whales (*Balaenoptera edeni*)." Reports of the International Whaling Commission 34: 403-423.

Best, P. B. and C. H. Lockyer. (2002). "Reproduction, growth and migrations of sei whales *Balaenoptera borealis* off the west coast of South Africa in th 1960s." South African Journal of Marine Science 24: 111-133.

Best, P. B., R. A. Rademeyer, C. Burton, D. Ljungblad, K. Sekiguchi, H. Shimada, D. Thiele, D. Reeb and D. S. Butterworth. (2003). "The abundance of blue whales on the Madagascar Plateau, December 1996." Journal of Cetacean Research and Management 5(3): 253-260.

Bester, M. N., Ferguson, J. W. H. & Jonker, F. C. (2002). Population densities of pack ice seals in the Lazarev Sea, Antarctica. Antarctic Science, 14(2), 123-127.

Bjorge, A. (2002). How persistent are marine mammal habitats in an ocean of variability?. In. Marine Mammals: Biology and Conservation. P. G. H. Evans and A. Raga, Kluwer Academic/Plenum Publishers**:** 63-91.

Black, N. A. (1994). Behavior and ecology of Pacific white-sided dolphins (Lagenorhynchus obliquidens) in Monterey Bay, California Master's, San Francisco State University.

Black, N. A. (2009). Pacific white-sided dolphin *Lagenorhynchus obliquidens*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 817-819.

Blackwell, S. B., Lawson, J. W. & Williams, M. T. (2004). Tolerance by ringed seals (*Phoca hispida*) to impact pipe-driving and construction sounds at an oil production island. *Journal of the Acoustical Society of America* 115(5, Pt. 1): 2346-2357.

Bloodworth, B. and D. K. Odell (2008). "Kogia breviceps." Mammalian Species 819: 1-12.

Bloom, P. & Jager, M. (1994). The injury and subsequent healing of a serious propeller strike to a wild bottlenose dolphin (Tursiops truncatus) resident in cold waters off the Northumberland coast of England. Aquatic Mammals, 20.2, 59-64.

Boggs, C. H., Oleson, E. M., Forney, K. A., Hanson, B., Kobayashi, D. R., Taylor, B. L., . . . Ylitalo, G. M. (2010). Status Review of Hawaiian Insular False Killer Whales (Pseudorca crassidens) under the Endangered Species Act. (NOAA Technical Memorandum NMFS-PIFSC-22, pp. 140 + Appendices) U. S. Department of Commerce and National Oceanic and Atmospheric Administration.

Bowles, A. E., Smultea, M., Wursig, B., DeMaster, D. P. & Palka, D. (1994). Relative abundance and behavior of marine mammals exposed to transmissions from the Heard Island Feasibility Test. Journal of the Acoustical Society of America, 96, 2469-2484.

Boyd, I., Claridge, D., Clark, C., Southall, B. & Tyack, P. (eds). (2008). BRS 2008 Preliminary Report. US Navy NAVSEA PEO IWS 5, ONR, US Navy Environmental Readiness Division, NOAA, SERDP.

Bradford, A. L., K. A. Forney, E. M. Oleson, and J. Barlow (2012). Line-transect abundance estimates of false killer whales (*Pseudorca crassidens*) in the pelagic region of the Hawaiian Exclusive Economic Zone and in the insular waters of the Northwestern Hawaiian Islands. Pacific Islands Fisheries Science Center, National Marine Fisheries Service, NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-12-02.

Bradshaw, C. J. A. Evans, K. and Hindell, M. A. (2006). Mass Cetacean Stardings--a Plea for Empiricism. Diversity (1-3).

Brillinger, D. R., B. S. Stewart and C. S. Littnan. (2006). A meandering *hylje**. In Festschrift for Tarmo Pukkila on his 60th Birthday. E. P. Liski, J. Isotalo, J. Niemelä, S. Puntanen and G. P. H. Styan. Finland, Dept. of Mathematics, Statistics and Philosophy, University of Tampere**:** 79-92.

Brownell Jr, R. L., K. Ralls, S. Baumann-Pickering and M. M. Poole. (2009). "Behavior of melon-headed whales, Peponocephala electra, near oceanic islands." Marine Mammal Science 25(3): 639-658.

Brownell Jr., R. L., Clapham, P. J., Miyashita, T. and Kasuya, T. (2001). Conservation status of North Pacific right whales. *Journal of Cetacean Research and Management* Special Issue 2: 269-286.

Brownell, R. L., Jr., W. A. Walker and K. A. Forney. (1999). Pacific white-sided dolphin Lagenorhynchus obliquidens Gill, 1865. In: Handbook of Marine Mammals. S. H. Ridgway and R. Harrison, Academic Press. 6: The second book of dolphins and the porpoises: 57-84.

Bryant, P.J., C. M. Lafferty, and S. K. Lafferty. (1984). Reoccupation of Laguna Guerrero Negro, Baja California, Mexico, by gray whales. In: M.L. Jones, S.L. Swartz and S. Leatherwood (eds.), The Gray Whale, Eschrichtius robustus. Academic Press, pp. 375-87.

Buckland, S.T., D.R. Anderson, K.P Burnham, J.L. Laake, D.L. Borchers, and L. Thomas. (2001). Introduction to distance sampling: Estimating abundance of biological populations. Oxford University Press, Oxford.

Bull, J. C., Jepson, P. D., Ssuna, R. K., Deaville, R., Allchin, C. R., Law, R. J. & Fenton, A. (2006). The relationship between polychlorinated biphenyls in blubber and levels of nematode infestations in harbour porpoises, *Phocoena phocoena*. *Parasitology, 132*, 565-573. doi:10.1017/S003118200500942X.

Burn, D., & Doroff, A. (2005). Decline in sea otter (Enhydra lutris) populations along the Alaska Peninsula, 1986-2001. Fishery Bulletin, 103(2), 270-279.

Burns, J. J. (2008). Harbor seal and spotted seal *Phoca vitulina* and *P. largha*. In. Encyclopedia of Marine Mammals (Second Edition). W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 533-542.

Calambokidis, J. (2009). Symposium on the results of the SPLASH humpback whale study: Final Report and Recomm*endations*: 68.

Calambokidis, J. (2012). Summary of ship-strike related research on blue whales in 2011. Manuscript on file: 9.

Calambokidis, J., G. H. Steiger, J. M. Straley, S. Cerchio, D. R. Salden, J. R. Urban, J. K. Jacobsen, O. von Ziegesar, K. C. Balcomb, C. M. Gabriele, M. E. Dahlheim, S. Uchida, G. Ellis, Y. Miyamura, P. Ladron De Guevara, M. Yamaguchi, F. Sato, S. A. Mizroch, L. Schlender, K. Rasmussen, J. Barlow and T. J. Quinn II (2001). "Movements and population structure of humpback whales in the North Pacific." Marine Mammal Science 17(4): 769-794.

Calambokidis, J. and J. Barlow (2004). "Abundance of blue and humpback whales in the eastern North Pacific estimated by capture-recapture and line-transect methods." Marine Mammal Science **20**(1): 63-85.

Calambokidis, J., J.D. Darling, V. Deecke, P. Gearin, M. Gosho, W. Megill, C.M. Tombach, D. Goley, C. Toropova, & B. Gisborne (2002). Abundance, range and movements of a feeding aggregation of gray whales (*Eschrichtius robustus*) from California to southeastern Alaska in 1998*. Journal of Cetacean Research and Management,* 4(3), 267-276.

Calambokidis, J., T. Chandler, E. Falcone and A. Douglas (2004). Research on large whales off California, Oregon, and Washington in 2003. Annual Report for 2003. La Jolla, California.

Calambokidis, J., E.A. Falcone, T.J. Quinn, A.M. Burdin, P.J. Clapham, J.K.B. Ford, C.M. Gabriele, R. LeDuc, D. Mattila, L. Rojas-Bracho, J.M. Straley, B.L. Taylor, J. Urban R., D. Weller, B.H. Witteveen, M. Yamaguchi, A. Bendlin, D. Camacho, K. Flynn, A. Havron, J. Huggins, N. Maloney, J. Barlow, and P.R. Wade (2008). SPLASH: Structure of Populations, Levels of Abundance and Status of Humpback Whales in the North Pacific. Final report for Contract AB133F-03-RP-00078 prepared by Cascadia Research for U.S. Dept of Commerce.

Calambokidis, J., Falcone, E., Douglas, A., Schlender, L. & Huggins, J. (2009a). Photographic identification of humpback and blue whales off the US West Coast: Results and updated abundance estimates from 2008 field season [Final Report]. (Contract AB133F08SE2786, pp. 18). La Jolla, CA: U. S. Department of Commerce. Prepared by Cascadia Research Collective. Prepared for National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Calambokidis, J., J. Barlow, et al. (2009b). "Insights into the population structure of blue whales in the Eastern North Pacific from recent sightings and photographic identification." Marine Mammal Science 25(4): 816-832.

Calambokidis, J., J.L. Laake and A. Klimek (2010). Abundance and population structure of seasonal gray whales in the Pacific Northwest, 1998 - 2008. Paper IWC/62/BRG32 submitted to the International Whaling Commission Scientific Committee. 50 pp.

Caldwell, D. K. and M. C. Caldwell (1989). Pygmy sperm whale *Kogia breviceps* (de Blainville, 1838): Dwarf sperm whale *Kogia simus* Owen, 1866. In. Handbook of Marine Mammals. S. H. Ridgway and R. Harrison. San Diego, CA, Academic Press. 4: 234-260.

California Department of Transportation (2001). Pile Installation Demonstration Project (PIDP)- Marine Mammal Impact Assessment. San Francisco – Oakland Bay Bridge East Span Seismic Safety Project.

California Department of Transportation (2009). Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. February 2009.

Camargo, F. S. & Bellini, C. (2007). Report on the collision between a spinner dolphin and a boat in the Fernando de Noronha Archipelago, Western Equatorial Atlantic, Brazil. Biota Neotropica, 7(1), 209-211.

Canadas, A., R. Sagarminaga and S. Garcia-Tiscar. (2002). "Cetacean distribution related with depth and slope in the Mediterranean waters off southern Spain." Deep Sea Research I 49: 2053-2073.

Canese, S., A. Cardinali, C. M. Foruntа, M. Giusti, G. Lauriano, E. Salvati and S. Greco (2006). "The first identified winter feeding ground of fin whales (Balaenoperta physalus) in the Mediterranean Sea." Journal of the Marine Biological Association of the United Kingdom 86(4): 903-907.

Carrera, M. L., Favaro, E. G. P. & Souto, A. (2008). The response of marine tucuxis (*Sotalia fluviatilis*) towards tourist boats involves avoidance behaviour and a reduction in foraging. *Animal Welfare, 17*, 117-123.

Carretta, J. V., Lynn, M. S. & LeDuc, C. A. (1994). Right Whale (Eubalaena Glacialis) Sighting Off San Clemente Island, California. Marine Mammal Science, 10(1), 101-105.

Carretta, J. V., Forney, K. A. & Barlow, J. (1995). Report of 1993-1994 marine mammal aerial surveys conducted within the U.S. Navy Outer Sea Test Range off southern California. (NOAA Technical Memorandum NMFS-SWFSC 217, pp. 90).

Carretta, J. V., K. A. Forney and J. L. Laake. (1998). "Abundance of Southern California coastal bottlenose dolphins estimated from tandem aerial surveys." Marine Mammal Science 14(4): 655-675.

Carretta, J. V., M. S. Lowry, C. E. Stinchcomb, M. S. Lynne and R. E. Cosgrove. (2000). Distribution and abundance of marine mammals at San Clemente Island and surrounding offshore waters: Results from aerial and ground surveys in 1998 and 1999. La Jolla, CA, NOAA: Southwest Fisheries Science Center**:** 43.

Carretta, J. V., T. Price, D. Petersen and R. Read. (2005). "Estimates of marine mammal, sea turtle, and seabird mortality in the California drift gillnet fishery for swordfish and thresher shark, 1996-2002." Marine Fisheries Review 66(2): 21-30.

Carretta, J. V. & J. Barlow (2008). Acousitc pingers eliminate beaked whale bycatch in a gill net fishery. Marine Mammal Science, 24(4): 956-961.

Carretta, J. V., K. A. Forney, M. S. Lowry, J. Barlow, J. Baker, D. Johnston, B. Hanson, M. M. Muto, D. Lynch and L. Carswell. (2009). *U.S. Pacific Marine Mammal Stock Assessments: 2009*. Silver Spring, MD, NOAA**:** 341.

Carretta, J. V., K. A. Forney, M. S. Lowry, J. Barlow, J. Baker, D. Johnston, B. Hanson, R. L. Brownell, Jr., J. Robbins, D. Mattila, K. Ralls, M. M. Muto, D. Lynch and L. Carswell. (2010). *U.S. Pacific Marine*

Mammal Stock Assessments: 2009. La Jolla, CA, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center**:** 336.

Carretta, J. V., K. A. Forney, E. Oleson, K. Martien, M. M. Muto, M. S. Lowry, J. Barlow, J. Baker, B. Hanson, D. Lynch, L. Carswell, R. L. Brownell, J. Robbins, D. K. Mattila, K. Ralls and M. C. Hill. (2011). *U.S. Pacific Marine Mammal Stock Assessments: 2010*. La Jolla, CA, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center**:** 352.

Carretta, J.V., K.A. Forney, E. Oleson, K. Martien, M.M. Muto, M.S. Lowry, J. Barlow, J. Baker, B. Hanson, D. Lynch, L. Carswell, R.L. Brownell Jr., J. Robbins, D.K. Mattila, K. Ralls, & Marie C. Hill. (2012). U.S. Pacific Marine Mammal Stock Assessments: 2011. U.S. Department of Commerce, NOAA Technical Memorandum, NMFS-SWFSC-488.

Carretta, J.V., E. Oleson, D.W. Weller, A.R. Lang, K.A. Forney, J. Baker, B. Hanson, K. Martien, M.M. Muto, M.S. Lowry, J. Barlow, D. Lynch, L. Carswell, R.L. Brownell Jr., D.K. Mattila, K. Ralls, & Marie C. Hill (2013). *U.S. Pacific Marine Mammal Stock Assessments: 2012*. U.S. Department of Commerce, NOAA Technical Memorandum, NMFS-SWFSC-504.

Carswell, L. (2013). Personal communication, email from USFWS to Navy (Kelly Ebert) on 12 Feb 2013 regarding sea otter counts in Southern California. Communication on file.

Cascadia Research. (2008). *An update on our December 2008 Hawai'i field work*, Cascadia Research,. 2010.

Cascadia Research. (2010). *Hawai'i's false killer whales*, Cascadia Research. 2010.

Cascadia Research. (2012a). *An update on our June/July 2012 Kaua'i field work,* Cascadia Research Collective. http://www.cascadiaresearch.org/hawaii/july2011.htm

Cascadia Research. (2012b). Beaked Whales in Hawai'I, Cascadia Research. http://www.cascadiaresearch.org/hawaii/beakedwhales.htm

Cassoff, R.M., K.M. Moore, W.A. McLellan, S.G. Barco, D.S. Rotstein, and M.J. Moore. (2011). Lethal entanglement in baleen whales. Diseases of Aquatic Organisms. Vol. 96: 175 – 185. doi: 10.3354/dao02385. Available from: http://darchive.mblwhoilibrary.org:8080/handle/1912/4879.

Cetacean and Turtle Assessment Program. (1982). "A Characterization of Marine Mammals and Turtles in the Mid- and North Atlantic Areas of the U.S. Outer Continental Shelf." 540.

Chivers, S. J., R. W. Baird, K. M. Martien, B. L. Taylor, E. Archer, A. M. Gorgone, B. L. Hancock, N. M. Hedrick, D. Matilla, D. J. McSweeney, E. M. Oleson, C. L. Palmer, V. Pease, K. M. Robertson, J. Robbins, J. C. Salinas, G. Schorr, M. Schultz, J. L. Thieleking and D. L. Webster (2010). "Evidence of genetic differentiation for Hawaii insular false killer whales (Pseudorca crassidens)." NOAA Technical Report NMFS NOAA-TM-NMFS-SWFSC-458: 49.

Chivers, S. J., R. W. Baird, D. J. McSweeney, D. L. Webster, N. M. Hedrick and J. C. Salinas (2007). "Genetic variation and evidence for population structure in eastern North Pacific false killer whales (*Pseudorca crassidens*)." Canadian Journal of Zoology 85: 783-794.

Christiansen, F., Lusseau, D., Stensland, E. & Berggren, P. (2010). Effects of tourist boats on the behaviour of Indo-Pacific bottlenose dolphins off the south coast of Zanzibar. *Endangered Species Research* 11: 91-99.

Clapham, P. J. (2000). The humpback whale: seasonal feeding and breeding in a baleen whale. In. Cetacean Societies: Field Studies of Dolphins and Whales. J. Mann, R. C. Connor, P. L. Tyack and H. Whitehead, University of Chicago Press**:** 173-196.

Clapham, P. J. and D. K. Mattila (1990). "Humpback whale songs as indicators of migration routes." Marine Mammal Science 6(2): 155-160.

Clapham, P. J. and J. G. Mead (1999). "Megaptera novaeangliae." Mammalian Species 604: 1-9.

Claridge, D. & Durban, J. (2009). Abundance and movement patterns of Blainville's beaked whales at the Atlantic undersea test and evaluation center (AUTEC). Presented at the 2009 ONR Marine Mammal Program Review, Alexandria, VA.

Clark, S. L. & Ward, J. W. (1943). The Effects of Rapid Compression Waves on Animals Submerged In Water. Surgery, Gynecology & Obstetrics, 77, 403-412.

Clark, C. W. & Fristrup, K. M. (2001). Baleen whale responses to low-frequency human-made underwater sounds. [Abstract Only]. *Journal of the Acoustical Society of America, 110*(5), 2751.

Clark, L. S., Cowan, D. F. & Pfeiffer, D. C. (2006). Morphological changes in the Atlantic bottlenose dolphin (Tursiops truncatus) adrenal gland associated with chronic stress. Journal of Comparative Pathology, 135, 208-216.

Clark, C. W., W. T. Ellison, B. L. Southall, L. Hatch, S. M. Van Parijs, A. Frankel, D. Ponirakis (2009). Acoustic Masking in Marine Ecosystems: Intuitions, Analysis, and Implication. Marine Ecology Progress Series 395: 201-222.

Clarke, M. R. (1996). "Cephalopods as prey. III. Cetaceans." Philosophical Transactions of the Royal Society of London 351: 1053-1065.

Costa, D. P. & Block, B. (2009). Use of electronic tag data and associated analytical tools to identify and predict habitat utilization of marine predators. In Marine Mammals & Biological Oceanography Annual Reports: FY09. (pp. 9) Office of Naval Research.

Costa, D. P., Crocker, D. E., Gedamke, J., Webb, P. M., Houser, D. S., Blackwell, S. B., . . . Le Boeuf, B. J. (2003). The effect of a low-fequency sound source (acoustic thermometry of the ocean climate) on the diving behavior of juvenile northern elephant seals, Mirounga angustirostris. Journal of the Acoustical Society of America, 113, 1155-1165.

Cowan, D. F. and Curry, B. E. (2008). Histopathology of the Alarm Reaction in Small Odontocetes. Science Direct. J. Comp. Path. 2008,139, 24-133.

Cox, T., Ragen, T., Read, A., Vox, E., Baird, R., Balcomb, K., . . . Benner, L. (2006). Understanding the impacts of anthropogenic sound on beaked whales. Journal of Cetacean Research and Management, 7(3), 177-187.

Craig Jr., J. C. (2001). Appendix D, Physical Impacts of Explosions on Marine Mammals and Turtles Final Environmental Impact Statement, Shock Trial of the WINSTON CHURCHILL (DDG 81) (Final, pp. 43). U.S. Department of the Navy, Naval Sea Systems Command (NAVSEA).

Craig, J. C. & C. W. Hearn (1998). Physical Impacts of Explosions On Marine Mammals and Turtles. Final Environmental Impact Statement, Shock Testing the SEAWOLF Submarine. Department of the Navy. North Charleston, South Carolina, U.S. Department of the Navy, Southern Division, Naval Facilities Engineering Command: 43.

Craig, A. S. and L. M. Herman (2000). "Habitat preferences of female humpback whales Megaptera novaeangliae in the Hawaiian Islands are associated with reproductive status." Marine Ecology Progress Series 193: 209-216.

Croll, D. A., C. W. Clark, J. Calambokidis, W. T. Ellison and B. R. Tershy (2001). "Effect of anthropogenic low-frequency noise on the foraging ecology of Balaenoptera whales." Animal Conservation 4(PT1): 13-27.

Crum, L. A. & Mao, Y. (1996). Acoustically enhanced bubble growth at low frequencies and its implications for human diver and marine mammal safety. *Journal of the Acoustical Society of America, 99*(5), 2898-2907.

Crum, L., Bailey, M., Guan, J., Hilmo, P., Kargl, S. & Matula, T. (2005). Monitoring bubble growth in supersaturated blood and tissue ex vivo and the relevance to marine mammal bioeffects. Acoustics Research Letters Online, 6(3), 214-220. 10.1121/1.1930987

Culik, B. M. (2002). Review on Small Cetaceans: Distribution, Behaviour, Migration and Threats *United Nations Environment Programme, Convention on Migratory Species*. (pp. 343) Marine Mammal Action Plan/Regional Seas Reports and Studies No. 177.

Cummings, W. C. (1985). Bryde's whale *Balaenoptera edeni* Anderson, 1878. In. Handbook of Marine Mammals. S. H. Ridgway and R. Harrison. San Diego, CA, Academic Press. 3**:** 137-154.

Czech-Damal, N. U., Liebschner, A., Miersch, L., Klauer, G., Hanke, F. D., Marshall, C., . . . Hanke, W. (2011). Electroreception in the Guiana dolphin (Sotalia guianensis). Proceedings of the Royal Society B: Biological Sciences. 10.1098/rspb.2011.1127 Retrieved from http://rspb.royalsocietypublishing.org/content/early/2011/07/21/rspb.2011.1127.abstract

D'Amico, A., Gisiner, R., Ketten, D., Hammock, J., Johnson, C., Tyack, P., Mead, J. (2009). "Beaked Whale Strandings and Naval Exercises." Aquatic Mammals 35(4): 452-472.

D'Spain, G.L., and H.H. Batchelor (2006). Observations of biological choruses in the Southern California Bight: A chorus at midfrequencies. Journal of the Acoustical Society of America, 120(4):1942-1955.

D'Vincent, C. G., R. M. Nilson and R. E. Hanna. (1985). "Vocalization and coordinated feeding behavior of the humpback whale in southeastern Alaska." Scientific Reports of the the Whales Research Institute 36: 41-47.

Dahlheim, M. E. and J. E. Heyning. (1999). Killer whale *Orcinus orca* (Linnaeus, 1758). In. Handbook of Marine Mammals. S. H. Ridgway and R. Harrison. San Diego, CA, Academic Press. 6**:** 281-322.

Dahlheim, M. E., A. Schulman-Janiger, N. Black, R. Ternullo, D. Ellifrit and K. C. Balcomb Iii. (2008). "Eastern temperate North Pacific offshore killer whales (*Orcinus orca*): Occurrence, movements, and insights into feeding ecology." Marine Mammal Science 24(3): 719-729.

Dahlheim, M. E., A. Schulman-Janiger, N. Black, R. Ternullo, D. Ellifrit and K. C. Balcomb Iii. (2009). "Cetaceans of southeast Alaska: Distribution and seasonal occurrence." Journal of Biogeography 36: 410-426.

Dalebout, M. L., J. G. Mead, C. S. Baker, A. N. Baker and A. L. van Helden. (2002). "A new species of beaked whale *Mesoplodon perrini* sp. n. (Cetacea: Ziphiidae) discovered through phylogenetic analyses of mitochondrial DNA sequences." Marine Mammal Science 18(3): 577-608.

Dalebout, M. L., G. J. B. Ross, C. S. Baker, R. C. Anderson, P. B. Best, V. G. Cockcroft, H. L. Hinsz, V. M. Peddemors and R. L. Pitman. (2003). "Appearance, distribution and genetic distinctiveness of Longman's beaked whale, *Indopacetus pacificus*." Marine Mammal Science 19(3): 421-461.

Danil, K. (2006). Sea Otter at NASNI - Necropsy Results. Personal communication via email from K. Danil (National Oceanic and Atmospheric Administration) to T. Conkle (U.S. Navy, Commander Navy Region Southwest) on 15 June 2006.

Danil, K. & St. Ledger, J. A. (2011). Seabird and dolphin mortality associated with underwater detonation exercises. Marine Technology Society Journal, 45(6), 89-95.

Davis, R. W., T. M. Williams and F. T. Awbrey (1988). Sea Otter Oil Spill Avoidance Study, Minerals Management Service: 76.

Davis, R. W., G. S. Fargion, N. May, T. D. Leming, M. Baumgartner, W. E. Evans, L. J. Hansen and K. Mullin (1998). "Physical habitat of cetaceans along the continental slope in the north-central and western Gulf of Mexico." Marine Mammal Science 14(3): 490-507.

Davis, R. W., W. E. Evans and B. Wursig (2000). *Cetaceans, Sea Turtles and Seabirds in the Northern Gulf of Mexico: Distribution, Abundance and Habitat Associations. Volume II: Technical report*. New Orleans, LA, U.S. Department of the Interior, Geological Survey, Biological Resources Division, and Minerals Management Service, Gulf of Mexico OCS Region**:** 346.

Davis, R. W., N. Jaquet, D. Gendron, U. Markaida, G. Bazzino and W. Gilly (2007). "Diving behavior of sperm whales in relation to behavior of a major prey species, the jumbo squid, in the Gulf of California, Mexico." Marine Ecology Progress Series 333: 291-302.

DeAngelis, M (2013). Personal communication, email from De Angliss (NMFS Southwest Region), to Navy (Chip Johnson) regarding Guadalupe fur seal. Communication on file.

DeRuiter, S.L., B.L. Southall, J. Calambokidis, W.M.X. Zimmer, D. Sadykova, E.A. Falcone, A.S. Friedlaender, J.E. Joseph, D. Moretti, G.S. Schorr, L. Thomas, and P.L Tyack (2013). First direct measurements of behavioural responses by Cuvier's beaked whales to mid-frequency active sonar. *Biology Letters* , 9(4):1-5.

de Stephanis, R. & Urquiola (2006). Collisions between ships and cetaceans in Spain. Conservation Information and Research on Cetaceans, 6.

Deecke, V. B., Slater, P. J. B. & Ford, J. K. B. (2002). Selective habituation shapes acoustic predator recognition in harbour seals. Nature, 420(14 November), 171-173.

Defran, R. H. and D. W. Weller (1999). "Occurrence, distribution, site fidelity, and school size of bottlenose dolphins (Tursiops truncatus) off San Diego, California." Marine Mammal Science 15(2): 366-380.

Dennison, S. Moore, M. J. Fahlman, K. M. Sharp, S. Harry, C. T. Hoppe, J. Niemeyer, M. Lentell, B. Wells, R. S. (2011). Bubbles in live-stranded dolphins. Biological Sciences Proceedings of The Royal Society, doi: 10.1098/rspb.2011.1754

Derraik, J. G. B. (2002). The pollution of the marine environment by plastic debris: A review. Marine Pollution Bulletin, 44, 842-852.

Dizon, A. E., W. F. Perrin and P. A. Akin (1994). Stocks of dolphins (*Stenella spp*. and *Delphinus delphis*) in the eastern tropical Pacific: A phylogeographic classification, NOAA**:** 20

Dohl, T. P., R. C. Guess, M. L. Duman and R. C. Helm. (1983). Cetaceans of central and northern California, 1980-1983: status, abundance, and distribution**:** 298.

Dolar, M. L. L. (2008). Fraser's dolphin *Lagenodelphis hosei*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Würsig and J. G. M. Thewissen. San Diego, CA, Academic Press**:** 485-487.

Dolman, S.J., M.P. Simmonds, and S.Keith. (2003). Marine wind famrs and cetaceans. Whale and Dolphin Conservation Society.

Donahue, M. A. and W. L. Perryman. (2008). Pygmy killer whale Feresa attenuata. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Würsig and J. G. M. Thewissen. San Diego, CA, Academic Press: 938-939.

Donohue, M. J. and D. G. Foley. (2007). "Remote sensing reveals links among the endangered Hawaiian monk seal, marine debris and El Niño." Marine Mammal Science 23(2): 468–473.

Donovan, G. P. (1991). "A review of IWC stock boundaries." Reports of the International Whaling Commission Special Issue 13: 39-68.

Doucette, G. J., A. D. Cembella, J. L. Martin, J. Michaud, T. V. N. Cole and R. M. Rolland. (2006). "Paralytic shellfish poisoning (PSP) toxins in North Atlantic right whales *Eubalaena glacialis* and their zooplankton prey in the Bay of Fundy, Canada." Marine Ecology Progress Series 306: 303-313.

Douglas, A. B. Calambokidis, J. Raverty, S. Jeffries, S. J. Lambourn, D. M. Norman, S. A. (2008). Incidence of ship strikes of large whales in Washington State. Journal of the Marine Biological Association of the United Kingdom, 88(6), 1121-1132.

Doyle, L. R. McCowan, B. Hanser, S. F. Chyba, C. Bucci, T. Blue, J. E. (2008). Applicability of Information Theory to the Quantification of Responses to Anthropogenic Noise by Southeast Alaskan Humpback Whales. Entropy 2008, 10, 33-46.

Dudzik, K. J., K. M. Baker and D. W. Weller. (2006). Mark-recapture abundance estimate of California coastal stock bottlenose dolphins: February 2004 to April 2005. La Jolla, CA, NOAA: Southwest Fisheries Center**:** 15.

Dunphy-Daly, M. M., M. R. Heithaus and D. E. Claridge. (2008). "Temporal variation in dwarf sperm whale (Kogia sima) habitat use and group size off Great Abaco Island, Bahamas." Marine Mammal Science 24(1): 171-182.

Edds-Walton, P. L. (1997). Acoustic Communication Signals of Mysticete Whales. Bioacoustics The International Journal of Animal Sound and its Recording, 8, 47-60.

Efroymson, R. A., W H. Rose, and G. W. Suter II. (2001). Ecological Risk Assessment Framework for Low-altitude Overflights by Fixed-Wing and Rotary-Wing Military Aircraft. Oak Ridge National Laboratory, ORNL/TM-2000/289; ES-5048.

Elfes, C., VanBlaricom, G. R., Boyd, D., Calambokidis, J., Clapham, P., Pearce, R., . . . Krahn, M. (2010). Geographic Variation of Persistent Organic Pollutant Levels in Hampback Whale (Megaptera Novaeangliae) Feeding Areas of the North Pacific and North Atlantic. Environmental Toxicology and Chemistry, 29(4), 824-834. 10.1002/etc. 110.

Engelhard, G. H., Brasseur, S. M. J. M., Hall, A. J., Burton, H. R. & Reijnders, P. J. H. (2002). Adrenocortical responsiveness in southern elephant seal mothers and pups during lactation and the effect of scientific handling. *Journal of Comparative Physiology – B, 172*, 315–328.

Engelhard, J., C. V. Löhr, J. Rice, and D. Duffield. 2012. Retrospective Analyses of Marine Mammal Strandings on the Oregon Coast. Poster Presentations Oregon State University http://ir.library.oregonstate.edu/xmlui/handle/1957/29416

Englund, A. & P. Berggren. (2002). The Impact of Tourism on Indo-Pacific Bottlenose Dolphins (*Tursiops aduncus*) in Menai Bay, Zanzibar, International Whaling Commission.

Environmental Sciences Group. (2005). CFMETR Environmental Assessment Update 2005. (RMC-CCE-ES-05-21, pp. 652). Kingston, Ontario: Environmental Sciences Group, Royal Military College.

Erbe, C. (2002). Underwater Noise of Whale-Watching Boats and Potential Effects on Killer Whales (Orcinus Orca), Based on an Acoustic Impact Model. Marine Mammal Science, 18(2), 394-418.

Erbe, C. (2000). Detection of whale calls in noise: Performance comparison between a beluga whale, human listeners, and a neural network. Journal of the Acoustical Society of America, 108(1), 297-303.

Erbe C., A. MacGillivray, and R. Williams (2012). Mapping cumulative noise from shipping to inform marine spatial planning. *Journal of the Acoustical Society of America*, 132(5): 423-428.

Ersts, P. J. and H. C. Rosenbaum. (2003). "Habitat preference reflects social organization of humpback whales (Megaptera novaeangliae) on a wintering ground." Journal of Zoology, London 260: 337-345.

Eskesen, I. G., Teilmann, J., Geertsen, B. M., Desportes, G., Riget, F., Dietz, R., . . . Siebert, U. (2009). Stress level in wild harbour porpoises (Phocoena phocoena) during satellite tagging measured by respiration, heart rate and cortisol. Journal of the Marine Biological Association of the United Kingdom, 89(5), 885–892.

Estes, J. A., J. L. Bodkin and M. Ben-David. (2009). Otters, marine. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 807-816.

Etnier, M. A. (2002). "Occurrence of Guadalupe fur seals (*Arctocephalus townsendi*) on the Washington coast over the past 500 years." Marine Mammal Science 18(2): 551-557.

Evans, W. E. (1994). Common dolphin, white-bellied porpoise--*Delphinus delphis* Linnaeus, 1758. In. Handbook of Marine Mammals. Volume 5: The First Book of Dolphins. S. H. Ridgway and R. Harrison. New York, Academic Press**:** 191-224.

Evans, P. G. H. & Miller, L. A. (2003). Proceedings of the workshop on active sonar and cetaceans European cetacean society newsletter, No. 42 - Special Issue. Las Palmas, Gran Canaria.

Fahlman, A., Olszowka, A., Bostrom, B. & Jones, D. R. (2006). Deep diving mammals: Dive behavior and circulatory adjustments contribute to bends avoidance. Respiratory Physiology and Neurobiology, 153, 66-77.

Fair, P. A., Adams, J., Mitchum, G., Hulsey, T. C., Reif, J. S., Houde, M., . . . Bossart, G. D. (2010). Contaminant blubber burdens in Atlantic bottlenose dolphins (*Tursiops truncatus*) from two southeastern US estuarine areas: Concentrations and patterns of PCBs, pesticides, PBDEs, PFCs, and PAHs. *Science of the Total Environment, 408*, 1577-1597. doi:10.1016/j.scitotenv.2009.12.021

Falcone, E., G. Schorr, A. Douglas, J. Calambokidis, E. Henderson, M. McKenna, J. Hildebrand and D. Moretti. (2009). "Sighting characteristics and photo-identification of Cuvier's beaked whales (*Ziphius cavirostris*) near San Clemente Island, California: A key area for beaked whales and the military?" Marine Biology 156: 2631-2640.

Fauquier, D. A., Kinsel, M. J., Dailey, M. D., Sutton, G. E., Stolen, M. K., Wells, R. S. & Gulland, F. M. D. (2009). Prevalence and pathology of lungworm infection in bottlenose dolphins *Tursiops truncatus* from southwest Florida. *Diseases Of Aquatic Organisms, 88*, 85-90. doi: 10.3354/dao02095.

Felix, F., and K. van Waerebeek (2005). Whale mortality from ship strikes in Ecuador and Wwest Africa. Latin American Journal of Aquatic Mammals: 4(1) 55 – 60. January/June. e-ISSN 2236-1057 - doi:10.5597/lajam00070 Retrieved from: http://dx.doi.org/10.5597/lajam00070.

Ferguson, M. C. (2005). *Cetacean Population Density in the Eastern Pacific Ocean: Analyzing Patterns With Predictive Spatial Models* Ph.D., University of California, San Diego.

Ferguson, M. C., J. Barlow, P. Feidler, S. B. Reilly and T. Gerrodette. (2006a). "Spatial models of delphinid (family Delphinidae) encouter rate and group size in the eastern Pacific Ocean." Ecological Modelling 193: 645-662.

Ferguson, M. C., J. Barlow, S. B. Reilly and T. Gerrodette. (2006b). "Predicting Cuvier's (*Ziphius cavirostris*) and *Mesoplodon* beaked whale population density from habitat characteristics in the eastern tropical Pacific Ocean." Journal of Cetacean Research and Management 7(3): 287-299.

Ferguson, M. C., J. Barlow, T. Gerrodette and P. Fiedler. (2001). Meso-scale patterns in the density and distribution of ziphiid whales in the eastern Pacific Ocean. Fourteenth Biennial Conference on the Biology of Marine Mammals, Vancouver, British Columbia.

Fernandez, A., Edwards, J., Rodriguez, F., Espinosa De Los Monteros, A., Herraez, P., Castro, P., . . . Arbelo, M. (2005). "Gas and Fat Embolic Syndrome" Involving a Mass Stranding of Beaked Whales (Family Ziphiidae) Exposed to Anthropogenic Sonar Signals. Veterinary Pathology, 42(4), 446-457.

Ferrero, R. C. and W. A. Walker. (1996). "Age, growth, and reproductive patterns of the Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) taken in high seas drift nets in the central North Pacific Ocean." Canadian Journal of Zoology 74: 1673-1687.

Ferrero, R. C. and W. A. Walker (1999). "Age, growth, and reproductive patterns of Dall's porpoise (*Phocoenoides dalli*) in the central North Pacific Ocean." Marine Mammal Science **15**(2): 273-313.

Ferguson, M. C., J. Barlow, T. Gerrodette and P. Fiedler (1996). "A report of killer whales (*Orcinus orca*) feeding on a carcharhinid shark in Costa Rica." Marine Mammal Science 12(4): 606-611.

Finneran, J. J. & Schlundt, C. E. (2004). Effects of intense pure tones on the behavior of trained odontocetes [Technical Report]. (Vol. TR 1913). San Diego, CA: SSC San Diego.

Finneran, J. J. & C. E. Schlundt (2009). Auditory Weighting Functions and Frequency-Dependent Effects of Sound in Bottlenose Dolphins (*Tursiops truncatus*). Alexandria, Virginia, 2009 ONR Marine Mammal Program Review.

Finneran, J. J. & Schlundt, C. E. (2010). Frequency-dependent and longitudinal changes in noise-induced hearing loss in a bottlenose dolphin (Tursiops truncatus). Journal of the Acoustical Society of America, 128(2), 567-570. 10.1121/1.3458814.

Finneran, J. J. and C. E. Schlundt (2011). Subjective loudness level measurements and equal loudness contours in a bottlenose dolphin (*Tursiops truncatus*). *Journal of the Acoustical Society of America* (in review).

Finneran, J. J., Schlundt, C. E., Carder, D. A., Clark, J. A., Young, J. A., Gaspin, J. B. & Ridgway, S. H. (2000). Auditory and behavioral responses of bottlenose dolphins (Tursiops truncatus) and a beluga whale (Delphinapterus leucas) to impulsive sounds resembling distant signatures of underwater explosions. Journal of Acoustical Society of America, 108(1), 417-431.

Finneran, J. J., Carder, D. A. & Ridgway, S. H. (2001). Temporary threshold shift (TTS) in bottlenose dolphins (Tursiops truncatus) exposed to tonal signals. Journal of the Acoustical Society of America, 110(5), 2749(A).

Finneran, J. J., Schlundt, C. E., Dear, R., Carder, D. A. & Ridgway, S. H. (2002). Temporary Shift in Masked Hearing Thresholds in Odontocetes After Exposure to Single Underwater Impulses from a Seismic Watergun. Journal of the Acoustical Society of America, 111(6), 2929-2940.

Finneran, J. J., Carder, D. A., Dear, R., Belting, T. & Ridgway, S. H. (2003). Pure-tone audiograms and hearing loss in the white whale (Delphinapterus leucas). Journal of the Acoustical Society of America, 114, 2434(A).

Finneran, J. J., Dear, R., Carder, D. A., Belting, T., McBain, J., Dalton, L. & Ridgway, S. H. (2005). Pure Tone Audiograms and Possible Aminoglycoside-Induced Hearing Loss in Belugas (Delphinapterus leucas). Journal of the Acoustic Society of America, 117, 3936-3943.

Finneran, J. J., Schlundt, C. E., Branstetter, B. & Dear, R. L. (2007). Assessing temporary threshold shift in a bottlenose dolphin (Tursiops truncatus) using multiple simultaneous auditory evoked potentials. [Journal Article]. Journal of the Acoustical Society of America, 122(2), 1249–1264.

Finneran, J. J., D. S. Houser, B. Mase-Guthrie, R. Y. Ewing and R. G. Lingenfelser (2009). "Auditory Evoked Potentials in a Stranded Gervais' Beaked Whale (Mesoplodon europaeus)." Journal of Acoustical Society of America 126(1): 484-490.

Finneran, J. J., Carder, D. A., Schlundt, C. E. & Dear, R. L. (2010). Growth and recovery of temporary threshold shift at 3 kHz in bottlenose dolphins: Experimental data and mathematical models. Journal of the Acoustical Society of America, 127(5), 3256–3266.

Finneran, J. J. and A.K. Jenkins (2012). Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis. Department of Navy, San Diego, CA.

Fire, S. E., Flewelling, L. J., Wang, Z., Naar, J., Henry, M. S., Pierce, R. H. & Wells, R. S. (2008). Florida red tide and brevetoxins: Association and exposure in live resident bottlenose dolphins (*Tursiops truncatus*) in the eastern Gulf of Mexico, U.S.A. *Marine Mammal Science, 24*(4), 831-844. doi: 10.1111/j.1748-7692.2008.00221.x.

Fitch, R., Harrison, J. & Lewandowski, J. (2011). Marine Mammal and Sound Workshop July 13 and 14, 2010: Report to the National Ocean Council Ocean Science and Technology Interagency Policy Committee Bureau of Ocean Energy Management (BOEM), Department of the Navy (DoN) and National Oceanic and Atmospheric Administration (NOAA) (Eds.). Washington, D.C.

Foote, A. D., Osborne, R. W. & Hoelzel, A. R. (2004). Whale-call response to masking boat noise, Nature (Vol. 428, pp. 910-910).

Ford, J. K. B. (2008). Killer whale *Orcinus orca*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Würsig and J. G. M. Thewissen. San Diego, CA, Academic Press**:** 650-657.

Ford, J. K. B. and G. M. Ellis (1999). *Transients: Mammal-Hunting Killer Whales of British Columbia, Washington, and Southeastern Alaska*. Vancouver, BC, and Seattle, WA, UBC Press and University of Washington Press**:** 96.

Ford, J. K. B., G. M. Ellis, D. R. Matkin, K. C. Balcomb, D. Briggs and A. B. Morton (2005). "Killer whale attacks on minke whales: Prey capture and antipredator tactics." Marine Mammal Science 21(4): 603-618.

Ford, J.K.B., G.M. Ellis, P.F. Olesiuk, and K.C. Balcomb (2009). Linking killer whale survival and prey abundance: food limitation in the oceans' apex predator. Biol. Lett.

Forestell, P. H. and J. Urbán-Ramirez (2007). Movement of a Humpback Whale (Megaptera Novaeangliae) between the Revillagigedo Aand Hawaiian Archipelagos within a Winter Breeding Season. LAJAM 6(1): 97-102.

Forney, K. A. (1997). *Patterns of Variability and Environmental Models of Relative Abundance for California Cetaceans*. Ph.D., University of California, San Diego.

Forney, K. A. (2007). *Preliminary Estimates of Cetacean Abundance Along the U.S. West Coast and Within Four National Marine Sanctuaries During 2005*, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, and Southwest Fisheries Science Center**:** 36.

Forney, K. A. and J. Barlow (1993). "Preliminary winter abundance estimates for cetaceans along the California coast based on a 1991 aerial survey." Reports of the International Whaling Commission 43: 407-415.

Forney, K. A. and J. Barlow (1998). "Seasonal patterns in the abundance and distribution of California cetaceans, 1991-1992." Marine Mammal Science 14(3): 460-489.

Forney, K. and Kobayashi, D. (2007). Updated Estimates of Mortality and Injury of Cetaceans in the Hawaii-Based Longline Fishery, 1994-2005. NOAA Technical Memorandum NMFS-SWFSC-412: 35.

Forney, K. A., J. Barlow and J. V. Carretta (1995). "The abundance of cetaceans in California waters. Part II: Aerial surveys in winter and spring of 1991 and 1992." Fishery Bulletin 93: 15-26.

Forney, K., R. Baird and E. Oleson. (2010). Rationale for the 2010 revision of stock boundaries for the Hawaiʻi insular and pelagic stocks of false killer whales, *Pseudorca crassidens*. NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-471.

Frankel, A. S. & Clark, C. W. (2000). Behavioral responses of humpback whales (*Megaptera novaeangliae*) to full-scale ATOC signals. Journal of the Acoustical Society of America, 108(4), 1930-1937.

Frantzis, A., J. C. Goold, E. K. Skarsoulis, M. I. Taroudakis and V. Kandia. (2002). "Clicks from Cuvier's beaked whales, *Ziphius cavirostris* (L)." Journal of the Acoustical Society of America 112(1): 34-37.

Frasier, T.R., Koroscil S.M., White B.N., and Darling J.D. (2011). Assessment of population substructure in relation to summer feeding ground use in the eastern North Pacific gray whale. Endangered Species Research 14:39-48.

Fristrup, K. M., Hatch, L. T., Clark, C. W. (2003). Variation in humpback whale (Megaptera novaeangliae) song length in relation to low-frequency sound broadcasts. Acoustical Society of America, DOI: 10.1121/1.1573637.

Fromm, D. (2004a). Acoustic Modeling Results of the Haro Strait for 5 May 2003, Naval Research Laboratory.

Fromm, D. (2004b). EEEL Analysis of SHOUP Transmissions in the Haro Strait on 5 May 2003, Naval Research Laboratory: 12.

Fujimori, L. (2002). "Elephant Seal Visits Hawaii Shores." Honolulu Star Bulletin Hawaii News, available at http://starbulletin.com/2002/01/18/news/story7.html.

Fulling, G. L., K. D. Mullin and C. W. Hubard (2003). "Abundance and distribution of cetaceans in outer continental shelf waters of the U.S. Gulf of Mexico." Fishery Bulletin 101: 923-932.

Fulling, G. L., Thorson, P. H., Rivers, J. (2011). Distribution and Abundance Estimates for Cetaceans in the Waters off Guam and the Commonwealth of the Northern Mariana Islands. Offical Journal of the Pacific Science Association, In press Pacific Science, 1-46.

Gailey, G., Wursig, B. & McDonald, T. L. (2007). Abundance, behavior, and movement patterns of western gray whales in relation to a 3-D seismic survey, Northeast Sakhalin Island, Russia. Environmental Monitoring and Assessment, 134, 75-91.

Gallo-Reynoso, J. P. and A. L. Figueroa-Carranza (1995). "Occurrence of bottlenose whales in the waters of Isla Guadalupe, Mexico." Marine Mammal Science 11(4): 573-575.

Gannier, A. (2000). "Distribution of cetaceans off the Society Islands (French Polynesia) as obtained from dedicated surveys." Aquatic Mammals 26(2): 111-126.

Gannier, A. and E. Praca (2007). "SST fronts and the summer sperm whale distribution in the north-west Mediterranean Sea." Journal of the Marine Biological Association of the United Kingdom 87: 187-193.

Gannier, A. and K. L. West (2005). "Distribution of the rough-toothed dolphin (Steno bredanensis) around the Windward Islands, (French Polynesia)." Pacific Science 59: 17-24.

Gaskin, D. E. (1984). The harbour porpoise (*Phocoena phocoena* L.): regional populations, status, and information on direct and indirect catches. Rep. int. Whal. Commn 34:569_586.

Geijer, C. K. A. and A. J. Read. (2013). Mitigation of marine mammal bycatch in U.S. fisheries since 1994. Biological Conservation 159:54-60.

Gende, S. M., A. N. Hendrix, K. R. Harris, B. Eichenlaub, J. Nielsen, and S. Pyare (2011). A Bayesian approach for understanding the role of ship speed in whale–ship encounters. Ecological Applications: 21(16). pp. 2,232 – 2,240. Ecologial Society of America.

Gentry, R. L. (2009). Northern fur seal *Callorhinus ursinus*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press: 788-791.

Geraci, J. R., Harwood, J. & Lounsbury, V. J. (1999). Marine mammal die-offs: Causes, investigations, and issues J. R. Twiss and R. R. Reeves (Eds.), *Conservation and management of marine mammals* (pp. 367-395). Washington, DC: Smithsonian Institution Press.

Geraci, J. R. & Lounsbury, V. J. (2005). Marine Mammals Ashore: A Field Guide for Strandings (Second Edition) (pp. 1-305). Baltimore, MD: National Aquarium in Baltimore.

Ghoul, A. and C. Reichmuth. (2012). Sound Production and Reception in Southern Sea Otters (*Enhydra lutris nereis*). In A.N. Popper and A. Hawkins (eds.), *The Effects of Noise on Aquatic Life.* Advances in Experimental Medicine and Biology 730, 001 10.1007/978-1-4419-7311-5_35, Springer Science+Business Media, LLC 2012.

Gilbert, J. R. and N. Guldager (1998). *Status of Harbor and Gray Seal Populations in Northern New England*. Woods Hole, MA, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Fisheries Science Center.

Gilmartin, W. G. and J. Forcada (2009). Monk seals *Monachus monachus, M. tropicalis*, and *M. schauinslandi*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 741-744.

Gjertz, I. & Børset, A. (1992). Pupping in the most northerly harbor seal (Phoca vitulina). Marine Mammal Science, 8(2), 103-109.

Goertner, J. F. (1982). Prediction of Underwater Explosion Safe Ranges for Sea Mammals. Dahlgren, Virginia, Naval Surface Weapons Center: 25.

Goldbogen, J. A., J. Calambokidis, R. E. Shadwick, E. M. Oleson, M. A. McDonald and J. A. Hildebrand (2006). "Kinematics of foraging dives and lunge-feeding in fin whales." Journal of Experimental Biology 209: 1231-1244.

Goldbogen J.A., B.L. Southall, S.L. DeRuiter, J. Calambokidis, A.S. Friedlaender, E.L. Hazen, E.A. Falcone, G.S. Schorr, A. Douglas, D.J. Moretti, C. Kyburg, M.F. McKenna, and P.L. Tyack (2013). Blue whales respond to simulated mid-frequency military sonar. Proceedings of the Royal Society Bulletin 280: 20130657.

Goodman-Lowe, G. D. (1998). Diet of the Hawaiian monk seal (*Monachus schauinslandi*) from the Northwestern Hawaiian Islands during 1991-1994. In. Marine Biology. 132**:** 535-546.

Goold, J. C. (2000). "A diel pattern in vocal activity of short-beaked common dolphins, *Delphinus delphis*." Marine Mammal Science 16(1): 240-244.

Gordon, J., Gillespie, D., Potter, J., Frantzis, A., Simmonds, M. P., Swift, R. & Thompson, D. (2003). A review of the effects of seismic surveys on marine mammals. Marine Technology Society Journal, 37(4), 16-34.

Gosho, M., Gearin P., Jenkinson R., Laake L., Mazzuca L., Kubiak,D., Calambokidis J., Megill W., Gisborne B., Goley D., Tombach C., Darling J., and Deecke V. (2011). Movements and diet of gray whales (*Eschrichtius robustus*) off Kodiak Island, Alaska, 2002 – 2005. Paper SC/M11/AWMP2 presented to the International Whaling Commission AWMP workshop 28 March-1 April 2011.

Götz, T. & Janik, V. M. (2010). Aversiveness of sounds in phocid seals: psycho-physiological factors, learning processes and motivation. *The Journal of Experimental Biology, 213*, 1536-1548.

Götz, T. & Janik, V. M. (2011). Repeated elicitation of the acoustic startle reflex leads to sensation in subsequent avoidance behaviour and induces fear conditioning. *BMC Neuroscience, 12*(30), 13.

Greaves, F. C., Draeger, R. H., Brines, O. A., Shaver, J. S. & Corey, E. L. (1943). An Experimental Study of Concussion. United States Naval Medical Bulletin, 41(1), 339-352.

Green, G. A., J. J. Brueggeman, R. A. Grotefendt, C. E. Bowlby, M. L. Bonnell and K. C. Balcomb, III. (1992). *Cetacean distribution and abundance off Oregon and Washington, 1989-1990*. Los Angeles, CA, Minerals Management Service**:** 100.

Green, D. M., DeFerrari, H., McFadden, D., Pearse, J., Popper, A., Richardson, W. J., . . . Tyack, P. (1994). Low-Frequency Sound and Marine Mammals: Current Knowledge and Research Needs (pp. 1-75). Washington,DC: Ocean Studies Board, Commission on Geosciences, Environment, and Resources, National Research Concil.

Gregory, P. R. & A. A. Rowden. (2001). Behaviour patterns of bottlenose dolphins (*Tursiops truncatus*) relative to tidal state, time-of-day, and boat traffic in Cardigan Bay, West Wales. *Aquatic Mammals* 27.2: 105-114.

Gregr, E. J., L. Nichol, J. K. B. Ford, G. Ellis and A. W. Trites. (2000). "Migration and population structure of northeastern Pacific whales off coastal British Columbia: An analysis of commercial whaling records from 1908-1967." Marine Mammal Science 16(4): 699-727.

Gregr, E. J. and A. W. Trites (2001). "Predictions of critical habitat for five whale species in the waters of coastal British Columbia." Canadian Journal of Fisheries and Aquatic Sciences 58: 1265-1285.

Griffin, R. B. and N. J. Griffin (2004). "Temporal variation in Atlantic spotted dolphin (*Stenella frontalis*) and bottlenose dolphin (*Tursiops truncatus*) densities on the west Florida continental shelf." Aquatic Mammals 30(3): 380-390.

Gulland, F. M. D., M. H. Perez-Cotes, J. Urban R., L. Rojas-Bracho, G. J. Ylitalo, J. Weir, S. A. Norman, M. M. Muto, D. J. Ruch, C. Kreuder and T. Rowles (2005). *Eastern North Pacific Gray Whale (*Eschrichtius robustus*) Unusual Mortality Event, 1999-2000*, NOAA**:** 33

Hain, J. H. W., Ellis, S. L., Kenney, R. D., Clapham, P. J., Gray, B. K., Weinrich, M. T. & Babb, I. G. (1995). Apparent bottom feeding by humpback whales on Stellwagen Bank. Marine Mammal Science, 11(4), 464-479.

Hall, A. J., Hugunin, K., Deaville, R., Law, R. J., Allchin, C. R., Jepson, P. D. (2006a). The Risk of Infection from Polychloriinated Biphenyl Exposure in the Harbor Porpoise (Phocoena phocoena): A Case-Control Approach. Research, vol. 114, No. 5, 704-712.

Hall, A. J., McConnell, B. J., Rowles, T. K., Aguilar, A., Borrell, A., Schwacke, L., Reijnders, P. J. H., Wells, R. S. (2006b). Individual-Based Model Framework to Assess Population Consequences of Polychlorinated Biphenyl Exposure in Bottlenose Dolphins. Monograph, vol. 114, supplement 1, 60-64.a.

Hamer, D. J., S. J. Childerhouse and N. J. Gales (2010). Mitigating operational interactions between odontocetes and the longline fishing industry: A preliminary global review of the problem and of potential solutions. Tasmania, Australia, International Whaling Commission: 30.

Handley, C. O. (1966). A synopsis of the genus *Kogia* (pygmy sperm whales). In. Whales, Dolphins, and Porpoises. K. S. Norris, University of California Press: 62-69.

Hanggi, E. B. & Schusterman, R. J. (1994). Underwater acoustic displays and individual variation in male harbour seals, Phoca vitulina. [doi: 10.1006/anbe.1994.1363]. *Animal Behaviour, 48*(6), 1275-1283. Retrieved from http://www.sciencedirect.com/science/article/pii/S0003347284713637

Hanlon, R. T. & Messenger, J. B. (1996). Cephalopod behaviour. Cambridge, NY: Cambridge University Press.

Hanni, K. D., D. J. Long, R. E. Jones, P. Pyle and L. E. Morgan (1997). "Sightings and strandings of Guadalupe fur seals in central and northern California, 1988-1995." Journal of Mammalogy 78(2): 684-690.

Hanson, M. T. and R. H. Defran (1993). "The behavior and feeding ecology of the Pacific coast bottlenose dolphin, Tursiops truncatus." Aquatic Mammals 19(3): 127-142.

Harvey, J., Thomas, K., Goldstein, T., Barakos, J. & Gulland, F. (2010). Movement, dive behavior, and survival of California sea lions (*Zalophus californianus*) posttreatment for domoic acid toxidosis. Marine Mammal Science, 26(1), 36-52. doi: 10.1111/j.1748-7692.2009.00314.x

Hatch, L. & Wright, A. J. (2007). A Brief Review of Anthropogenic Sound in the Oceans. International Journal of Comparative Psychology, 20, 12.

Hauksson, E. and V. Bogason (1997). "Comparative feeding of grey (Halichoerus grypus) and common seals (Phoca vitulina) in coastal waters of Iceland, with a note on the diet of hooded (Cystophora cristata) and harp seals (Phoca groenlandica)." Journal of Northwest Atlantic Fishery Science 22: 125-135.

Haviland-Howell, G., Frankel, A. S., Powell, C. M., Bocconcelli, A., Herman, R. L. & Sayigh, L. S. (2007). Recreational boating traffic: A chronic source of anthropogenic noise in the Wilmington, North Carolina Intracoastal Waterway. Journal of the Acoustical Society of America, 122(1), 151-160.

Hayano, A., M. Yoshioka, M. Tanaka and M. Amano. (2004). "Population differentiation in the Pacific white-sided dolphin *Lagenorhynchus obliquidens* inferred from mitochondrial DNA and microsatellite analyses." Zoological Science 21: 989-999.

HDR. (2012). Summary Report: Compilation of Visual Survey Effort and Sightings for Marine Species Monitoring in the Hawaii Range Complex, 2005-2012. Prepared for Commander, U.S. Pacific Fleet, Pearl Harbor, Hawaii. Submitted to Naval Facilities Engineering Command Pacific (NAVFAC), EV2 Environmental Planning, Pearl Harbor, Hawaii, 96860-3134, under contract # N62470-10-D-3011, issued to HDR, Inc., San Diego, California, 92123.

Heath, C. B. and W. F. Perrin. (2009). California, Galapagos, and Japanese sea lions *Zalophus californianus, Z. wollebaeki,* and *Z. japonicus*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 170-176.

Heezen, B. C. (1957). Whales entangled in deep sea cables. *Deep Sea Research, 4*(2), 105-115.

Heise, K. (1997). "Life history and population parameters of Pacific white-sided dolphins (*Lagenorhynchus obliquidens*)." Reports of the International Whaling Commission 47: 817-826.

Heithaus, M. R. and L. M. Dill. (2008). Feeding strategies and tactics. In Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 1100-1103.

Helfman, G. S., Collette, B. B., Facey, D. E. & Bowen, B. W. (2009). The Diversity of Fishes. In Wiley-Blackwell (Ed.) (Second ed.).

Hemila, S., S. Nummela, A. Berta, & T. Reuter (2006). High-frequency hearing in phocid and otariid pinnipeds: An interpretation based on inertial and cochlear constraints. Journal of the Acoustical Society of America 120(6): 3463-3466. DOI: 10.1121/1.2372712.

Henkel, L. A. and J. T. Harvey (2008). "Abundance and distribution of marine mammals in nearshore waters of Monterey Bay, California." California Fish and Game 94: 1-17.

Herman, L. M., Baker, C. S., Forestell, P. H. & Antinoja, R. C. (1980). Right Whale Balaena glacialis Sightings Near Hawaii: A Clue to the Wintering Grounds? Marine Ecology - Progress Series, 2, 271-275.

Hewitt, R. P. (1985). Reaction of dolphins to a survey vessel: Effects on census data. *Fishery Bulletin* 83(2): 187-193.

Heyning, J. E. (1984). "Functional morphology involved in intraspecific fighting of the beaked whale *Mesoplodon carlhubbsi*." Canadian Journal of Zoology 62: 1645-1654.

Heyning, J. E. (1989). Cuvier's beaked whale *Ziphius cavirostris* G. Cuvier, 1823. In. Handbook of Marine Mammals. S. H. Ridgway and R. Harrison. San Diego, CA, Academic Press. 4**:** 289-308.

Heyning, J. & Lewis, T. (1990). Entanglements of Baleen Whales in Fishing Gear off Southern California. Report to the International Whaling Commission, 40, 427-431.

Heyning, J. E. and J. G. Mead (1996). "Suction feeding in beaked whales: Morphological and observational evidence." Los Angeles County Museum Contributions in Science 464: 1-12.

Heyning, J. E. and J. G. Mead (2008). Cuvier's beaked whale *Ziphius cavirostris*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 294-295.

Heyning, J. E. and W. F. Perrin (1994). "Evidence for two species of common dolphins (Genus *Delphinus*) from the eastern north Pacific." Contributions in Science 442: 1-35.

Hickmott, L. S. (2005). *Diving behaviour and foraging behaviour and foraging ecology of Blainville's and Cuvier's beaked whales in the Northern Bahamas*. Master of Research in Environmental Biology Master's thesis, University of St. Andrews.

Hildebrand, J. A. (2005). Impacts of anthropogenic sound. Marine Mammal Research: Conservation beyond Crisis. J. E. Reynolds, The John Hopkins University Press**:** 101-124.

Hildebrand, J. A. (2009). Anthropogenic and natural sources of ambient noise in the ocean. Marine Ecology Progress Series, vol. 395: 5-20.

Hildebrand, J. A., and M. A. McDonald (2009). Beaked Whale Presence, Habitat, and Sound Production in the North Pacific. Unpublished technical report on file. (pp. 5).

Hildebrand, J., Bassett, H., Baumann, S., Campbell, G., Cummins, Amanda, Kerosky, S., Melcon, M., Merkens, K., Munger, L., Roch, M., Roche, L., Simonis, A., Wiggins, S. (2011). High Frequency Acoustic Recording Package Data Summary Report January 31, 2010 - March 26, 2010 SOCAL 37, Site N. Marine Physical Laboratory, Scripps Institution of Oceanography University of California San Diego, La Jolla, CA.

Hindell, M. A. and W. F. Perrin (2009). Elephant seals *Mirounga angustirostris* and *M. leonina*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 364-368.

Hobbs, R. C., D. J. Rugh, J. M. Waite, J. M. Breiwick and D. P. DeMaster (2004). "Abundance of eastern North Pacific gray whales on the 1995/96 southbound migration." Journal of Cetacean Research and Management 6(2): 115-120.

Hodder, J., R. F. Brown and C. Cziesla. (1998). "The northern elephant seal in Oregon: A pupping range extension and onshore occurrence." Marine Mammal Science 14(4): 873-881.

Hoelzel, A. R. (1999). "Impact of population bottlenecks on genetic variation and the importance of life-history; a case study of the northern elephant seal." Biological Journal of the Linnean Society 68: 23-29.

Hoelzel, A. R. (2002). *Marine Mammal Biology: An Evolutionary Approach*. Malden, MA, Blackwell Publishing**:** 448.

Hodder, J., R. F. Brown and C. Cziesla. (1989). "The foraging specializations of individual minke whales." Animal Behaviour 38: 786-794.

Hodder, J., R. F. Brown and C. Cziesla. (2007). "Evolution of population structure in a highly social top predator, the killer whale " Molecular Biology and Evolution 24(6): 1407-1415.

Hoelzel, A. (2003). Marine Mammal Biology: Blackwell Publishing.

Holst, M., Greene, C., Richardson, J., McDonald, T., Bay, K., Schwartz, S., & Smith, G. (2011). Responses of Pinnipeds to Navy missile Launches at San Nicolas Island, California. Aquatic Animals, 37(2), 139-150. doi: 10.1578/AM.37.2011.139.

Holt, M. M., Noren, D. P., Veirs, V., Emmons, C. K. & Veirs, S. (2008). Speaking up: Killer whales (Orcinus orca) increase their call amplitude in response to vessel noise. [Express Letters]. Journal of the Acoustical Society of America, 125(1), EL27-EL32.

Holt, M.M, D. P. Noren, and C. K. Emmons. (2011). Effects of noise levels and call types on the source levels of killer whale calls, J. Acoust. Soc. Am. 130, 3100. DOI:10.1121/1.3641446

Honolulu Advertiser. (2007). “Man charged in monk seal's death in a net”, reported 7 June 2007, available at http://the.honoluluadvertiser.com/article/2007/Jun/07/br/br4325609817.html.

Hooker, S. K., Metcalfe, T. L., Metcalfe, C. D., Angell, C. M., Wilson, J. Y., Moore, M. J., Whitehead, H. (2007). Changes in persistent contaminant concentration and CYP1A1 protein expression in biopsy samples from northern bottlenose whales, Hyperoodon ampullatus, follwoing the onset of nerby oil and gas development. Article in Press, Environmental Pollution, 1-12.

Hooker, S., Baird, R. & Fahlman, A. (2009). Could beaked whales get the bends? Effect of diving behaviour and physiology on modelled gas exchange for three species: Ziphius cavirostris, Mesoplodon densirostris and Hyperoodon ampullatus. Respiratory Physiology & Neurobiology. 10.1016/j.resp.2009.04.023.

Hooker, S.K., A. Fahlman, M. J. Moore, N. Aguilar de Soto, Y. Bernaldo de Quiros, A. O. Brubakk, D. P. Costa, A. M. Costidis, S. Dennison, K. J. Falke, A. Fernandez, M. Ferrigno, J. R. Fitz-Clarke, M. M. Garner, D. S. Houser, P. D. Jepson, D. R. Ketten, P. H. Kvadsheim, P. T. Madsen, N. W. Pollock, D. S. Rotstein, T. K. Rowles, S. E. Simmons, W. Van Bonn, P. K. Weathersby, M. J. Weise, T. M. William, and P. L. Tyack. (2012). Deadly diving? Physiological and behavioural management of decompression stress in diving mammals. Proceedings of the Royal Society Bulletin: 279, 1041–1050.

Hoover, A. A. (1988). Harbor Seal (Phoca vitulina) J. W. Lentfer (Ed.), Selected Marine Mammals of Alaska: Species Accounts with Research and Management Recommendations (pp. 125-157). Washington, D.C.: Marine Mammal Commission.

Horwood, J. (1987). *The Sei Whale: Population Biology, Ecology, and Management*. New York, NY, Croom Helm**:** 375.

Horwood, J. (2009). Sei whale *Balaenoptera borealis*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen. San Diego, CA, Academic Press**:** 1001-1003.

Houck, W. J. & Jefferson, T. A. (1999). Dall's Porpoise *Phocoenoides dalli* In S. H. Ridgway and R. Harrison (Eds.), *Handbook of Marine Mammals Vol 6: The second book of dolphins and porpoises* (pp. 443-472). San Diego: Academic Press.

Houser, D. S., Helweg, D. A. & Moore, P. W. B. (2001a). A bandpass filter-bank model of auditory sensitivity in the humpback whale. Aquatic Mammals, 27(2), 82-91.

Houser, D., Howard, R. & Ridgway, S. (2001b). Can Diving-inducted Tissue Nitrogen Supersaturation Increase the Chance of Acoustically Driven Bubble Growth in Marine Mammals? Journal of Theoretical Biology, 213, 183-195. 10.1006/jtbi.2001.2415 Retrieved from http://www.idealibrary.com

Houser, D. S. and J. J. Finneran. (2006). "Variation in the hearing sensitivity of a dolphin population determined through the use of evoked potential audiometry." Journal of Acoustical Society of America, 120(6): 4090-4099.

Houser, D. S., Gomez-Rubio, A., Finneran, J. J. (2008). Evoked potential adiometry of 13 Pacific bottlenose dolphins (Tursiops Truncatus gilli). Marine Mammal Science, 24(1): 28-41.

Houser, D. S., Dankiewicz-Talmadge, L. A., Stockard, T. K. & Ponganis, P. J. (2009). Investigation of the potential for vascular bubble formation in a repetitively diving dolphin. The Journal of Experimental Biology, 213, 52-62.

Houser, D. S., Dankiewicz-Talmadge, L. A., Stockard, T. K., & Ponganis, P. J. (2010a). Investigation of the potential for vascular bubble formation in a repetitively diving dolphin. *The Journal fo Experimental Biology*, 213, 52-62.

Houser, D. S., Finneran, J. J., Ridgway, S. H. (2010b). Research with Navy Marine Mammals Benefits Animal Care, Conservation and Biology. International Journal of Comparative Psycology, 23, 249-268.

Houck, W. J. and T. A. Jefferson. (1999). Dall's porpoise Phocoenoides dalli (True, 1885). In. Handbook of Marine Mammals. S. H. Ridgway and R. Harrison, Academic Press. 6: The Second Book of Dolphins and the Porpoises: 443-472.

Hui, C. A. (1979). "Undersea topography and distribution of dolphins of the genus Delphinus in the Southern California Bight." Journal of Mammalogy 60: 521-527.

Hui, C. A. (1985). "Undersea topography and the comparative distribution of two pelagic cetaceans." Fishery Bulletin 83: 472-475.

Hullar, T., Fales, S., Hemond, H., Koutrakis, P., Schlesinger, W., Sobonya, R., . . . Watson, J. (1999). Environmental Effects of RF Chaff A Select Panel Report to the Undersecretary of Defense for Environmental Security U.S. Department of the Navy and N. R. Laboratory (Eds.), [Electronic Version]. (pp. 84).

International Council for the Exploration of the Sea. (2005a). Answer to DG Environment request on scientific information concerning impact of sonar activities on cetacean populations. ICES.

International Council for the Exploration of the Sea. (2005b). Ad-Hoc Group on the Impact of Sonar on Cetaceans. (pp. 50).

International Union for Conservation of Nature. (IUCN). (2012). Report of the 11th Meeting of the Western Gray Whale Advisory Panel. Geneva, Switzerland. Available from http://www.iucn.org/wgwap/publications_and_reports/.

Jahoda, M., Lafortuna, C. L., Biassoni, N., Almirante, C., Azzellino, A., Panigada, S., . . . Di Sciara, G. N. (2003). Mediterranean fin whale's (Balaenoptera physalus) response to small vessels and biopsy sampling assessed through passive tracking and timing of respiration. Marine Mammal Science, 19(1), 96-110. doi:10.1111/j.1748-7692.2003.tb01095.x

Janik, V. M. & P. M. Thompson. (1996). Changes in surfacing patterns of bottlenose dolphins in response to boat traffic. *Marine Mammal Science* 12(4): 597-602.

Jansen, J. K., Boveng, P. L., Dahle, S. P., Bengtson, J. L. (2010). Reaction of Harbor Seals to Cruise Ships. Journal on Wildlife Management 74(6): 1186-1194.

Jaquet, N. & Whitehead, H. (1996). Scale-dependent correlation of sperm whale distribution with environmental features and productiviity in the South Pacific. Marine Ecology Progress Series, 135, 1-9.

Jaramillo-Legorreta, A. M., Rojas-Bracho, L. & Gerrodette, T. (1999). A new abundance estimate for vaquitas: First step for recovery. *Marine Mammal Science* 15(4): 957-973.

Jefferson, T. A. (1991). "Observations on the distribution and behavior of Dall's porpoise (*Phocoenoides dalli*) in Monterey Bay, California." Aquatic Mammals 17(1): 12-19.

Jefferson, T. A. (2009a). Dall's porpoise Phocoenoides dalli. In. In W. F. Perrin, B. Wursig & J. G. M. Thewissen (Eds.), Encyclopedia of Marine Mammals (2nd ed., pp. 296-298): Academic Press.

Jefferson, T. A. (2009b). Rough-toothed dolphin Steno bredanensis. In W. F. Perrin, B. Wursig & J. G. M. Thewissen (Eds.), Encyclopedia of Marine Mammals (Second Edition) (pp. 990-992): Academic Press.

Jefferson, T. A. and N. B. Barros. (1997). "Peponocephala electra." Mammalian Species 553: 1-6.

Jefferson, T. A. and S. Leatherwood. (1994). "*Lagenodelphis hosei*." Mammalian Species 470: 1-5.

Jefferson, T. A. and S. K. Lynn. (1994). "Marine mammal sightings in the Gulf of Mexico and Caribbean Sea, summer 1991." Caribbean Journal of Science 30: 83-89.

Jefferson, T. A. and K. Van Waerebeek. (2002). "The taxonomic status of the nominal dolphin species *Delphinus tropicalis* van Bree, 1971." Marine Mammal Science 18(4): 787-818.

Jefferson, T. A., M. A. Webber, et al. (2008). *Marine Mammals of the World: A Comprehensive Guide to their Identification*. London, UK, Elsevier: 573 p.

Jensen, A. & Silber, G. (2003). Large Whale Ship Strike Database. In U.S. Department of Commerce (Ed.).

Jensen, A. S. & Silber, G. K. (2004). Large Whale Ship Strike Database. (pp. 39) National Marine Fisheries Service.

Jepson, P., Arbelo, M., Beaville, R., Patterson, I., Castro, P., Baker, J., . . . Fernandez, A. (2003). Gas-bubble lesions in stranded cetaceans: Was sonar responsible for a spate of whale deaths after an Atlantic military exercise? Nature, 425, October.

Jepson, P., Bennett, P., Deaville, R., Allchin, C. R., Baker, J. & Law, R. (2005). Relationships between polychlorinated Biphenyls and Health Status in Harbor Porpoises (Phocoena Phocoena) Stranded in the United Kingdom. Environmental Toxicology and Chemistry, 24(1), 238-248.

Johnson, C. S. (1971). Auditory masking of one pure tone by another in the bottlenosed porpoise. [Letters to the Editor]. Journal of the Acoustical Society of America, 49(4 (part 2)), 1317-1318.

Johnson, C. S. (1967). Sound Detection Thresholds in Marine Mammals. Marine Bioacoustics. W. N. Tavolga. Oxford, Pergamon Press: 247-260.

Johnson, W. S. & Allen, D. M. (2005). Zooplankton of the Atlantic and Gulf Coasts: A Guide to Their Identification and Ecology (pp. 379). Baltimore, MD: Johns Hopkins University Press.

Johnson, A. M., R. L. Delong, C. H. Fiscus and K. W. Kenyon. (1982). "Population status of the Hawaiian monk seal (*Monachus schauinslandi*), 1978." Journal of Mammalogy 63(3): 415-421.

Johnson, C. and J. Rivers (2009). *Marine Mammal Monitoring for the U.S. Navy's Hawaiian Range Complex (HRC) and Southern California (SOCAL) Range Complex*, Department of the Navy.

Johnston, D. W. (2002). The Effect of Acoustic Harassment Devices on Harbour Porpoises (Phocoena phocoena) in the Bay of Fundy, Canada. Biological Conservation, 108, 113-118.

Jones, M. L. and S. L. Swartz. (2009). Gray whale *Eschrichtius robustus*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 503-511.

Kajimura, K. (1984). *Opportunistic Feeding of the Northern Fur Seal,* Callorhinus ursinus*, in the Eastern North Pacific Ocean and Eastern Bering Sea*. Washington, DC, U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service**:** 49.

Kanda, N., M. Goto, H. Kato, M. V. McPhee and L. A. Pastene. (2007). "Population genetic structure of Bryde's whales (Balaenoptera brydei) at the inter-oceanic and trans-equatorial levels." Conservative Genetics 8(4): 853-864.

Kaschner, K., Watson, R., Trites, A. & Pauly, D. (2006). Mapping world-wide distributions of marine mammal species using a relative environmental suitability (RES) model. [electronic version]. Marine Ecology Progress Series, 316, 285-310.

Kastak, D., Southall, B. L., Schusterman, R. J. & Kastak, C. R. (2005). Underwater temporary threshold shift in pinnipeds: Effects of noise level and duration. Journal of the Acoustical Society of America, 118(5), 3154-3163.

Kastak, D., Reichmuth, C., Holt, M. M., Mulsow, J., Southall, B. L. & Schusterman, R. J. (2007). Onset, growth, and recovery of in-air temporary threshold shift in a California sea lion (Zalophus californianus). Journal of the Acoustical Society of America, 122(5), 2916–2924.

Kastelein, R. A., D. de Haan, N. Vaughan, C. Staal and N. M. Schooneman. (2000). "The influence of three acoustic alarms on the behaviour of harbour porpoises (Phocoena phocoena) in a floating pen." Marine Environmental Research 52: 351-371.

Kastelein, R. A., van Schie, R., Verboom, W. C. & de Haan, D. (2005a). Underwater hearing sensitivity of a male and a female Steller sea lion (Eumetopias jubatus). Journal of the Acoustical Society of America, 118(3), 1820-1829.

Kastelein, R. A., Verboom, W. C., Muijsers, M., Jennings, N. V. & van der Heul, S. (2005b). Influence of Acoustic Emissions for Underwater Data Transmission on the Behaviour of Harbour Porpoises (Phocoena phocoena) in a Floating Pen. Marine Environmental Research, 59, 287-307.

Kastelein, R.A.; R. Gransier, L. Hoek, A. Macleod, and J.M. Terhune. (2012a). Hearing threshold shifts and recovery in harbor seals (*Phoca vitulina*) after octave-band noise exposure at 4 kHz. Journal of the Acoustical Society of America, 132(4), 2745-2761.

Kasuya, T. (2009). Giant beaked whales *Berardius bairdii* and *B. arnuxii*. In Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen. Amsterdam, Academic Press**:** 498-500.

Kato, H. and W. F. Perrin. (2008). Bryde's whales *Balaenoptera edeni/brydei*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen. San Diego, CA, Academic Press**:** 158-163.

Katsumata, E., K. Ohishi and T. Maruyama. (2004). "Rehabilitation of a rescued pygmy sperm whale stranded on the Pacific coast of Japan." IEEE Journal: 488-491.

Keck, N., O. Kwiatek, F. Dhermain, F. Dupraz, H. Boulet, C. Danes, C. Laprie, A. Perrin, J. Godenir, L. Micout and G. Libeau. (2010). "Resurgence of Morbillivirus infection in Mediterranean dolphins off the French coast." The Veterinary record 166(21): 654-655.

Keiper, C. A., D. G. Ainley, S. G. Allen and J. T. Harvey. (2005). "Marine mammal occurrence and ocean climate off central California, 1986 to 1994 and 1997 to 1999." Marine Ecology Progress Series 289: 285-306.

Kemp, N. J. (1996). Habitat loss and degradation. In The Conservation of Whales and Dolphins. M. P. Simmonds and J. D. Hutchinson. New York, NY, John Wiley & Sons**:** 476.

Kenney, R. D. and H. E. Winn. (1987). "Cetacean biomass densities near submarine canyons compared to adjacent shelf/slope areas." Continental Shelf Research **7**: 107-114.

Kerosky, S.M., A. Širović, L.K. Roche, S. Baumann-Pickering, S.M. Wiggins, J.A. Hildebrand. (2012). Bryde's Whale Seasonal Range Expansion and Increasing Presence in the Southern California Bight from 2000 to 2010. Deep Sea Research I, 65:125-132.

Ketten, D. R., Lien, J. & Todd, S. (1993). Blast injury in humpback whale ears: Evidence and implications (A). *Journal of the Acoustical Society of America, 94*(3), 1849-1850.

Ketten, D. (1997). "Structure and function in whale ears." Bioacoustics 8: 103-135.Ketten, D. R., J. Lien, et al. (1993). Blast injury in humpback whale ears: Evidence and implications (A). Journal of the Acoustical Society of America 94(3): 1849-1850.

Ketten, D. R. (1998). Marine Mammal Auditory Systems: A Summary of Audiometric and Anatomical Data and its Implications for Underwater Acoustic Impacts. (NOAA Technical Memorandum NMFS-SWFSC-256, pp. 74). La Jolla, CA: U. S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Ketten, D. R. (2012). Marine Mammal Auditory System Noise Impacts: Evidence and Incidence. In: A. N. Popper and A. Hawkins (Eds.). The Effects of Noise on Aquatic Life Advances in Experimental

Medicine and Biology (Advances in Experimental Medicine and Biology ed., Vol. 730, pp. 207-212). New York: Springer Science+Business Media.

Kirschvink, J. L., A. E. Dizon and J. A. Westphal (1986). "Evidence from strandings for geomagnetic sensitivity in cetaceans." Journal of Experimental Biology 120: 1-24.

Kirschvink, J. L. (1990). Geomagnetic sensitivity in cetaceans: an update with live stranding records in the Unites States J. A. Thomas and R. A. Kastelein (Eds.), Sensory abilities of cetaceans: laboratory and field evidence (pp. 639-649).

Kishiro, T. (1996). "Movements of marked Bryde's whales in the western North Pacific." Reports of the International Whaling Commission 46: 421-428.

Kiyota, M., N. Baba and M. Mouri. (1992). "Occurrence of an elephant seal in Japan." Marine Mammal Science 8(4): 433.

Keiper, C. A., D. G. Ainley, S. G. Allen and J. T. Harvey (2006). "Sex hormones and reproductive status of the North Atlantic fin whales (Balaenoptera physalus) during the feeding season." Aquatic Mammals 32(1): 75-84.

Klimley, A. P., B. J. Le Boeuf, K. M. Cantara, J. E. Richert, S. F. Davis, S. Van Sommeran and J. T. Kelly (2001). "The hunting strategy of white sharks (*Carcharodon carcharias*) near a seal colony." Marine Biology 138: 617-636.

Klinowska, M. (1985). Cetacean live stranding sites relative to geomagnetic topography. Aquatic Mammals, 1985(1), 27-32.

Koski, W. R., J. W. Lawson, D. H. Thomson and W. J. Richardson (1998). *Point Mugu Sea Range marine mammal technical report*. San Diego, CA, Naval Air Warfare Center, Weapons Division and Southwest Division, Naval Facilities Engineering Command.

Krahn, M. M., M. J. Ford, W. F. Perrin, P. R. Wade, R. P. Angliss, M. B. Hanson, B. L. Taylor, G. M. Ylitalo, M. E. Dahlheim, J. E. Stein and R. S. Waples (2004). *2004 Status Review of Southern Resident Killer Whales (Orcinus orca) under the Endangered Species Act*. Seattle, WA, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northwest Fisheries Science Center**:** 73.

Kruse, S. (1991). The interactions between killer whales and boats in Johnstone Strait, B.C. In. Dolphin Societies: Discoveries and Puzzles. K. Pryor & K. S. Norris. Berkeley and Los Angeles, California, University of California Press: 149-159.

Kruse, S., D. K. Caldwell and M. C. Caldwell (1999). Risso's dolphin *Grampus griseus* (G. Cuvier, 1812). In. Handbook of Marine Mammals. S. H. Ridgway and R. Harrison. San Diego, CA, Academic Press. 6**:** 183-212.

Kryter, K. D., Ward, W. D., Miller, J. D. & Eldredge, D. H. (1965). Hazardous exposure to intermittent and steady-state noise. Journal of the Acoustical Society of America, 39(3), 451-464.

Kuker, K. J., J. A. Thomson and U. Tscherter (2005). "Novel surface feeding tactics of minke whales, Balaenoptera acutorostrata, in the Saguenay-St. Lawrence National Marine Park." Canadian Field-Naturalist 119(2): 214-218.

Kvadsheim, P. H., Sevaldsen, E. M., Scheie, D., Folkow, L. P. & Blix, A. S. (2010). Effects of naval sonar on seals Norwegian Defense Research Establishment (FFI) (Ed.). (pp. 26).

Kvadsheim, P. H., Miller, P. J. O., Tyack, P. L., Sivle, L. D., Lam, F. P. A. & Fahlman, A. (2012). Estimated tissue and blood N2 levels and risk of decompression sickness in deep-, intermediate-, and shallow-diving toothed whales during exposure to naval sonar. Frontiers in Physiology, 3(Article 125). 10.3389/fphys.2012.00125; http://www.frontiersin.org/Physiology/editorialboard.

Lagerquist, B. A., B. R. Mate, J. G. Ortega-Ortiz, M. Winsor, and J. Urban-Ramirez (2008). Migratory movements and surfacing rates of humpback whales (Megaptera novaeangliae) satellite tagged at Socorro Island, Mexico. Marine Mammal Science, 24(4): 815–830.

Laggner, D. (2009). Blue Whale (*Baleanoptera musculus*) Ship strike Threat Assessment in the Santa Barbara Channel, California. Masters Thesis. The Evergreen State College.

Laist, D. W. (1997). Impacts of marine debris: Entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records. In J. M. Coe and D. B. Rogers (Eds.), *Marine Debris: Sources, Impacts, and Solutions* (pp. 99-140). New York, NY: Springer-Verlag.

Laist, D. W., Knowlton, A. R., Mead, J., Collet, A. & Podesta, M. (2001). Collisions between ships and whales. *Marine Mammal Science, 17*(1), 35-75.

Lammers, MO, Pack, AA, Davis, L. (2003). Historical Evidence of Whale/Vessel Collision in Hawaiian Waters (1975-Present). U.S. Department of Commerce, NOAA OSI Technical Report. 25.

Lammers, M. O. (2004). "Occurence and behavior of Hawaiian spinner dolphins (*Stenella longirostris*) along Oahu's leeward and south shores." Aquatic Mammals 30(2): 237-250.

Lammers, M. O., P. I. Fisher-Pool, W. W. L. Au, C. G. Meyer, K. B. Wong, R. E. Brainard (2011). Humpback whale Megaptera novaeangliae song reveals wintering activity in the Northwestern Hawaiian Islands. Marine Ecology Progress Series, 423: 261–268.

Lander, M. E., T. R. Loughlin, M. G. Logsdon, G. R. VanBlaricom and B. S. Fadely (2010). "Foraging effort of juvenile Steller sea lions Eumetopias jubatus with respect to heterogeneity of sea surface temperature." Endangered Species Research 10: 145-158.

Laughlin, J. (2005). Underwater Sound Levels Associated With Pile Driving at the Bainbridge Island Ferry Terminal Preservation Project, Washington State Department of Transportation, Seattle, WA.

Laughlin, J. (2007). Underwater Sound Levels Associated with Driving Steel and Concrete Piles Near the Mukilteo Ferry Terminal, Washington State Department of Transportation, Seattle, WA.

Le Boeuf, B. J. (2002). "Status of pinnipeds on Santa Catalina Island." Proceedings of the California Academy of Sciences 53(2): 11-21.

Le Boeuf, B. J. and M. L. Bonnell (1980). Pinnipeds of the California Islands: abundance and distribution. In. The California Islands: Proceedings of a Multidisciplinary Symposium. D. M. Power. Santa Barbara, CA, Santa Barbara Museum of Natural History**:** 475-493.

Le Boeuf, B. J., D. E. Crocker, D. P. Costa, S. B. Blackwell, P. M. Webb and D. S. Houser (2000). "Foraging ecology of northern elephant seals." Ecological Monographs 70(3): 353-382.

Leatherwood, S., W. F. Perrin, R. L. Garvie and J. C. LaGrange (1973). *Observations of Sharks Attacking Porpoises (*Stenella spp. *and* Delphinus cf. D. delphis*)***:** 7.

Leatherwood, S., W. F. Perrin, V. L. Kirby, C. L. Hubbs and M. Dahlheim (1980). "Distribution and movements of Risso's dolphin, *Grampus griseus*, in the eastern North Pacific." Fishery Bulletin 77(4): 951-963.

Leatherwood, S., R.R. Reeves, W.F. Perrin, and W.E. Evans (1982). Whales, dolphins, and porpoises of the Eastern North Pacific and adjacent Arctic waters: A guide to their identification. NOAA Technical Report NMFS Circular**:** 245.

Leatherwood, S., R. R. Reeves, A. E. Bowles, B. S. Stewart and K. R. Goodrich (1984). "Distribution, seasonal movements and abundance of Pacific white-sided dolphins in the eastern North Pacific." Scientific Reports of the Whales Research Institute 35: 129-157.

Leatherwood, S. and W. A. Walker (1979). The northern right whale dolphin *Lissodelphis borealis* peale in the eastern North Pacific. In Behavior of Marine Animals. H. E. Winn and B. L. Olla, Plenum Press. 3**:** 85-141.

Lefebrve, K. A., Robertson, A., Frame, E. R., Colegrove, K. M., Nance, S., Baugh, K. A., . . . Gulland, F. M. D. (2010). Clinical signs and histopathology associated with domoic acid poisoning in northern fur seals (*Callorhinus ursinus*) and comparison of toxin detection methods. *Harmful Algae, 9*, 374-383. doi: 10.1016/j.hal.2010.01.007.

Lesage, V., Barrette, C., Kingsley, M. C. S. & Sjare, B. (1999). The effect of vessel noise on the vocal behavior of belugas in the St. Lawrence River estuary, Canada. *Marine Mammal Science, 15*(1), 65-84.

Leslie, M. S., A. Batibasaga, D. S. Weber, D. Olson and H. C. Rosenbaum (2005). "First record of Blainville's beaked whale *Mesoplodon densirostris* in Fiji." Pacific Conservation Biology 11(4): 302-304.

Li, S., Akamatsu, T., Wang, D., Wang, K., Dong, S., Zhao, X., . . . Brandon, J. R. (2008). Indirect evidence of boat avoidance behavior of Yangtze finless porpoises. *Bioacoustics* 17: 174-176.

Lidgard, D. C., Boness, D. J., Bowen, W. D. & McMillan, J. I. (2008). The implications of stress on male mating behavior and success in a sexually dimorphic polygynous mammal, the grey seal. *Hormones and Behavior, 53*, 241–248.

Lindstrom, U. and T. Haug (2001). "Feeding strategy and prey selectivity in common minke whales (Balaenoptera acutorostrata) foraging in the southern Barents Sea during early summer." Journal of Cetacean Research and Management 3(3): 239-250.

Lipsky, J. D. (2009). Right whale dolphins *Lissodelphis borealis* and *L. peronii*. In Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen. Amsterdam, Academic Press**:** 958-962.

Littnan, C. (2011). *Habitat Use and Behavioral Monitoring of Hawaiian Monk Seals in Proximity to the Navy Hawaii Range Complex. Report Period: August 2010-July 2011.* Appendix M, HRC annual monitoring report for 2011, submitted to National Marine Fisheries Service.

Littnan, C. L., B. S. Stewart, P. K. Yochem and R. Braun (2007). "Survey of selected pathogens and evaluation of disease risk factors for endangered Hawaiian monk seals in the main Hawaiian Islands." EcoHealth 3: 232–244.

Lodi, L. and B. Hetzel (1999). "Rough-toothed dolphin, Steno bredanensis, feeding behaviors in Ilha Grande Bay, Brazil." Biociências 7(1): 29-42.

Look, D. (2011). Pacific Island Region Marine Mammal Response Network unpublished data (Excel file) via personal email communication. Emaion and data are on file.

Loughlin, T. R., D. J. Rugh and C. H. Fiscus (1984). "Northern sea lion distribution and abundance: 1965-80." Journal of Wildlife Management 48: 729-740.

Loughlin, T. R. and M. A. Perez (1985). "Mesoplodon stejengeri." Mammalian Species 250: 1-6.

Lowry, M. S., P. Boveng, R. J. DeLong, C. W. Oliver, B. S. Stewart, H. DeAnda and J. Barlow (1992). *Status of the California sea lion (*Zalophus californianus californianus*) population in 1992*, National Marine Fisheries Service**:** 34.

Lowry, M. S. and K. A. Forney (2005). "Abundance and distribution of California sea lions (*Zalophus californianus*) in central and northern California during 1998 and summer 1999." Fishery Bulletin 103: 331-343.

Lowry, M. S., J. V. Carretta and K. A. Forney (2008). "Pacific harbor seal census in California during May-July 2002 and 2004." California Fish and Game 94(4): 180-193.

Lucke, K., Siebert, U., Lepper, P. A. & Blanchet, M.-A. (2009). Temporary shift in masked hearing thresholds in a harbor porpoise (*Phocoena phocoena*) after exposure to seismic airgun stimuli. *Journal of the Acoustical Society of America, 125*(6), 4060–4070.

Luksenburg, J. A. & E. C. M. Parsons (2009). The effects of aircraft on cetaceans: implications for aerial whalewatching, Department of Environmental Science and Policy, George Mason University: 10.

Lusseau, D. (2004). The hidden cost of tourism: Detecting long-term effects of tourism using behavioral information. *Ecology and Society* 9(1): 2.

Lusseau, D., D. E. Bain, R. Williams and J. C. Smith (2009). "Vessel traffic disrupts the foraging behavior of southern resident killer whales *Orcinus orca*." Endangered Species Research 6: 211–221.

Lux, C. A., A. S. Costa and A. E. Dizon (1997). "Mitochondrial DNA population structure of the Pacific white-sided dolphin." Reports of the International Whaling Commission 47: 645-652.

MacLeod, C. D. (2005). Niche partitioning, distribution and competition in North Atlantic beaked whales. Ph.D. Ph.D dissertation, University of Aberdeen.

MacLeod, C. D. and A. D'Amico (2006). "A review of beaked whale behaviour and ecology in relation to assessing and mitigating impacts of anthropogenic noise." Journal of Cetacean Research and Management **7**(3): 211-222.

MacLeod, C. D., N. Hauser and H. Peckham (2004). "Diversity, relative density and structure of the cetacean community in summer months east of Great Abaco, Bahamas." Journal of the Marine Biological Association of the United Kingdom 84: 469-474.

MacLeod, C. D. and G. Mitchell (2006). "Key areas for beaked whales worldwide." Journal of Cetacean Research and Management 7(3): 309-322.

MacLeod, C. D., N. Hauser and H. Peckham (2003). "Review of data on diets of beaked whales: evidence of niche separation and geographic segregation." Journal of the Marine Biological Association of the United Kingdom 83: 651-665.

MacLeod, C. D., N. Hauser and H. Peckham (2006a). "Known and inferred distributions of beaked whale species (Ziphiidae: Cetacea)." Journal of Cetacean Research and Management 7(3): 271-286.Macleod, C.D., Simmonds, M.P., and E. Murry (2006b). Abundance of fin (*Balaenoptera physalus*) and sei whales (B*. borealis*) amid oil exploration and development off northwest Scotland. Journal of Cetacean Research and Management (3) Vol. 8, pp. 247-254.

Madsen, P. T., D. A. Carder, K. Bedholm and S. H. Ridgway (2005). "Porpoise clicks from a sperm whale nose – convergent evolution of 130 kHz pulses in toothed whale sonars?" Bioacoustics 15: 195–206.

Madsen, P. T., Johnson, M., Miller, P. J., Aguilar Soto, N., Lynch, J. & Tyack, P. (2006). Quantitative measures of air-gun pulses recorded on sperm whales (*Physeter macrocephalus*) using acoustic tags during controlled exposure experiments. *Journal of the Acoustical Society of America, 120*(4), 2366-2379. Retrieved from http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=17069331

Magalhães, S., R. Prieto, M. A. Silva, J. Gonçalves, M. Afonso-Dias, & R.S. Santos (2002). Short-term reactions of sperm whales (*Physeter macrocephalus*) to whale-watching vessels in the Azores. *Aquatic Mammals, 28*(3), 267-274.

Maldini, D., L. Mazzuca and S. Atkinson (2005). "Odontocete stranding patterns in the main Hawaiian Islands (1937-2002): How do they compare with live animal surveys?" Pacific Science 59(1): 55-67.

Maldini Feinholz, D. (1996). *Pacific coastal bottlenose dolphins (*Tursiops truncatus gilli*) in Monterey Bay, California*. Master of Science M.Sc. thesis, San Jose State University.

Maldini Feinholz, D. (2003). Abundance and distribution patterns of Hawaiian odontocetes: Focus on O'ahu. Ph. D. Ph.D. dissertation, University of Hawaii.

Malme, C. I., Würsig, B., Bird, J. E. & Tyack, P. (1986). Behavioral responses of gray whales to industrial noise: Feeding observations and predictive modelling *Outer Continental Shelf Environmental*

Assessment Program, Final Report of Principal Investigators. (Vol. 56, pp. 393–600). Report 6265 (OCS Study MMS 88-0048) by Bolt Beranek, & Newman, Inc., Cambridge, MA, for National Oceanic and Atmospheric Administration, Anchorage, AK: Available as NTIS PB88-249008 from U.S. National Technical Information Service, 5285 Port Royal Road, Springfield, VA.

Malme, C. I., Wursig, B., Bird, J. E. & Tyack, P. (1988). Observations of feeding gray whale responses to controlled industrial noise exposure W. M. Sackinger, M. O. Jeffries, J. L. Imm and S. D. Tracey (Eds.), *Port and Ocean Engineering Under Arcitc Conditions* (Vol. 2, pp. 55-73). Fairbanks, AK: Geophysical Institute, Unversity of Alaska.

Manci, K. M., Gladwin, D. N., Villella, R. & Cavendish, M. G. (1988). *Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: A Literature Synthesis*. (NERC-88/29, pp. 88). Ft. Collins, Colorado: U. S. Fish and Wildlife Service, National Ecology Research Center.

Maniscalco, J. M., K. Wynne, K. W. Pitcher, M. B. Hanson, S. R. Melin and S. Atkinson (2004). "The occurrence of California sea lions (*Zalophus californianus*) in Alaska." Aquatic Mammals 30(3): 427-433.

Maravilla-Chavez, M. O. and M. S. Lowry (1999). "Incipient breeding colony of Guadalupe fur seals at Isla Benito del Este, Baja California, Mexico." Marine Mammal Science 15(1): 239-241.

Marcoux, M., H. Whitehead and L. Rendell (2007). "Sperm whale feeding variations by location, year, social group and clan: Evidence from stable isotopes." Marine Ecology Progress Series 333: 309-314.

Marine Mammal Commission. (2002). Hawaiian monk seal (*Monachus schauinslandi*). Species of Special Concern, Annual Report to Congress, 2001. Bethesda, MD, Marine Mammal Commission**:** 63-76.

Marine Mammal Commission (2003). *Workshop on the management of Hawaiian monk seals on beaches in the main Hawaiian Islands***:** 5.

Marine Mammal Commission. (2006). Annual Report to Congress 2005.

Marine Mammal Commission. (2010). The Marine Mammal Commission Annual Report to Congress 2009 (pp. 296).

Marine Species Modeling Team. (2012). Determination of Acoustic Effects on Marine Mammals and Sea Turtles for the Hawaii-Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement. NUWC-NPT Technical Report 12,084a, 24 September 2012 (updated from 12 March 2012), Navy Undersea Warfare Center, Code 70, Newport, RI.

Marcoux, M., H. Whitehead and L. Rendell (1996). "Aerial behavior in fin whales (*Balaenoptera physalus*) in the Mediterranean Sea." Marine Mammal Science 12(3): 489-495.

Marsh, H. E. (1989). "Mass Stranding of Dugongs by a Tropical Cyclone in Northern Australia." Marine Mammal Science 5(1): 78-84.

Marsh H. and D.F. Sinclair (1989) Correcting for visibility bias in strip transect aerial surveys of aquatic fauna. Journal of Wildlife Management 53:1017-1024.

Marten, K. (2000). "Ultrasonic analysis of pygmy sperm whale (*Kogia breviceps*) and Hubbs' beaked whale (*Mesoplodon carlhubbsi*) clicks." Aquatic Mammals 26(1): 45-48.

Marten, K. and S. Psarakos (1999). "Long-term site fidelity and possible long-term associations of wild spinner dolphins (*Stenella longirostris*) seen off Oahu, Hawaii." Marine Mammal Science 15(4): 1329-1336.

Martin, S. W. and T. Kok (2011). Report on Analysis for Marine Mammals Before, During and After the February 2011 Submarine Commanders Course Training Exercise. Pacific Fleet's 3022 Annual Monitoring Report NMFS: Appendix N.

Masaki, Y. (1976). "Biological studies on the North Pacific sei whale." Bulletin of the Far Seas Fisheries Research Laboratory 14: 1-104.

Masaki, Y. (1977). "The separation of the stock units of sei whales in the North Pacific." Reports of the International Whaling Commission (Special Issue 1): 71-79.

Marcoux, M., H. Whitehead and L. Rendell (1998). "Local and migratory movements of Hawaiian humpback whales tracked by satellite telemetry." Canadian Journal of Zoology 76: 863-868.

Marcoux, M., H. Whitehead and L. Rendell (1999). "Movements of north Pacific blue whales during the feeding season off Southern California and their southern fall migration." Marine Mammal Science 15(4): 1246-1257.

Mate, B. and J. Urban-Ramirez (2003). A note on the route and speed of a gray whale on its northern migration from Mexico to central California, tracked by satellite-monitored radio tag. Journal of Cetacean Research 5(2):155—l57.

Mate, B.R., Lagerquist, B. and Irvine, L. (2010). Feeding habitats, migration, and winter reproductive range movements derived from satellite-monitored radio tags on eastern North Pacific gray whales. Paper SC/62/BRG21 presented to the International Whaling Commission Scientific Committee. 22 pp.

Matkin, C. O., Saulitis, E. L., Ellis, G. M., Olesiuk, P. & Rice, S. D. (2008). Ongoing population-level impacts on killer whales *Orcinus orca* following the 'Exxon Valdez' oil spill in Prince William Sound, Alaska. *Marine Ecology Progress Series, 356*, 269-281. doi: 10.3354/meps07273.

Mattson, M. C., Thomas, J. A. & St. Aubin, D. (2005). Effects of boat activity on the behavior of bottlenose dolphins (*Tursiops truncatus*) in waters surrounding Hilton Head Island, South Carolina. *Aquatic Mammals* 31(1): 133-140.

May-Collado, L. J. & Wartzok, D. (2008). A comparison of bottlenose dolphin whistles in the Atlantic Ocean: Factors promoting whistle variation. *Journal of Mammalogy, 89*(5), 1229–1240.

McAlpine, D. F. (2009). Pygmy and dwarf sperm whales *Kogia breviceps* and *K. sima.* In. Encyclopedia of Marine Mammals (Second Edition). W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 936-938.

McCarthy, E., D. Moretti, L. Thomas, N. DiMarzio, R. Morrissey, S. Jarvis, J. Ward, A. M. Izzi and A. Dilley (2011). "Changes in spatial and temporal distribution and vocal behavior of Blainville's beaked whales (Mesoplodon densirostris) during multiship exercises with mid-frequency sonar." Marine Mammal Science.

McCracken, M.L., and K.A Forney (2010). Preliminary Assessment of Incidental Interactions with Marine Mammals in the Hawaii Longline Deep and Shallow Set Fisheries. National Marine Fisheries Service, PIFSC Working Paper WP-10-001.

McCauley, R. D., Jenner, M. N., Jenner, C., McCabe, K. A. & Murdoch, J. (1998). The response of humpback whales (*Megaptera novaeangliae*) to offshore seismic survey noise: Preliminary results of observations about a working seismic vessel and experimental exposures. *APPEA Journal*, 692-706.

McDonald, M. A., Hildebrand, J. A. & Webb, S. C. (1995). Blue and fin whales observed on a seafloor array in the Northeast Pacific. *Journal of the Acoustical Society of America, 98*(2), 712-721.

McDonald, M. A., Hildebrand, J. A. & Wiggins, S. M. (2006). Increases in deep ocean ambient noise in the Northeast Pacific west of San Nicolas Island, California. *Journal of the Acoustical Society of America, 120*(2), 711–718.

McDonald, M., J. Hildebrand, S. Wiggins and D. Ross (2008). "A 50 Year comparison of ambient ocean noise near San Clemente Island: A bathymetrically complex coastal region off Southern California." Journal of the Acoustical Society of America: 1985-1992.

McShane, L. J., Estes, J. A., Riedman, M. L. & Staedler, M. M. (1995). Repertoire, structure, and individual variation of vocalizations in the sea otter. *Journal of Mammalogy*, 414-427.

McSweeney, D. J., R. W. Baird and S. D. Mahaffy (2007). "Site fidelity, associations, and movements of Cuvier's (*Ziphius cavirostris*) and Blainville's (*Mesoplodon densirostris*) beaked whales off the Island of Hawaii." Marine Mammal Science 23(3): 666-687.

McSweeney, D., R. Baird, S. Mahaffy, D. Webster and G. Schorr (2009). "Site fidelity and association patterns of a rare species: Pygmy killer whales (Feresa attenuata) in the main Hawaiian Islands." Marine Mammal Science 25(3): 557-572.

Mead, J. G. (1981). "First records of *Mesoplodon hectori* (Ziphiidae) from the Northern Hemisphere and a description of the adult male." Journal of Mammalogy 62(2): 430-432.

Mead, J. G. (1989). Beaked whales of the genus *Mesoplodon.* In. Handbook of Marine Mammals. S. H. Ridgway and R. Harrison. San Diego, CA, Academic Press. 4: 349-430.

Mead, J. G. and C. W. Potter (1995). "Recognizing two populations of the bottlenose dolphin (*Tursiops truncatus*) off the Atlantic Coast of North America: Morphologic and ecologic considerations." IBI Reports 5: 31-44.

Mead, J. G., W. A. Walker and W. J. Houck (1982). "Biological observations on *Mesoplodon carlhubbsi* (Cetacea: Ziphiidae)." Smithsonian Contributions to Zoology 344: 1-25.

Melcón, M. L., A. J. Cummins, S. M. Kerosky, L. K. Roche, S. M. Wiggins et al. (2012). Blue Whales Respond to Anthropogenic Noise. PLoS ONE 7(2): e32681.

Melin, S. R. and R. L. Delong (1999). "Observations of a Guadalupe fur seal (*Arctocephalus townsendi*) female and pup at San Miguel Island, California." Marine Mammal Science 15(3): 885-887.

Melin, S. R. and R. L. DeLong (2000). At-sea distribution and diving behavior of California sea lion females from San Miguel Island, California. In Proceedings of the Fifth California Islands Symposium. D. R. Browne, K. L. Mitchell and H. W. Chaney, Minerals Management Service**:** 407-412.

Mesnick, S.L., B.L. Taylor, F.I. Archer, K.K. Martien, S. Escorza Trevino, B.L. Hancock, S.C. Moreno Medina, V.L. Pease, K.M. Robertson, J.M. Straley, R.W. Baird, J. Calambokidis, G.S. Schorr, P. Wade, V. Burkanov, C.R. Lunsford, L. Rendell, and P.A. Morin (2011). Sperm whale population structure in the eastern and central North Pacific inferred by the use of single-nucleotide polymorphisms, microsatellites and mitochondrial DNA. Molecular Ecology Resources 11:278-298.

Mignucci-Giannoni, A. A. (1998). "Zoogeography of cetaceans off Puerto Rico and the Virgin Islands." Caribbean Journal of Science 34(3-4): 173-190.

Miksis, J. L., Connor, R. C., Grund, M. D., Nowacek, D. P., Solow, A. R. & Tyack, P. L. (2001). Cardiac responses to acoustic playback experiments in the captive bottlenose dolphin (*Tursiops truncatus*). *Journal of Comparative Psychology, 115*(3), 227-232.

Miksis-Olds, J. L., Donaghay, P. L., Miller, J. H., Tyack, P. L. & Reynolds, J. E., III (2007). Simulated vessel approaches elicit differential responses from manatees. *Marine Mammal Science, 23*(3), 629-649. doi:10.1111/j.1748-7692.2007.00133.x

Miksis-Olds, J. L. & Tyack, P. L. (2009). Manatee (*Trichechus manatus*) vocalization usage in relation to environmental noise levels. *The Journal of the Acoustical Society of America, 125*(3), 1806-1815. Retrieved from http://link.aip.org/link/?JAS/125/1806/1

Miller, J. D. (1974). Effects of noise on people. *Journal of the Acoustical Society of America, 56*(3), 729-764.

Miller, E. J. (1989). Distribution and behavior of Dall's porpoise (*Phocoenoides dalli*) in Puget Sound, Washington Master's, University of Washington.

Miller, J. D., Watson, C. S. & Covell, W. P. (1963). Deafening effects of noise on the cat. *Acta Oto-Laryngologica, Supplement 176*, 1-88.

Miller, K. W. and V. B. Scheffer (1986). False killer whale. In. Marine Mammals of the Eastern North Pacific and Arctic Waters. D. Haley, Pacific Search Press**:** 148-151.

Miller, E. H. (1991). Communication in pinnipeds, with special reference to non-acoustic signalling. The Behaviour of Pinnipeds. D. Renouf. London, Chapman and Hall: 128–235.

Miller, P. J. O., Biassoni, N., Samuels, A. & Tyack, P. L. (2000). Whale songs lengthen in response to sonar. *Nature, 405*(6789), 903.

MIller, P. J. O., Johnson, M. P., Madsen, P. T., Biassoni, N., Quero, M. & Tyack, P. L. (2009). Using at-sea experiments to study the effects of airguns on the foraging behavior of sperm whales in the Gulf of Mexico. *Deep-Sea Research I, 56*, 1168-1181. doi:10.1016/j.dsr.2009.02.008

Miller, P., Antunes, R., Alves, A. C., Wensveen, P., Kvadsheim, P., Kleivane, L., Nordlund, N., Lam, F.-P., van IJsselmuide, S., Visser, F. & Tyack, P. (2011). The 3S experiments: studying the behavioural effects of naval sonar on killer whales (*Orcinus orca*), sperm whales (*Physeter macrocephalus*), and long-finned pilot whales (*Globicephala melas*) in Norwegian waters *Scottish Oceans Inst. Tech. Rept., SOI-2011-001*.

Mintz, J. D. & Filadelfo, R. J. (2011). Exposure of Marine Mammals to Broadband Radiated Noise. Prepared by CNA.

Mitchell, E. (1968). "Northeast Pacific stranding distribution and seasonality of Cuvier's beaked whale *Ziphius cavirostris*." Canadian Journal of Zoology 46: 265-279.

Miyashita, T. (1993). "Distribution and abundance of some dolphins taken in the North Pacific driftnet fisheries." International North Pacific Fisheries Commission Bulletin 53(3): 435-450.

Miyashita, T., T. Kishiro, N. Higashi, F. Sato, K. Mori and H. Kato (1996). "Winter distribution of cetaceans in the western North Pacific inferred from sighting cruises 1993-1995." Reports of the International Whaling Commission 46: 437-442.

Miyazaki, N. and W. F. Perrin (1994). Rough-toothed dolphin *Steno bredanensis* (Lesson, 1828). In Handbook of Marine Mammals. S. H. Ridgway and R. Harrison. San Diego, CA, Academic Press. **5:** 1-21.

Miyazaki, N. and S. Wada (1978). "Fraser's dolphin, *Lagenodelphis hosei* in the western North Pacific." Scientific Reports of the Whales Research Institute 30: 231-244.

Miyazaki, N. and S. Wada (1978). "Observation of Cetacea during whale marking cruise in the western tropical Pacific, 1976." Scientific Reports of the Whales Research Institute 30: 179-195.

Mizroch, S. A., D. W. Rice, D. Zwiefelhofer, J. Waite and W. L. Perryman (2009). "Distribution and movements of fin whales in the North Pacific Ocean." Mammal Review 39: 193-227.

Mobley, J. R. (2004). *Results of Marine Mammal Surveys on U.S. Navy Underwater Ranges in Hawaii and Bahamas***:** 27.

Mobley, J. R. (2005). "Assessing responses of humpback whales to North Pacific Acoustic Laboratory (NPAL) transmissions: Results of 2001-2003 aerial surveys north of Kauai." Journal of the Acoustical Society of America 117: 1666-1773.

Mobley, J. R., Jr., L. Mazzuca, A. S. Craig, M. W. Newcomer and S. S. Spitz (2001a). "Killer whales (Orcinus orca) sighted west of Ni'ihau, Hawai'i." Pacific Science 55: 301-303.

Mobley, J., S. Spitz and R. Grotefendt (2001b). Abundance of Humpback Whales in Hawaiian Waters: Results of 1993-2000 Aerial Surveys, Hawaiian Islands Humpback Whale National Marine Sanctuary, Department of Land and Natural Resources, State of Hawaii: 17.

Mobley, J. R., Jr., S. S. Spitz, K. A. Forney, R. Grotefendt and P. H. Forestell (2000). *Distribution and Abundance of Odontocete Species in Hawaiian Waters: Preliminary Results of 1993-98 Aerial Surveys*, Southwest Fisheries Science Center**:** 26.

Mobley, J. R., Jr., M. Smultea, T. Norris and D. Weller (1996). "Fin whale sighting north of Kaua'i, Hawai'i." Pacific Science **50**: 230-233.

Mobley, J. R., Jr., G. B. Bauer and L. M. Herman (1999). "Changes over a ten-year interval in the distribution and relative abundance of humpback whales (Megaptera novaeangliae) wintering in Hawaiian waters." Aquatic Mammals 25: 63-72.

Møhl, B. (1968). "Auditory sensitivity of the common seal in air and water." Journal of Auditory Research 8: 27-38.

Møhl, B., Wahlberg, M., Madsen, P. T., Heerfordt, A. & Lund, A. (2003). The monopulsed nature of sperm whale clicks. *Journal of the Acoustical Society of America, 114*(2), 1143-1154.

Moon, H. B., Kannan, K., Choi, M., Yu, J., Choi, H. G., An, Y. R., . . . Kim, Z. G. (2010). Chlorinated and brominated contaminants including PCBs and PBDEs in minke whales and common dolphins from Korean coastal waters. *Journal of Hazardous Materials, 179*(1-3), 735-741.

Mooney, T. A., Nachtigall, P. E., Castellote, M., Taylor, K. A., Pacini, A. F. & Esteban, J. A. (2008). Hearing pathways and directional sensitivity of the beluga whale, Delphinapterus leucas. [doi: 10.1016/j.jembe.2008.06.004]. *Journal of Experimental Marine Biology and Ecology, 362*(2), 108-116. Retrieved from http://www.sciencedirect.com/science/article/pii/S0022098108002645

Mooney, T. A., Nachtigall, P. E., Breese, M., Vlachos, S. & Au, W. W. L. (2009). Predicting temporary threshold shifts in a bottlenose dolphin (Tursiops truncatus): The effects of noise level and duration. The Journal of the Acoustical Society of America, 125(3), 1816-1826. Retrieved from http://link.aip.org/link/?JAS/125/1816/1

Moore, J. C. (1972). "More skull characters of the beaked whale *Indopacetus pacificus* and comparative measurements of austral relatives." Fieldiana Zoology 62: 1-19.

Moore, P. W. B. & Schusterman, R. J. (1987). Audiometric assessment of northern fur seals, Callorhinus ursinus. Marine Mammal Science, 3(1), 31-53.Moore, S. E., W. A. Watkins, et al. (2002). "Blue whale habitat associations in the northwest Pacific: Analysis of remotely-sensed data using a Geographic Information System." Oceanography 15: 20-25.

Moore, M. J., Bogomolni, A. L., Dennison, S. E., Early, G., Garner, M. M., Hayward, B. A., Lentell, B. J. & Rotstein, D. S. (2009). Gas bubbles in seals, dolphins, and porpoises entangled and drowned at depth in gillnets. *Veterinary Pathology, 46*, 536–547.

Moore, J. E. and J. Barlow (2011). "Bayesian state-space model of fin whale abundance trends from a 1991-2008 time series of line-transect surveys in the California Current." Journal of Applied Ecology: 1-11.

Moore, J.E., and J. P. Barlow (2013). Declining Abundance of Beaked Whales (Family Ziphiidae) in the California Current Large Marine Ecosystem. PLoS ONE 8(1):e52770. doi:10.1371/journal.pone.0052770.

Moretti, D., DiMarzio, N., Morrissey, R., McCarthy, E., Jarvis, S. & Dilley, A. (2009). An opportunistic study of the effect of sonar on marine mammals, marine mammal monitoring on navy ranges (M3R).

Presented at the 2009 Office of Naval Research Marine Mammal Program Review 7-10 December Alexandria, VA.

Morton, A. (2000). "Occurrence, photo-identification and prey of Pacific white-sided dolphins (*Lagen*orhynchus obliquidens) in the Broughton Archipelago, Canada 1984-1998." Marine Mammal Science 16(1): 80-93.

Moulton, V. D., W.J. Richardson, R.E. Elliott, T.L. McDonald, and M.T. Williams (2005). Effects of an offshore oil development on local abundance and distribution of ringed seals (Phoca hispida) of the Alaskan Beaufort Sea. Marine Mammal Science. 21(2):217-242.

Murata, S., K. Nomiyama, T. Kunisue, S. Takahashi, T.K. Yamada, and S. Tanabe. (2009). Hydroxylated Polychlorinated Biphenyls in the Blood of Cetaceans Stranded along the Japanese Coast. In interdisciplinary studies on environmental chemistry – Environmental research in Asia. Eds., Y. Obayashi, T. Isobe, A. Subramanian, S. Suzuki and S. Tanabe. pp. 55–66.

Mussi, B., A. Miragliuolo, T. De Pippo, M. C. Gambi and D. Chiota (2004). "The submarine canyon of Cuma (southern Tyrrhenian Sea, Italy), a cetacean key area to protect." European Research on Cetaceans 15: 178-179.

Nachtigall, P. E., J. L. Pawloski and W. W. L. Au. (2003). "Temporary threshold shifts and recovery following noise exposure in the Atlantic bottlenosed dolphin (Tursiops truncatus)." Journal of the Acoustical Society of America 113(6): 3425-3429.

Nachtigall, P. E., A. Y. Supin, J. Pawloski and W. W. L. Au.(2004). "Temporary threshold shifts after noise exposure in the bottlenose dolphin (Tursiops truncatus) measured using evoked auditory potentials." Marine Mammal Science 20(4): 673-687.

Nachtigall, P. E., T. A. Mooney, K. A. Taylor, L. A. Miller, M. H. Rasmussen, T. Akamatsu, J. Teilmann, M. Linnenschmidt and G. A. Vikingsson (2008). "Shipboard Measurements of the Hearing of the White-Beaked Dolphin Lagenorhynchus albirostris." The Journal of Experimental Biology 211: 642-647.

Nachtigall, P. E., A. Y. Supin, M. Amundin, B. Roken, T. Møller, T. A. Mooney, K. A. Taylor and M. Yuen (2007). "Polar bear Ursus maritimus hearing measured with auditory evoked potentials." The Journal of Experimental Biology 210(7): 1116-1122.

Nachtigall, P. E., M. M. L. Yuen, T. A. Mooney and K. A. Taylor (2005). "Hearing measurements from a stranded infant Risso's dolphin, Grampus griseus." Journal of Experimental Biology 208: 4181-4188.

Nagorsen, D. W. and G. E. Stewart (1983). "A dwarf sperm whale (*Kogia simus*) from the Pacific coast of Canada." Journal of Mammalogy 64(3): 505-506.

National Institute for Occupational Safety and Health. (1998). Criteria for a Recommended Standard: Occupational Noise Exposure (Revised Criteria 1998). Cincinnati, Ohio, United States Department of Health and Human Services, Centers for Disease Control and Prevention: 83.

National Marine Fisheries Service. (1976). "Hawaiian monk seal final regulations." Federal Register 41(227): 51611-51612.

National Marine Fisheries Service. (1986). "Designated critical habitat; Hawaiian monk seal." Federal Register 51(83): 16047-16053.

National Marine Fisheries Service. (1988). "Critical habitat; Hawaiian monk seal; Endangered Species Act." Federal Register 53(102): 18988-18998.

National Marine Fisheries Service. (1998). *Draft Recovery Plan for the Fin Whale* Balaenoptera physalus *and Sei Whale* Balaenoptera borealis. (pp. 66). Silver Spring, MD: U. S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources.

National Marine Fisheries Service. (2001a). Environmental Assessment on the Implementation of the Reasonable and Prudent Alternative Required by the Biological Opinion on the Issuance of the Marine Mammal Permit Under Section 101(a)(5)(E) of the Marine Mammal Protection Act.

National Marine Fisheries Service. (2001b). Regulations Governing Approaching Humpback Whales in Hawaii. 50 C.F.R. 224.103(a)(b)(c).

National Marine Fisheries Service. (2005). Assessment of Acoustic Exposures on Marine Mammals in Conjunction with USS Shoup Active Sonar Transmissions in the Eastern Strait of Juan de Fuca and Haro Strait, Washington, 5 May 2003. National Marine Fisheries Service, Office of Protected Resources.

National Marine Fisheries Service (2006). Pacific Islands Region, Marine Mammal Response Network Activity Update. January – March 2006. Available from: http://www.fpir.noaa.gov/Library/PRD/Marine%20Mammal%20Response/PIR%20hot%20topics%201%20FINAL.pdf

National Marine Fisheries Service. (2007a). Pacific Islands Region, Marine Mammal Response Network Activity Update #5.

National Marine Fisheries Service. (2007b). *Conservation Plan for the Eastern Pacific Stock of Northern Fur Seal (*Callorhinus ursinus*)*. Juneau, AK, NMFS Protected Resources Division, Alaska Region.

National Marine Fisheries Service. (2007c). "Endangered and threatened species; recovery plans." Federal Register **72**(162): 46966-46968.

National Marine Fisheries Service. (2007d). Recovery plan for the Hawaiian monk seal (*Monachus schauinslandi*). Silver Spring, MD, National Marine Fisheries Service**:** 165.

National Marine Fisheries Service. (2008a). Pacific Islands Region, Marine Mammal Response Network Activity Update #8.

National Marine Fisheries Service. (2008b). Taking and Importing of Marine Mammals; U.S. Navy Training in the Hawaii Range Complex; Proposed Rule. Federal Register, Monday, June 23, 2008, 73(121):35510-35577.

National Marine Fisheries Service. (2008c). Taking and Importing of Marine Mammals; U.S. Navy Training in the Southern California Range Complex; Proposed Rule. Federal Register, Tuesday, October 14, 2008, 7(199):60836-60908.

National Marine Fisheries Service. (2008d). "Listing endangered and threatened wildlife and designating critical habitat; 90–day finding for a petition to revise the critical habitat designation for the Hawaiian Monk Seal." Federal Register 73(193): 57583-57585.

National Marine Fisheries Service. (2009a). Taking and Importing of Marine Mammals; U.S. Navy Training in the Hawaii Range Complex; Final Rule. Federal Register, Monday, January 12, 2009, 74(7):1456-1491.

National Marine Fisheries Service. (2009b). Taking and Importing of Marine Mammals; U.S. Navy Training in the Southern California Range Complex; Final Rule. Federal Register, Wednesday, January 21, 2009, 74(12):3882-3918.

National Marine Fisheries Service. (2009c). "Endangered and threatened species: 12–month finding for a petition to revise critical habitat for Hawaiian monk seal." Federal Register 74(112): 27988-27993.

National Marine Fisheries Service. (2009d). "Endangered and threatened species; initiation of a status review for the humpback whale and request for information." Federal Register 74(154): 40568.

National Marine Fisheries Service. (2009e). *Sperm Whale (Physeter macrocephalus): 5-Year Review: Summary and Evaluation*. Silver Spring, MD, National Marine Fisheries Service Office of Protected Resources**:** 42.

National Marine Fisheries Service. (2009f). Pacific Islands Region, Marine Mammal Response Network Activity Update #12.

National Marine Fisheries Service. (2009g). Pacific Islands Region, Marine Mammal Response Network Activity Update #13.

National Marine Fisheries Service. (2010a). "Notice of intent to prepare a programmatic environmental impact statement on implementing recovery actions for Hawaiian monk seals." Federal Register 75(190): 60721-60723.

National Marine Fisheries Service. (2010b). Pacific Islands Regional Office. Hawaiian monk seal population and location. 2010.

National Marine Fisheries Service. (2010c). Pacific Islands Regional Office. Hawaiian monk seal top threats. 2010.

National Marine Fisheries Service. (2010d). Pacific Islands Regional Office. Protected Resources Volunteer Opportunities. 2010.

National Marine Fisheries Service. (2010e). Pacific Islands Region, Marine Mammal Response Network Activity Update #14 (pp. 6).

National Marine Fisheries Service. (2010f). Pacific Islands Region, Marine Mammal Response Network Activity Update #16

National Marine Fisheries Service. (2011a). Office of Protected Reosurces. Marine Mammal Health and Stranding Response Program website, accesses August 2011 at www.nmfs.noaa.gov/pr/health/.

National Marine Fisheries Service. (2011b). Southwest Region Stranding Database Excel file containing stranding from Southwest Region provided to Navy, manuscript on file.

National Marine Fisheries Service. (2011c). Pacific Science Center Stranding Data. Excel file containing stranding from the Hawaiian Islands, manuscript on file.

National Marine Fisheries Service. (2011d). Pacific Islands Region, Marine Mammal Response Network Activity Update #17.

National Marine Fisheries Service. (2011e). Final Recovery Plan for the Sei Whale (*Balaenoptera borealis*). National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD. 107 pp.

National Marine Fisheries Service. (2011f). Hawaiian Monk Seal Recovery 2009 – 2010: Program Update and Accomplishments Report. NOAA Fisheries Service, Pacific Islands Region.

National Marine Fisheries Service. (2012). Endangered and Threatened Wildlife and Plants; Endangered Status for the Main Hawaiian Islands Insular False Killer Whale Distinct Population Segment. Federal Register, 77(229), 70915-70939.

National Marine Fisheries Service. (2013). Final recovery plan for the North Pacific right whale (*Eubalaena japonica)*. National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD. Available from: http://www.nmfs.noaa.gov/pr/recovery/plans.htm.

National Oceanic and Atmospheric Administration. (1985). Threatened Fish and Wildlife; Guadalupe Fur Seal Final Rule. Federal Register, 50(241), 51252-51258.

National Oceanic and Atmospheric Administration. (2002). Report of the Workshop on Acoustic Resonance as a Source of Tissue Trauma in Cetaceans. National Marine Fisheries Service, Silver Spring, MD, pp. 19.

National Oceanic and Atmospheric Administration. (2009). National Marine Fisheries Service's Final Programmatic Environmental Impact Statement for the Marine Mammal Health and Stranding Response Program, February 2009. (pp. 1035) National Marine Fisheries Service.

National Oceanic and Atmospheric Administration. (2010). National Marine Fisheries Service's Final Biological Opinion for the Proposed Issuance of a United States Coast Guard Permit to the St. George Reef Lighthouse Preservation Society to Maintain the St. George Reef Lighthouse as a Private Aid to Navigation and its Effect on the Federally Threatened Eastern Distinct Population Segment of Steller Sea Lion and Designated Critical Habitat. (pp. 106)

National Oceanic and Atmospheric Administration. (2011).Protective Regulations for Killer Whales in the Northwest Region Under the Endangered Species Act and Marine Mammal Protection Act. Federal Register, 76(72), 20870-20890.

National Oceanic and Atmospheric Administration. (2012). Endangered and Threatened Wildlife and Plants; Endangered Status for the Main Hawaiian Islands Insular False Killer Whale Distinct Population Segment. Federal Register, 77(229), 70915-70939.

National Research Council. (2003). Ocean Noise and Marine Mammals (pp. 219). Washington, DC: National Academies Press.

National Research Council. (2005). Marine mammal populations and ocean noise. Washington, DC: National Academies Press.

National Research Council. (2006). Dynamic Changes in Marine Ecosystems: Fishing, Food Webs, and Future Options, Committee on Ecosystem Effects of Fishing: Phase II – Assessments of the Extent of Change and the Implications for Policy: National Research Council.

Natoli, A., V. M. Peddemors and A. R. Hoelzel (2004). "Population structure and speciation in the genus Tursiops based on microsatellite and mitochondrial DNA analyses." Journal of Evolutionary Biology 17: 363-375.

Navy Undersea Warfare Command (NUWC). (2012). Determination of Acoustic Effects on Marine Mammals and Sea Turtles for the Phase II Hawaii and Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement.

Neilson, J.L., J.M. Straley, C. M. Gabriele, and S. Hills. (2009). Non-lethal entanglement of humpback whales (*Megaptera novaeangliae*) in fishing gear in northern Southeast Alaska. Journal of Biogeography 46(3):452-464.

Nemoto, T. and A. Kawamura. (1977). "Characteristics of food habits and distribution of baleen whales with special reference to the abundance of North Pacific sei and Bryde's whales." Reports of the International Whaling Commission Special Issue 1: 80-87.

Newell, C. L. and T. J. Cowles. (2006). "Unusual gray whale *Eschrichtius robustus* feeding in the summer of 2005 off the central Oregon Coast." Geophysical Research Letters 33: L22S11.

Norman, S. A., C. E. Bowlby, M. S. Brancato, J. Calambokidis, D. Duffield, P. J. Gearin, T. A. Gornall, M. E. Gosho, B. Hanson, J. Hodder, S. J. Jeffries, B. Lagerquist, D. M. Lambourn, B. Mate, B. Norberg, R. W. Osborne, J. A. Rash, S. Riemer and J. Scordino. (2004). "Cetacean strandings in Oregon and Washington between 1930 and 2002." Journal of Cetacean Research and Management 6(1): 87-99.

Normandeau, Exponent, Tricas, T. & Gill, A. (2011). Effects of EMFs from undersea power cables on elasmobranchs and other marine species [Final report]. (OCS Study BOEMRE 2011-09, pp. 426). Camarillo, CA: U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific Outer Continental Shelf Region.

Norris, K. S. and T. P. Dohl (1980). "Behavior of the Hawaiian spinner dolphin, Stenella longirostris." Fishery Bulletin 77: 821-849.

Norris, K. S. & J. H. Prescott (1961). Observations on Pacific cetaceans of Californian and Mexican waters. *University of California Publications in Zoology* 63(4): 291-402.

Norris, K. S., B. Wursig, R. S. Wells and M. Wursig (1994). *The Hawaiian Spinner Dolphin*. Berkeley, CA, University of California Press**:** 408.

Norris, T. F., M. McDonald and J. Barlow (1999). "Acoustic detections of singing humpback whales (*Megaptera novaeangliae*) in the eastern North Pacific during their northbound migration." Journal of the Acoustical Society of America 106(1): 506-514.

Norris, T. F., M. A. Smultea, A. M. Zoidis, S. Rankin, C. Loftus, C. Oedekoven, J. L. Hayes and E. Silva (2005). *A Preliminary Acoustic-Visual Survey of Cetaceans in Deep Waters around Ni'ihau, Kaua'i, and portions of O'ahu, Hawai'i from Aboard the R/V* Dariabar. Bar Harbor, ME**:** 75.

Northridge, S. (2008). Fishing industry, effects of. In Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen. San Diego, CA, Academic Press**:** 443-447.

Norris, T. F., M. A. Smultea, A. M. Zoidis, S. Rankin, C. Loftus, C. Oedekoven, J. L. Hayes and E. Silva (1968). "20-Hz signals observed in the central Pacific." Journal of the Acoustical Society of America 43(2): 383-384.

Nowacek, D., M. Johnson and P. Tyack (2004). "North Atlantic right whales (Eubalaena glacialis) ignore ships but respond to alerting stimuli." Proceedings of the Royal Society of London 271(B): 227-231.

Nowacek, D., L. H. Thorne, D. Johnston and P. Tyack (2007). "Responses of cetaceans to anthropogenic noise." Mammal Review 37(2): 81-115.

Ocean Alliance. (2010). *The Voyage of the Odyssey: Executive Summary***:** 34.

Odell, D. K. and K. M. McClune (1999). False killer whale -- *Pseudorca crassidens* (Owen, 1846). In. Handbook of Marine Mammals, vol. 6: The Second Book of Dolphins and the Porpoises. S. H. Ridgway and S. R. Harrison. New York, Academic Press. 6: The second book of dolphins and the porpoises: 213-244.

Ohizumi, H., T. Isoda, T. Kishiro and H. Kato (2003). "Feeding habits of Baird's beaked whale *Berardius bairdii*, in the western North Pacific and Sea of Okhotsk off Japan." Fisheries Science 69: 11-20.

Ohizumi, H. and T. Kishiro (2003). "Stomach contents of a Cuvier's beaked whale (*Ziphius cavirostris*) stranded on the central Pacific coast of Japan." Aquatic Mammals 29(1): 99-103.

Ohizumi, H., T. Matsuishi and H. Kishino (2002). "Winter sightings of humpback and Bryde's whales in tropical waters of the western and central North Pacific." Aquatic Mammals 28(1): 73-77.

Ohizumi, H., T. Matsuishi and H. Kishino (2001). "Spatial and temporal structure of the western North Pacific minke whale distribution inferred from JARPN sightings data." Journal of Cetacean Research and Management 3(2): 193-200.

Oleson, E., and M. Hill (2009). *Report to PACFLT: Data Collection and Preliminary Results form the Main Hawaiian Islands Cetacean Assessment Survey & Cetacean Monitoring Associated with Explosives*

Training off Oahu. 2010 Annual Range Complex Monitoring Report for Hawaii and Southern Califonria.

Oleson, E. M., C. H. Boggs, K. A. Forney, B. Hanson, D. R. Kobayashi, B. L. Taylor, P. Wade and G. M. Ylitalo (2010). *Status Review of Hawaiian Insular False Killer Whales (*Pseudorca crassidens*) under the Endangered Species Act*, U.S. Department of Commerce and National Oceanic and Atmospheric Administration**:** 140 + Appendices.

Olson, P. A. (2009). Pilot whales *Globicephala melas* and *G. macrorhynchus*. In Encyclopedia of Marine Mammals. W. F. Perrin, B. Würsig and J. G. M. Thewissen. San Diego, CA, Academic Press**:** 898-903.

Ortiz, R. M. & Worthy, G. A. J. (2000). Effects of capture on adrenal steroid and vasopressin concentrations in free-ranging bottlenose dolphins (*Tursiops truncatus*). *Comparative Biochemistry and Physiology A, 125*(3), 317-324.

O'Shea, T.J. and R.L. Brownell Jr. (1994). Ogranochlorine and metal contanimants in baleen whales: a review and evaluation of conservation implications. The Science of the Total Environment 145: 179-200.

Östman-Lind, J., A. D. Driscoll-Lind and S. H. Rickards. (2004). *Delphinid Abundance, Distribution and Habitat Use off the Western Coast of the Island of Hawaii*. La Jolla, CA, National Marine Fisheries Service.

Oswald, J. N., J. Barlow and T. F. Norris. (2003). "Acoustic identification of nine delphinid species in the eastern tropical Pacific Ocean." Marine Mammal Science 19(1): 20-37.

Pacini, A. F., P. E. Nachtigall, C. T. Quintos, T. D. Schofield, D. A. Look, G. A. Levine and J. P. Turner (2011). Audiogram of a stranded Blainville's beaked whale (*Mesoplodon densirostris*) measured during auditory evoked potentials. Journal of Experimental *Biology* 214: 2409-2415.

Palka, D. L. & Hammond, P. S. (2001). Accounting for responsive movement in line transect estimates of abundance. *Canadian Journal of Fisheries and Aquatic Sciences, 58*, 777-787.

Panigada, S., M. Zanardelli, M. Mackenzie, C. Donovan, F. Melin and P. Hammond (2008). "Modelling habitat preferences for fin whales and striped dolphins in the Pelagos Sanctuary (Western Mediterranean Sea) with physiographic and remote sensing variables." Remote Sensing of Environment 112(8): 3400-3412.

Paniz-Mondolfi, A. E. and L. Sander-Hoffmann (2009). "Lobomycosis in inshore and estuarine dolphins." Emerging Infectious Diseases 15(4): 672-673.

Parks, S. E., Clark, C. W. & Tyack, P. L. (2007). Short- and long-term changes in right whale calling behavior: The potential effects of noise on acoustic communication. *Journal of the Acoustical Society of America, 122*(6), 3725–3731.

Parks, S. E. (2009). Assessment of acoustic adaptations for noise compensation in marine mammals. Presented at the 2009 Office of Naval Research Marine Mammal Program Review, 7-10 December Alexandria, VA.

Parrish, F. A., M. P. Craig, T. J. Ragen, G. J. Marshall and B. M. Buhleier (2000). "Identifying diurnal foraging habitat of endangered Hawaiian monk seals using a seal-mounted video camera." Marine Mammal Science 16(2): 392-412.

Parrish, F. A., G. J. Marshall, B. Buhleier and G. A. Antonelis (2008). "Foraging interaction between monk seals and large predatory fish in the Northwestern Hawaiian Islands." Endangered Species Research 4(3): 299-308.

Patenaude, N. J., Richardson, W. J., Smultea, M. A., Koski, W. R., Miller, G. W., Wursig, B. & Greene, C. R., Jr. (2002). Aircraft sound and disturbance to bowhead and beluga whales during spring migration in the Alaskan Beaufort Sea. *Marine Mammal Science, 18*(2), 309-335.

Payne, R. & Webb, D. (1971). Orientation by means of long range signaling in baleen whales. *188*, 110-141.

Payne, P. M. and D. W. Heinemann (1993). "The distribution of pilot whales (*Globicephala* spp.) in shelf/shelf edge and slope waters of the northeastern United States, 1978-1988." Reports of the International Whaling Commission Special Issue 14: 51-68.

Pepper, C. B., Nascarella, M. A. & Kendall, R. J. (2003). A review of the effects of aircraft noise on wildlife and humans, current control mechanisms, and the need for further study. *Environmental Management, 32*(4), 418-432.

Perkins, J. S. and G. W. Miller (1983). "Mass stranding of *Steno bredanensis* in Belize." Biotropica 15(3): 235-236.

Perrin, W. F. (1976). "First record of the melon-headed whale, *Peponocephala electra*, in the eastern Pacific, with a summary of world distribution." Fishery Bulletin 74(2): 457-458.

Perrin, W. F. (2001). "*Stenella attenuata*." Mammalian Species 683: 1-8.

Perrin, W. F. (2008a). Common dolphins *Delphinus delphis* and *D. capensis*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press: 255-259.

Perrin, W. F. (2008b). Pantropical spotted dolphin *Stenella attenuata*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press: 819-821.

Perrin, W. F. (2008c). Spinner dolphin *Stenella longirostris*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press: 1100-1103.

Perrin, W. F., P. B. Best, W. H. Dawbin, K. C. Balcomb, R. Gambell and G. J. B. Ross (1973). "Rediscovery of Fraser's dolphin *Lagenodelphis hosei*." Nature 241: 345-350.

Perrin, W. F. & Geraci, J. R. (2002). Stranding. In W. F. Perrin, B. Wursig and J. G. M. Thewissen (Eds.), *Encyclopedia of Marine Mammals* (pp. 1192-1197). San Diego: Academic Press.

Perrin, W. F. and J. W. Gilpatrick, Jr. (1994). Spinner dolphin *Stenella longirostris* (Gray, 1828). In Handbook of Marine Mammals, Volume 5: The first book of dolphins. S. H. Ridgway and R. Harrison. San Diego, CA, Academic Press. 5: 99-128.

Perrin, W. F. and A. A. Hohn (1994). Pantropical spotted dolphin *Stenella attenuata*. In Handbook of Marine Mammals. S. H. Ridgway and R. Harrison. San Diego, CA, Academic Press. 5: 71-98.

Perrin, W. F., C. E. Wilson and F. I. Archer, II (1994a). Striped dolphin--*Stenella coeruleoalba* (Meyen, 1833). In Handbook of Marine Mammals. S. H. Ridgway and R. Harrison. San Diego, CA, Academic Press. 5: The First Book of Dolphin**s:** 129-159.

Perrin, W. F., S. Leatherwood and A. Collet (1994b). Fraser's dolphin Lagenodelphis hosei Fraser, 1956. Handbook of Marine Mammals, Volume 5: The first book of dolphins. S. H. Ridgway and R. Harrison. San Diego, California, Academic Press**:** 225-240.

Perrin, W. F., S. Leatherwood and A. Collet (2008). *Encyclopedia of Marine Mammals*. San Diego, CA, Academic Press**:** 1316.

Perrin, W. F., C. S. Baker, A. Berta, D. J. Boness, R. L. Brownell, Jr., M. L. Dalebout, D. P. Domning, R. M. Hamner, T. A. Jefferson, J. G. Mead, D. W. Rice, P. E. Rosel, J. Y. Wang and T. Yamada (2009). *Marine Mammal Species and Subspecies*. Last updated 7 December 2009 by members of the Ad Hoc Committee on Taxonomy). Retrieved from http://www.marinemammalscience.org/index.php?option=com_contentandview=articleandid=420andItemid=280

Perry, S. L., D. P. DeMaster and G. K. Silber (1999). "The great whales: history and status of six species listed as Endangered under the U.S. Endangered Species Act of 1973." Marine Fisheries Review 61(1): 1-74.

Perryman, W. L. (2008). Melon-headed whale *Peponocephala electra*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 719-721.

Perryman, W. L., D. W. K. Au, S. Leatherwood and T. A. Jefferson (1994). Melon-headed whale Peponocephala electra Gray, 1846. Handbook of Marine Mammals, Volume 5: The first book of dolphins. S. H. Ridgway and R. Harrison, Academic Press**:** 363-386.

Perryman, W. L. and T. C. Foster (1980). *Preliminary Report on Predation by Small Whales, Mainly the False Killer Whale,* Pseudorca crassidens*, on Dolphins (*Stenella spp*. and* Delphinus delphis*) in the Eastern Tropical Pacific*. La Jolla, CA, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center**:** 9.

Phillips, Y. Y. & Richmond, D. R. (1990). Primary blast injury and basic research: A brief history R. Zajtchuk, D. P. Jenkins, R. F. Bellamy and C. Mathews-Quick (Eds.), *Textbook of Military Medicine: Conventional warfare, ballistic, blast, and burn injuries* (pp. 221-240). Office of the Surgeon General, Dept. of the Army, USA.

Philips, J. D., Nachtigall, P. E., Au, W. W. L., Pawloski, J. L. & Roitblat, H. L. (2003). Echolocation in the Risso's dolphin, Grampus griseus. *The Journal of the Acoustical Society of America, 113*(1), 605-616. Retrieved from http://dx.doi.org/10.1121/1.1527964

Piantadosi, C. A. & Thalmann, E. D. (2004). Whales, sonar and decompression sickness (pp. 1-2).

Pierce, G., M. Santos, C. Smeenk, A. Saveliev and A. Zuur (2007). "Historical trends in the incidence of strandings of sperm whales (*Physeter macrocephalus*) on North Sea coasts: An association with positive temperature anomalies." Fisheries Research 87(2-3): 219-228.

Pirotta, E., Milor, R., Quick, N., Moretti, D., Di Marzio, N., Tyack, P., Boyd, I. & Hastie, G. (2012). Vessel Noise Affects Beaked Whale Behavior: Results of a Dedicated Acoustic Response Study. [doi:10.1371/journal.pone.0042535]. *PLoS ONE, 7*(8), e42535. Retrieved from http://dx.doi.org/10.1371%2Fjournal.pone.0042535

Pitman, R. (2008a). Indo-Pacific beaked whale *Indopacetus pacificus*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 600-602.

Pitman, R. L. (2008b). Mesoplodont whales *Mesoplodon spp.* In. Encyclopedia of Marine Mammals (Second Edition). W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 721-726.

Pitman, R. L., D. W. K. Au, M. D. Scott and J. M. Cotton (1988). *Observations of Beaked Whales (*Ziphiidae*) from the Eastern Tropical Pacific Ocean*, International Whaling Commission.

Pitman, R. L. and L. T. Ballance (1992). "Parkinson's petrel distribution and foraging ecology in the eastern Pacific: Aspects of an exclusive feeding relationship with dolphins." The Condor 94: 825-835.

Pitman, R. L., H. Fearnbach, R. LeDuc, J. W. Gilpatrick, Jr., J. K. B. Ford and L. T. Ballance (2007). "Killer whales preying on a blue whale calf on the Costa Rica Dome: Genetics, morphometrics, vocalisations and composition of the group." Journal of Cetacean Research and Management 9(2): 151-157.

Pitman, R. L. and M. S. Lynn (2001). "Biological observations of an unidentified mesoplodont whale in the eastern tropical Pacific and probable identity: *Mesoplodon peruvianus*." Marine Mammal Science 17(3): 648-657.

Pitman, R. L. and C. Stinchcomb (2002). "Rough-toothed dolphins (Steno bredanensis) as predators of mahimahi (Coryphaena hippurus)." Pacific Science 56(4): 447-450.

Polacheck, T. & L. Thorpe (1990). The swimming direction of harbor porpoise in relationship to a survey vessel. Reports of the International Whaling Commission 40: 463-470.

Poole, M. M. (1995). Aspects of the behavioral ecology of spinner dolphins (Stenella longirostris) in the nearshore waters of Mo'orea, French Polynesia Ph.D. dissertation, University of California, Santa Cruz.

Popov, V. V. & Supin, A. Y. (2009). Comparison of directional selectivity of hearing in a beluga whale and a bottlenose dolphin. *The Journal of the Acoustical Society of America, 126*(3), 1581-1587. Retrieved from http://dx.doi.org/10.1121/1.3177273

Popov, V. V., A. Y. Supin, M. G. Pletenko, V. O. Klishin, Bulgakova, T.N. and E. I. Rosanova (2007). "Audiogram Variability in Normal Bottlenose Dolphins (Tursiops truncatus)." Aquatic Mammals 33: 24-33.

Potter, J. R., Thillet, M., Douglas, C., Chitre, M. A., Doborzynski, Z. & Seekings, P. J. (2007). Visual and passive acoustic marine mammal observations and high-frequency seismic source characteristics recorded during a seismic survey. *IEEE Journal of Oceanic Engineering, 32*(2), 469-483.

Prescott, R. (1982). "Harbor seals: Mysterious lords of the winter beach." Cape Cod Life 3(4): 24-29.

Pryor, T., K. Pryor and K. S. Norris (1965). "Observations on a pygmy killer whale (*Feresa attenuata* Gray) from Hawaii." Journal of Mammalogy 46(3): 450-461.

Pyle, P., D. J. Long, J. Schonewald, R. E. Jones and J. Roletto (2001). "Historical and recent colonization of the South Farallon Islands, California, by northern fur seals (*Callorhinus ursinus*)." Marine Mammal Science 17(2): 397-402.

Pyle, P., D. J. Long, J. Schonewald, R. E. Jones and J. Roletto (1995). "Early migration of northern fur seal pups from St. Paul Island, Alaska." Journal of Mammalogy 76(4): 1137-1148.

Rankin, S. and J. Barlow (2005). "Source of the North Pacific "boing" sound attributed to minke whales." Journal of the Acoustical Society of America 118: 3346-3351.

Rankin, S. and J. Barlow (2007). "Sounds recorded in the presence of Blainville's beaked whales, *Mesoplodon densirostris*, near Hawaii (L)." Journal of the Acoustical Society of America 122(1): 42-45.

Rankin, S., T. F. Norris, M. A. Smultea, C. Oedekoven, A. M. Zoidis, E. Silva and J. Rivers (2007). "A visual sighting and acoustic detections of minke whales, Balaenoptera acutorostrata (Cetacea: Balaenopteridae), in nearshore Hawaiian waters." Pacific Science 61: 395-398.

Read, A. J. (2008). "The looming crisis: Interactions between marine mammals and fisheries." Journal of Mammalogy 89(3): 541-548.

Read, A. J., Drinker, P. & Northridge, S. (2006). Bycatch of marine mammals in U.S. and global fisheries. *Conservation Biology, 20*(1), 163-169.

Redfern, J.V., M. F. McKenna, T. J. Moore, J. Calambokidis, M. L. DeAngelis, E. A. Becker, J. Barlow, K. A. Forney, P. C. Fiedler, S. J. Chivers (In Review). “Mitigating the risk of large whale ship strikes using a marine spatial planning approach.”

Reeves, R., S. Leatherwood and R. Baird (2009). "Evidence of a possible decline since 1989 in false killer whales (Pseudorca crassidens) around the main Hawaiian Islands." Pacific Science 63: 253-261.

Reeves, R. R., W. F. Perrin, B. L. Taylor, C. S. Baker and S. L. Mesnick (2004). *Report of the Workshop on Shortcomings of Cetacean Taxonomy in Relation to Needs of Conservation and Management, April 30 - May 2, 2004 La Jolla, California*. La Jolla, CA, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center: 94.

Reeves, R. R., B. D. Smith, E. A. Crespo and G. Notarbartolo di Sciara (2003). *Dolphins, Whales and Porpoises: 2002-2010 Conservation Action Plan for the World's Cetaceans* Gland, Switzerland and Cambridge, UK, IUCN: 147.

Reeves, R. R., B. S. Stewart, P. J. Clapham and J. A. Powell (2002). *National Audubon Society Guide to Marine Mammals of the World*. New York, NY, Alfred A. Knopf**:** 527.

Reeves, R. R., B. S. Stewart and S. Leatherwood (1992). *The Sierra Club Handbook of Seals and Sirenians*. San Francisco, CA, Sierra Club Books**:** 359.

Reichmuth, C. (2008). "Hearing in marine carnivores." Bioacoustics 17: 89-92.

Reidman, M.L., and J.A. Estes. (1990). The sea otter (*Enhydra lutris*) behavior, ecology, and natural history. U.S. Fish and Wildlife Service. Biological Report 90 (14). Available from: http://www.fort.usgs.gov/Products/Publications/pub_abstract.asp?PubID=2183

Reilly, S. B. (1990). "Seasonal changes in distribution and habitat differences among dolphins in the eastern tropical Pacific." Marine Ecology Progress Series 66: 1-11.

Reilly, S.B., Bannister, J.L., Best, P.B., Brown, M., Brownell Jr., R.L., Butterworth, D.S., Clapham, P.J., Cooke, J., Donovan, G.P., Urbán, J. & Zerbini, A.N. (2008). *Eubalaena japonica*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 29 September 2012.

Reilly, S. B. and S. H. Shane (1986). Pilot whale. In. Marine Mammals of the Eastern North Pacific and Arctic Waters. D. Haley. Seattle, WA, Pacific Search Press: 132-139.

Reinhall, P. G. & Dahl, P. H. (2011). Underwater Mach Wave Radiation from Impact Pile Driving: Theory and Observation. Journal of the Acoustical Society of America, 130(3), 1209-1216.

Reuland, K. (2010). Habitat Use and Behvaioral Monitoring of Hawaiian Monk Seals in Proximity to the Navy Hawaii Range Comples. 2010 Annual Range Complex Monitoring Report for Hawaii and Southern Califonria.

Reyes, J. C., J. G. Mead and K. Van Waerebeek (1991). "A new species of beaked whale *Mesoplodon peruvianus* sp. n. (Cetacea: Ziphiidae) from Peru." Marine Mammal Science 7(1): 1-24.

Reynolds, J. E., III and S. A. Rommel (1999). *Biology of Marine Mammals*. Washington, DC, Smithsonian Institution Press: 578.

Rice, D. W. (1977). "Synopsis of biological data on the sei whale and Bryde's whale in the eastern North Pacific." Reports of the International Whaling Commission Special Issue 1: 92-97.

Rice, D. W. (1989). Sperm whale *Physeter macrocephalus* Linnaeus, 1758. In Handbook of Marine Mammals, Volume 4: River dolphins and the larger toothed whales. S. H. Ridgway and R. Harrison. San Diego, CA, Academic Press. 4: 177-234.

Rice, D. W. (1998). Marine mammals of the world: systematics and distribution. Society for Marine Mammalogy Special Publication. Lawrence, KS, Society for Marine Mammology: 231.

Richardson, W. J., C.R.J. Green, C.I. Malme and D.H. Thomson (1995). Marine Mammals and Noise. San Diego, CA, Academic Press.

Richmond, D. R., J. T. Yelverton and E. R. Fletcher (1973). Far-field underwater-blast injuries produced by small charges. Washington, DC, Lovelace Foundation for Medical Education and Research, Defense Nuclear Agency: 108.

Richter, C. F., S. M. Dawson and E. Slooten (2003). "Sperm whale watching off Kaikoura, New Zealand: Effects of current activities on surfacing and vocalisation patterns." Science for Conservation 219: 78.

Richter, C., Dawson, S. & Slooten, E. (2006). Impacts of commercial whale watching on male sperm whales at Kaikoura, New Zealand. *Marine Mammal Science* 22(1): 46-63.

Ridgway, S. H. and D. A. Carder (2001). "Assessing hearing and sound production in cetaceans not available for behavioral audiograms: Experiences with sperm, pygmy sperm, and gray whales." Aquatic Mammals 27(3): 267-276.

Ridgway, S. H., R. J. Harrison and P. L. Joyce (1975). "Sleep and cardiac rhythm in the gray seal." Science 187: 553-554.

Ridgway, S. H., D. A. Carder, R. R. Smith, T. Kamolnick, C. E. Schlundt and W. R. Elsberry (1997). Behavioral Responses and Temporary Shift in Masked Hearing Threshold of Bottlenose Dolphins, Tursiops truncatus, to 1-second Tones of 141 to 201 dB re 1 µPa. San Diego, CA, U. S. Department of Navy, Naval Command, Control and Ocean Surveillance Center, RDT&E Division.

Ridgway, S. H. and M. D. Dailey (1972). "Cerebral and cerebellar involvement of trematode parasites in dolphins and their possible role in stranding." Journal of Wildlife Diseases 8: 33-43.

Ridgway, S. H. and R. Howard (1979). "Dolphin lung collapse and intramuscular circulation during free diving: Evidence from nitrogen washout." Science 206: 1182-1183.

Riedman, M. L. and J. A. Estes (1990). *The Sea Otter (*Enhydra lutris*): Behavior, Ecology, and Natural History*. Washington, D.C., U.S. Department of the Interior, Fish and Wildlife Service: 126.

Ritter, F. (2002). "Behavioural observations of rough-toothed dolphins (*Steno bredanensis*) off La Gomera, Canary Islands (1995-2000), with special reference to their interactions with humans." Aquatic Mammals 28(1): 46-59.

Robertson, K. M. and S. J. Chivers (1997). "Prey occurrence in pantropical spotted dolphins, Stenella attenuata, from the eastern tropical Pacific." Fishery Bulletin 95(2): 334-348.

Robinson, P. W., D. P. Costa, D. E. Crocker, J. P. Gallo-Reynoso, C. D. Champagne, M. A. Fowler, C. Goetsch, K. T. Goetz, J. L. Hassrick, L. A. Huckstadt, C. E. Kuhn, J. L. Maresh, S. M. Maxwell, B. I. McDonald, S. H. Peterson, S. E. Simmons, N. M. Teutschel, S. Villegas-Amtmann, Ken Yoda (2012). Foraging Behavior and Success of a Mesopelagic Predator in the Northeast Pacific Ocean: Insights from a Data-Rich Species, the Northern Elephant Seal. PLoS ONE 7(5): e36728. doi:10.1371/journal.pone.0036728.

Rolland, R.M, Susan E. Parks, Kathleen E. Hunt, Manuel Castellote, Peter J. Corkeron, Douglas P. Nowacek, Samuel K. Wasser and Scott D. Kraus. (2012). Evidence that ship noise increases stress in right whales. *Proc. R. Soc. B Biological Sciences* 279, 2363-2368. doi: 10.1098/rspb.2011.2429.

Romano, T., Keogh, M., Kelly, C., Feng, P., Berk, L., Schlundt, C. E., Carder, D. A. & Finneran, J. J. (2004). Anthropogenic sound and marine mammal health: measures of the nervous and immune systems before and after intense sound exposures. *Canadian Journal of Fisheries and Aquatic Sciences, 61*, 1124-1134.

Ronald, K. and B. L. Gots (2003). Seals: *Phocidae*, *Otariidae,* and *Odobenidae*. In Wild mammals of North America: Biology, management, and conservation. G. A. Feldhamer, B. C. Thompson and J. A. Chapman. Baltimore, MD, Johns Hopkins University Press**:** 789-854.

Rosel, P. E. and H. Watts (2008). "Hurricane impacts on bottlenose dolphins in the northern Gulf of Mexico." Gulf of Mexico Science 25(1): 88-94.

Rosen, G. & Lotufo, G. R. (2010). Fate and effects of Composition B in multispecies marine exposures. *Environmental Toxicology and Chemistry, 29*(6), 1330-1337.

Ross, G. J. B. (1971). "Shark attack on an ailing dolphin *Stenella coeruleoalba* (Meyen)." South African Journal of Science 67: 413-414.

Ross, G. J. B. and S. Leatherwood (1994). Pygmy killer whale Feresa attenuata Gray, 1874. Handbook of Marine Mammals, Volume 5: The first book of dolphins. S. H. Ridgway and R. Harrison, Academic Press**:** 387-404.

Rowntree, V., J. Darling, G. Silber and M. Ferrari (1980). "Rare sighting of a right whale (Eubalaena glacialis) in Hawaii." Canadian Journal of Zoology 58: 4.

Rugh, D., J. Breiwick, et al. (2008). *Report of the 2006-2007 Census of the Eastern North Pacific Stock of Gray Whales*. Seattle, WA, NOAA, NMFS, Alaska Fisheries Science Center: 157.

Rugh, D. J., M. M. Muto, R. C. Hobbs and J. A. Lerczak (2008). "An assessment of shore-based counts of gray whales." Marine Mammal Science 24(4): 864-880.

Saez, L., D. Lawson, M. DeAngelis, S. Wilkin, E. Petras, and C. Fahy. (2012). Co-occurrence of Large Whales and Fixed Commercial Fishing Gear: California, Oregon, and Washington. Poster presented at: 2012 Southern California Marine Mammal Workshop, 3-4 February 2012, Newport Beach, CA.

Salden, D. R. (1989). An observation of apparent feeding by a sub-adult humpback whale off Maui, Hawaii. [Abstract]. Presented at the Eighth Biennial Conference on the Biology of Marine Mammals, Pacific Grove, CA. 7-11 December.

Salden, D., & Mickelsen, J. (1999). Rare Sighting of a North Pacific Right Whale (Eubalaena glacialis) in Hawai'i. Pacific Science, 53(4), 341-345.

Salden, D.R., Herman, L.M., Yamaguchi, M. and Sato, F. (1999) Multiple visits of individual humpback whales (Megaptera novaeangliae) between the Hawaiian and Japanese winter grounds. Canadian Journal of Zoology 77: 504-508.

Salvadeo, C. J., D. Lluch-Belda, et al. (2010). "Climate change and a poleward shift in the distribution of the Pacific white-sided dolphin in the northeastern Pacific." Endangered Species Research 11: 13-19.

Sanino, G. P., J. L. Yanez, et al. (2007). "A first confirmed specimen record in Chile, and sightings attributed to the lesser beaked whale *Mesoplodon peruvianus* Reyes, Mead and Van Waerebeek, 1991." Boletin del Museo Nacional de Historia Natural, Chile 56: 89-96.

Santos, M. B., V. Martin, et al. (2007). "Insights into the diet of beaked whales from the atypical mass strandings in the Canary Islands in September 2002." Journal of the Marine Biological Association of the United Kingdom 87: 243-251.

Santos, M. B., G. J. Pierce, et al. (2001). "Feeding ecology of Cuvier's beaked whale (*Ziphius cavirostris*): A review with new information on the diet of this species." Journal of the Marine Biological Association of the United Kingdom 81: 687-694.

Saunders, K. J., P. R. White, T. G. Leighton (2008). Models for Predicting Nitrogen Tensions and Decompression Sickness Risk in Diving Beaked Whales. Proceedings of the Institute of Acoustics, 30(5), pp.8.

Scarpaci, C., S. W. Bigger, et al. (2000). Bottlenose dolphins (Tursiops truncatus) increase whistling in the presence of 'swim-with-dolphin' tour operations. Journal of Cetacean Research and Management 2(3): 183-185.

Schecklman, S., Houser, D. S., Cross, M., Hernandez, D. & Siderius, M. (2011). Comparison of methods used for computing the impact of sound on the marine environment. Marine Environmental Research, 71, 342-350. doi:10.1016/j.marenvres.2011.03.002

Scheifele, P. M., Andrew, S., Cooper, R. A., Darre, M., Musiek, F. E. & Max, L. (2005). Indication of a Lombard vocal response in the St. Lawrence River beluga. Journal of the Acoustical Society of America, 117(3), 1486–1492.

Schilling, M. R., I. Seipt, M. T. Weinrich, S. E. Frohock, A. E. Kuhlberg and P. J. Clapham (1992). "Behavior of individually identified sei whales *Balaenoptera borealis* during an episodic influx into the southern Gulf of Maine in 1986." Fishery Bulletin 90: 749-755.

Schlundt, C. E., Finneran, J. J., Carder, D. A. & Ridgway, S. H. (2000). Temporary shift in masked hearing thresholds of bottlenose dolphins, Tursiops truncatus, and white whales, Delphinapterus leucas, after exposure to intense tones. Journal of the Acoustical Society of America, 107(6), 3496-3508.

Schlundt, C. E., Dear, R. L., Carder, D. A. & Finneran, J. J. (2006). Growth and Recovery of Temporary Threshold Shifts in a Dolphin Exposed to Midfrequency Tones with Durations up to 128 s. Presented at the Fourth Joint Meeting: ASA and ASJ.

Schmelzer, I. (2000). "Seals and seascapes: Covariation in Hawaiian monk seal subpopulations and the oceanic landscape of the Hawaiian Archipelago." Journal of Biogeography 27: 901-914.

Schneider, D. C. and P. M. Payne (1983). "Factors affecting haul-out of harbor seals at a site in southeastern Massachusetts." Journal of Mammalogy 64(3): 518-520.

Baird, R., G. Schorr, D. Webster, D. McSweeney, M. Hanson and R. Andrews (2010). "Movements of satellite-tagged Blainville's beaked whales off the island of Hawai'i." Endangered Species Research 10: 203-213.

Schusterman, R. J., Balliet, R. F. & John, S. S. T. (1970). Vocal displays by the grey seal, the harbor seal, and the stellar sea lion. *Psychonometric Science, 18*(5).

Schusterman, R. J., Balliet, R. F. & Nixon, J. (1972). Underwater audiogram of the California sea lion by the conditioned vocalization technique. Journal of the Experimental Analysis of Behavior, 17, 339-350.

Schusterman, R. (1981). "Behavioral Capabilities of Seals and Sea Lions: A Review of Their Hearing, Visual, Learning and Diving Skills." The Psychological Record 31: 125-143.

Scott, M. D. and S. J. Chivers (1990). Distribution and herd structure of bottlenose dolphins in the eastern tropical Pacific Ocean. In. The Bottlenose Dolphin. S. Leatherwood and R. R. Reeves, Academic Press**:** 387-402.

Scott, M. D. and S. J. Chivers (2009). "Movements and diving behavior of pelagic spotted dolphins." Marine Mammal Science 25: 137-160.

Seagars, D. J. (1984). *The Guadalupe Fur Seal: A Status Review*. Terminal Island, CA, National Marine Fisheries Service, Southwest Region.

Sears, R. and W. F. Perrin (2008). Blue whale. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen. San Diego, CA, Academic Press: 120-124.

Sekiguchi, K., N. T. W. Klages and P. B. Best (1992). "Comparative analysis of the diets of smaller odontocete cetaceans along the coast of southern Africa." South African Journal of Marine Science 12: 843-861.

Shallenberger, E. W. (1981). *The Status of Hawaiian Cetaceans*. Kailua, HI, Manta Corporation: 79.

Shane, S. H., R. S. Wells and B. Wursig (1986). "Ecology, behavior and social organization of the bottlenose dolphin: a review." Marine Mammal Science 2(1): 34-63.

Shane, S. H. (1990). Comparison of bottlenose dolphin behavior in Texas and Florida, with a critique of methods for studying dolphin behavior. In. The Bottlenose Dolphin. S. Leatherwood and R. R. Reeves. San Diego, CA, Academic Press**:** 541-558.

Shane, S. H. (1994). "Occurrence and habitat use of marine mammals at Santa Catalina Island, California from 1983-91." Bulletin of the Southern California Academy of Sciences 93(1): 13-29.

Shane, S. H. (1995). "Relationship between pilot whales and Risso's dolphins at Santa Catalina Island, California, USA." Marine Ecology Progress Series 123: 5-11.

Shimek, S. J. (1977). "The underwater foraging habits of the sea otter, *Enhydra lutris*." California Fish and Game Bulletin 63(2): 120-122.

Silber, G., Slutsky, J., & Bettridge, S. (2010). Hydrodynamics of a ship/whale collision. [electronic version]. Journal of Experimental Marine Biology and Ecology, 391, 10-19. doi: 10.1016/j.jembe.2010.05.013

Simmonds, M. P. and W. J. Eliott (2009). "Climate change and cetaceans: Concerns and recent developments." Journal of the Marine Biological Association of the United Kingdom 89(1): 203-210.

Simmons, S. E., D. E. Crocker, J. L. Hassrick, C. E. Kuhn, P. W. Robinson, Y. Tremblay and D. P. Costa (2010). "Climate-scale hydrographic features related to foraging success in a capital breeder, the northern elephant seal Mirounga angustirostris." Endangered Species Research 10: 233-243.

Smith, B. D., G. Braulik, S. Strindberg, R. Mansur, M. A. A. Diyan and B. Ahmed (2009). "Habitat selection of freshwater-dependent cetaceans and the potential effects of declining freshwater flows and sea-level rise in waterways of the Sundarbans mangrove forest, Bangladesh." Aquatic Conservation: Marine and Freshwater Ecosystems 19: 209-225.

Smith, R. C., P. Dustan, D. Au, K. S. Baker and E. A. Dunlap (1986). "Distribution of cetaceans and sea-surface chlorophyll concentrations in the California Current." Marine Biology 91: 385-402.

Smultea, M. A. (1994). "Segregation by humpback whale (*Megaptera novaeangliae*) cows with a calf in coastal habitat near the island of Hawaii." Canadian Journal of Zoology 72: 805-811.

Smultea, M. A., J. L. Hopkins and A. M. Zoidis (2007). *Marine Mammal Visual Survey in and near the Alenuihaha Channel and the Island of Hawai'i: Monitoring in Support of Navy Training Exercises in the Hawai'i Range Complex, January 27 – February 2, 2007*. Oakland, CA**:** 63.

Smultea, M., Mobley, J., Fertl, D., & Fulling, G. (2008a). Short Communication An Unusual Reaction and Other Observations of Sperm Whales Near Fixed-Wing Aircraft. Gulf and Caribbean Research, 20, 75-80.

Smultea, M. A., J. L. Hopkins and A. M. Zoidis (2008b). *Marine Mammal and Sea Turtle Monitoring Survey in Support of Navy Training Exercises in the Hawai'i Range Complex November 11-17, 2007*. C. R. Organization. Oakland, CA**:** 62.

Smultea, M. A., T. A. Jefferson and A. M. Zoidis (2010). "Rare sightings of a Bryde's whale (*Balaenoptera edeni*) and sei whales (*B. borealis*) (Cetacea: Balaenopteridae) northeast of O'ahu, Hawai'i." Pacific Science 64: 449-457.

Smultea, M.A., A.E. Douglas, C.E. Bacon, T.A. Jefferson, and L. Mazzuca. (2012). Bryde's Whale (*Balaenoptera brydei/edeni*) Sightings in the Southern California Bight. Aquatic Mammals 38(1), 92-97.

Soldevilla, M. S. (2008). Risso's and Pacific white-sided dolphins in the Southern California Bight: Using echolocation clicks to study dolphin ecology Ph.D. dissertation, University of California, San Diego.

Soldevilla, M. S., E. E. Henderson, G. S. Campbell, S. M. Wiggins, J. A. Hildebrand and M. A. Roch (2008). "Classification of Risso's and Pacific white-sided dolphins using spectral properties of echolocation clicks." Journal of the Acoustical Society of America 124(1): 609-624.

Soldevilla, M. S., S. M. Wiggins, J. Calambokidis, A. Douglas, E. M. Oleson and J. A. Hildebrand (2006). "Marine mammal monotoring and habitat investigations during CalCOFI surveys." California Cooperative Oceanic Fisheries Investigations Reports 47: 79-91.

Sousa-Lima, R. S. & Clark, C. W. (2008). Modeling the effect of boat traffic on the fluctuation of humpback whale singing activity in the Abrolhos National Marine Park, Brazil. Canadian Acoustics, 36(1), 174-181.

Southall, B. L., Schusterman, R. J. & Kastak, D. (2000). Masking in three pinnipeds: underwater, low-frequency critical ratios. Journal of the Acoustical Society of America, 108(3), 1322-1326.

Southall, B. L., Schusterman, R. J. & Kastak, D. (2003). Auditory masking in three pinnipeds: Aerial critical ratios and direct critical bandwidth measurements. Journal of the Acoustical Society of America, 114(3), 1660-1666.

Southall, B., R. J. Schusterman, D. Kastak and C. Reichmuth Kastak (2005). Reliability of underwater hearing thresholds in pinnipeds. *Acoustics Research Letters Online* 6(4): 243-249.

Southall, B. L., Braun, R., Frances, M. D. G., Heard, A. D., Baird, R. W., Wilkin, S. M. & Rowles, T. K. (2006). Hawaiian Melon-headed Whales (Peponacephala electra) Mass Stranding Event of July 3-4, 2004 NOAA Technical Memorandum NMFS-OPR-31. (pp. 78).

Southall, B. L., Bowles, A. E., Ellison, W. T., Finneran, J. J., Gentry, R. L., Greene, C. R., Jr., . . . Tyack, P. L. (2007). Marine mammal noise and exposure criteria: initial scientific recommendations. *Aquatic Mammals, 33*, 411-521.

Southall, B. L., Tyack, P. L., Moretti, D., Clark, C., Claridge, D. & Boyd, I. (2009). Behavioral responses of beaked whales and other cetaceans to controlled exposures of simulated sonar and other sounds, 18th Biennial Conference on the Biology of Marine Mammals. Quebec City, Quebec, Canada.

Southall, B., Calambokidis, J., Tyack, P., Moretti, D., Hildebrand, J., Kyburg, C., Carlson, R., Friedlaender, A. S., Falcone, E. A., Schorr, G. S., Douglas, A., Deruiter, S. L., Goldbogen, J. A. & Barlow, J. (2011). Biological and Behavioral Response Studies of Marine Mammals in Southern California, 2010 ("SOCAL-10") *SOCAL-BRS* [Project Report]. (pp. 29).

Southall, B., J. Calambokidis, P. Tyack, D. Moretti, A. Friedlaender, S. DeRuiter, J. Goldbogen, E. Falcone, G. Schorr, A. Douglas, A. Stimpert, J. Hildebrand, C. Kyburg, R. Carlson, T. Yack, and J. Barlow (2012). Biological and Behavioral Response Studies of Marine Mammals in Southern California, 2011 (“SOCAL-11”), Final Project Report, 8 March 2012. Manuscript on file.

Spargo, B. J. (2007). Chaff end cap and piston bouyancy. M. Collins, Parson.

St. Aubin, D. J. & Dierauf, L. A. (2001). Stress and Marine Mammals L. A. Dierauf and F. M. D. Gulland (Eds.), Marine Mammal Medicine (second ed., pp. 253-269). Boca Raton: CRC Press.

St. Aubin, D. J. & Geraci, J. R. (1988). Capture and handling stress suppresses circulating levels of thyroxine (T4) and triiodothyronine (T3) in beluga whales Delphinapterus leucas. Physiological Zoology 61(2), 170-175.

St. Aubin, D. J. & Geraci, J. R. (1989). Adaptive changes in hematologic and plasma chemical constituents in captive beluga whales, Delphinapterus leucas. Canadian Journal of Fisheries and Aquatic Sciences, 46, 796-803.

St. Aubin, D. J., Ridgway, S. H., Wells, R. S. & Rhinehart, H. (1996). Dolphin thyroid and adrenal hormones: Circulating levels in wild and semidomesticated Tursiops truncatus, and influence of sex, age, and season. Marine Mammal Science, 12(1), 1-13.

St. Aubin, D. J. (2002). Hematological and serum chemical constituents in pantropical spotted dolphins (Stenella attenuata) following chase and encirclement. (Vol. LJ-02-37C, pp. 1-47) Southwest Fisheries Science Center.

Stafford, K., D. Bohnenstiehl, M. Tolstoy, E. Chapp, D. Mellinger and S. Moore (2004). "Antarctic-type blue whale calls recorded at low latitudes in the Indian and eastern Pacific oceans." Deep-Sea Research I 51: 1337-1346.

Stafford, K. M., S. L. Nieukirk and C. G. Fox (1999). "An acoustic link between blue whales in the eastern tropical Pacific and the northeast Pacific." Marine Mammal Science 15(4): 1258-1268.

Steiger, G., J. Calambokidis, J. Straley, L. Herman, S. Cerchio, D. Salden, J. Urban-R, J. Jacobsen, O. Ziegesar, K. Balcomb, C. Gabriele, M. Dahlheim, S. Uchida, J. Ford, P. Ladron de Guevara-P, M. Yamaguchi and J. Barlow (2008). "Geographic variation in killer whale attacks on humpback whales in the North Pacific: implications for predation pressure." Endangered Species Research 4(3): 247-256.

Stensland, E. & P. Berggren (2007). Behavioural changes in female Indo-Pacific bottlenose dolphins in response to boat-based tourism. *Marine Ecology Progress Series* 332: 225-234.

Sterling, J. T. and R. R. Ream (2004). "At-sea behavior of juvenile male northern fur seals (*Callorhinus ursinus*)." Canadian Journal of Zoology 82: 1621-1637.

Stewart, B. (1981). "The Guadalupe fur seal (*Arctocephalus townsendi*) on San Nicolas Island, California." Bulletin of the Southern California Academy of Sciences 80(3): 134-136.

Stewart, B. S. (1997). "Ontogeny of differential migration and sexual segregation in northern elephant seals." Journal of Mammalogy 78(4): 1101-1116.

Stewart, B. S., G. A. Antonelis, J. D. Baker and P. K. Yochem (2006). "Foraging biogeography of Hawaiian monk seals inthe Northwestern Hawaiian Islands." Atoll Research Bulletin 543: 131–146.

Stewart, B. S. and R. L. DeLong (1994). Postbreeding foraging migrations of northern elephant seals. In. Elephant Seals: Population Ecology, Behavior, and Physiology. B. J. Le Boeuf and R. M. Laws. Berkeley, CA, University of California Press**:** 290-309.

Stewart, B. S. and R. L. DeLong. (1995). "Double migrations of the northern elephant seal, *Mirounga angustirostris*." Journal of Mammalogy 76(1): 196-205.

Stewart, B. S. and H. R. Huber. (1993). "*Mirounga angustirostris*." Mammalian Species 449: 1-10.

Stewart, B. S., P. K. Yochem, R. L. DeLong and G. A. Antonelis. (1993). Trends in abundance and status of pinnipeds on the Southern California Channel Islands. In. Third California Islands Symposium: Recent Advances in Research on the California Islands. F. G. Hochberg. Santa Barbara, CA, Santa Barbara Museum of Natural History**:** 501-516.

Stewart, B. S., P. K. Yochem, H. R. Huber, R. L. DeLong, R. J. Jameson, W. J. Sydeman, S. G. Allen and B. J. Le Boeuf. (1994). History and present status of the northern elephant seal population. In. Elephant Seals: Population Ecology, Behavior, and Physiology. B. J. Le Boeuf and R. M. Laws, University of California Press**:** 29-48.

Stock, M. K., Lanphier, E. H., Anderson, D. F., Anderson, L. C., Phernetton, T. M. & Rankin, J. H. (1980). Responses of fetal sheep to simulated no-decompression dives (Vol. 48, pp. 776-780).

Stockin, K., Lusseau, D., Binedell, V., Wiseman, N. & Orams, M. (2008). Tourism affects the behavioural budget of the common dolphin Delphinus sp. in the Hauraki Gulf, New Zealand. [electronic version]. Marine Ecology Progress Series, 355, 287-295. 10.3354/meps07386.

Sumich, J.L. (1984). Gray whales along the Oregon coast in summer, 1977-1 980. *Murrelet*, 65,33-40.

Sumich, J.L. and I.T. Show (2011). Offshore Migratory Corridors and Aerial Photogrammetric Body Length Comparisons of Southbound Gray Whales, *Eschrichtius robustus*, in the Southern California Bight, 1988–1990. *Marine Fisheries Review*, 73(1):28-34.

Swartz, S. L., B. L. Taylor and D. J. Rugh. (2006). "Gray whale *Eschrichtius robustus* population and stock identity." Mammal Review 36(1): 66-84.

Szymanski, M. D., Bain, D. E., Kiehl, K., Pennington, S., Wong, S. & Henry, K. R. (1999). Killer whale (Orcinus orca) hearing: Auditory brainstem response and behavioral audiograms. Journal of the Acoustical Society of America, 106(2), 1134-1141.

Tabuchi, M., Veldhoen, N., Dangerfield, N., Jeffries, S., Helbing, C. & Ross, P. (2006). PCB-Related Alteration of Thyroid Hormones and Thyroid Hormone Receptor Gene Expression in Free-Ranging Harbor Seals (Phoca vitulina). Environmental Health Perspectives, 114, 1024-1031. doi:10.1289/ehp.8661 Retrieved from http://ds.doi.org/

Teilmann, J., Henriksen, O.D., Carstensensen, J. & H. Skov (2002). Monitoring effects of offshore windfarms on harbour porpoises using PODs (porpoise detectors). Ministry of the Environment.

Teilmann, J., J. Tougaard, L. A. Miller, T. Kirketerp, K. Hansen and S. Brando (2006). Reactions of captive harbor porpoises (*Phocoena phocoena*) to pinger-like sounds. *Marine Mammal Science* 22(2): 240-260.

Terhune, J. M. (1988). Detection thresholds of a harbour seal to repeated underwater high-frequency, short-duration sinusoidal pulses. Canadian Journal of Zoology, 66.

Terhune, J. M. and K. Ronald (1971). "The harp seal, Pagophilus groenlandicus (Erxleben, 1777) X. The air audiogram." Canadian Journal of Zoology 49: 385-390.

Terhune, J. M. and K. Ronald. (1972). "The harp seal, Pagophilus groenlandicus (Erxleben, 1777) III. The underwtater audiogram." Canadian Journal of Zoology 50: 565-569.

Terhune, J. M. & Ronald, K. (1975). Underwater hearing sensitivity of two ringed seals (Pusa hispida). Canadian Journal of Zoology, 53, 227-231.

Terhune, J. M. & Ronald, K. (1976). The upper frequency limit of ringed seal hearing. Canadian Journal of Zoology, 54, 1226-1229.

Terhune, J. and S. Turnbull. (1995). Variation in the psychometric functions and hearing thresholds of a harbour seal. In. Sensory Systems of Aquatic Mammals. R. A. Kastelein, J. A. Thomas and P. E. Nachtigall. Woerden, The Netherlands, De Spil Publishers: 81-93.

Terhune, J. M. & Verboom, W. C. (1999). Right whales and ship noises. Marine Mammal Science, 15(1), 256-258.

Thomas, J. A., Kastelein, R. A. & Awbrey, F. T. (1990a). Behavior and blood catecholamines of captive belugas during playbacks of noise from an oil drilling platform. Zoo Biology, 9(5), 393-402.

Thomas, J., Moore, P., Withrow, R. & Stoermer, M. (1990b). Underwater audiogram of a Hawaiian monk seal (*Monachus schauinslandi*). Journal of Acoustical Society of America 87(1): 417-420.

Thomas, K., J. Harvey, T. Goldstein, J. Barakos and F. Gulland (2010). "Movement, dive behavior, and survival of California sea lions (*Zalophus californianus*) posttreatment for domoic acid toxidosis." Marine Mammal Science 26(1): 36-52.

Thomson, D. H. & Richardson, W. J. (1995). Marine mammal sounds. In W. J. Richardson, C. R. Greene, Jr., C. I. Malme and D. H. Thomson (Eds.), Marine mammals and noise (pp. 159-204). San Diego, CA: Academic Press.

Thorson, P. H., Francine, J. K., Berg, E. A., Meyers, L. E., Oliver, G. W. & Eidson, D. A. (1998). Quantitative Analysis of Behavioral Responses for Selected Pinnipeds on Vandenberg Air Force Base and San Miguel Island, California and Acoustic Measurement of the 24 September 1999 Athena 2 IKONOS-II Launch. (pp. 41).

Tinker, M. T., J. A. Estes, K. Ralls, T. M. Williams, D. Jessup, D. P. Costa (2006). "Population Dynamics and Biology of the California Sea Otter (Enhydra lutris nereis) at the Southern End of its Range." MMS OCS Study 2006-007. Coastal Research Center, Marine Science Institute, University of California, Santa Barbara, California. MMS Cooperative Agreement Number 14-35-0001-31063.

Tinker, M.T., G. Bentall, and J. A. Estes (2008). Food limitation leads to behavioral diversification and dietary specialization in sea otters. Proceedings of the National Academy of Sciences of the United States of America 105(2), 560-565.

Todd, S., Stevick, P., Lien, J., Marques, F. & Ketten, D. (1996). Behavioural effects of exposure to underwater explosions in humpback whales (Megaptera novaeanlgiae). Canadian Journal of Zoology, 74, 1661-1672.

Tomich, P. Q. (1986). Mammals in Hawai'i (Vol. 2nd). Honolulu, HI: Bishop Museum Press.

Torres de la Riva, G., Johnson, C. K., Gulland, F. M. D., Langlois, G. W., Heyning, J. E., Rowles, T. & Mazet, J. A. K. (2009). Association of an unusual marine mammal mortality event with Pseudo-nitzschia spp. blooms along the southern California coastline. *Journal of Wildlife Diseases, 45*(1), 109-121.

Trites, A. W. & D. E. Bain (2000). Short- and long-term effects of whale watching on killer whales (*Orcinus orca*) in British Columbia. Adelaide, Australia, International Whaling Commission.

Thomas, K., J. Harvey, T. Goldstein, J. Barakos and F. Gulland (2001). "Pacific white-sided dolphins (*Lagenorhynchus obliquidens*) with anomalous colour patterns in Volcano Bay, Hokkaido, Japan." Aquatic Mammals 27(2): 172-182.

Turnbull, S. D. & Terhune, J. M. (1990). White noise and pure tone masking of pure tone thresholds of a harbour seal listening in air and underwater. Canadian Journal of Zoology, 68.

Twiss, J. R., Jr. and R. R. Reeves (1999). *Conservation and Managment of Marine Mammals*. Washington, D.C., Smithsonian Institution Press**:** 471.

Tyack, P. L. (2009). "Human-generated sound and marine mammals." Physics Today: 39-44.

Tyack, P. L., Johnson, M., Aguilar Soto, N., Sturlese, A. & Madsen, P. T. (2006). Extreme deep diving of beaked whales. Journal of Experimental Biology, 209, 4238-4253. doi:10.1242/jeb.02505.

Tyack, P., Zimmer, W., Moretti, D., Southall, B., Claridge, D., Durban, J., . . . Boyd, I. (2011). Beaked Whales Respond to Simulated and Actual Navy Sonar. [electronic version]. PLoS ONE, 6(3), 15. 10.1371/journal.pone.0017009.

U.S. Air Force. (1997). Environmental Effects of Self-Protection Chaff and Flares. (pp. 241).

U.S. Department of Interior, Fish and Wildlife Service. (2012b). Draft Southern Sea Otter Stock Assessment Report. Manuscript on file.

U.S. Department of the Navy. (2002). Final Environmental Impact Statement/Overseas Environmental Impact Statement—Point Mugu Sea Range. Prepared for the Naval Air Warfare Center Weapons Division, Point Mugu, California by Ogden Environmental and Energy Services, Inc., Santa Barbara, California.

U.S. Department of the Navy. (2003). Report on the results of the inquiry into allegations of marine mammal impacts surrounding the use of active sonar by USS SHOUP (DDG 86) in the Haro Strait on or about 5 May 2003 U. S. P. F. C. Commander (Ed.).

U.S. Department of the Navy. (2004). Coral Princess Underwater Acoustic Levels. In Naval Surface Warfare Center - Detachment Bremerton Technical Report (Ed.).

U.S. Department of the Navy. (2006). Rim of the Pacific Exercise After Action Report: Analysis of Effectiveness of Mitigation and Monitoring Measures as Required Under the Marine Mammals Protection Act (MMPA) Incidental Harassment Authorization and the National Defense Exemption from the Requirements of the MMPA for Mid-Frequency Active Sonar Mitigation Measures**:** 60.

U.S. Department of the Navy. (2008a). Hawaii Range Complex Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), May 9, 2008.

U.S. Department of the Navy. (2008b). Southern California Range Complex Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), December 15, 2008.

U.S. Department of the Navy. (2009a). Marine Species Monitoring for the U.S. Navy's Hawaii Range Complex and the Southern California Range Complex, 2009 Annual Report. Available at www.nmfs.noaa.gov/pr/permits/incidental.htm#applications.

U.S. Department of the Navy. (2009b). Swimmer interdiction security system (SISS) Final Environmental Impact Statement. Naval base Kitsap-Bangor. Silverdale, WA.

U.S. Department of the Navy. (2010). Marine Species Monitoring for the U.S. Navy's Hawaii Range Complex and the Southern California Range Complex, 2010 Annual Report. Available at www.nmfs.noaa.gov/pr/permits/incidental.htm#applications.

U.S. Department of the Navy. (2011). Marine Species Monitoring for the U.S. Navy's Hawaii Range Complex and the Southern California Range Complex, 2011 Annual Report. Available at www.nmfs.noaa.gov/pr/permits/incidental.htm#applications

U.S. Department of the Navy. (2012a). Marine mammal strandings associated with U.S. Navy sonar activities. (pp. 72 p.) Space and Naval Warfare (SPAWAR) Systems Center Pacific, San Diego.

U.S. Department of the Navy. (2012b). Pacific Navy Marine Species Density Database. NAVFAC Pacific Technical Report, Makalapa, Hawaii.

U.S. Department of the Navy. (2013a). Comprehensive Monitoring Report for the U.S. Navy's Southern California Range Complex. U.S. Pacific Fleet. Final 17 June 2013.

U.S. Department of the Navy. (2013b). Comprehensive Exercise and Marine Species Monitoring Report for The U.S. Navy's Hawaii Range Complex. Department of the Navy, Commander, U.S. Pacific Fleet, Pearl Harbor, Hawaii. 17 June 2013.

U.S. Department of the Navy. (2013c). Post-Model Quantitative Analysis of Animal Avoidance Behavior and Mitigation Effectiveness for the Atlantic Fleet Training and Testing. Technical report prepared by Navy Marine Mammal Program, SPAWAR.

U.S. Fish & Wildlife Service and National Marine Fisheries Service. (1998). Endangered Species Act Consultation Handbook. PROCEDURES FOR CONDUCTING SECTION 7 CONSULTATIONS AND CONFERENCES (pp. 315).

University of Hawaii. (2010). Hawaii Undersea Military Munitions Assessment, Final Investigation Report HI-05, South of Pearl Harbor, Oahu, Hawaii. Prepared for the National Defense Center for Energy and Environment under Contract Number W74V8H-04-005, Task Number 0496. Manuscript available at http://www.hummaproject.com/.

Urick, R. (1983). Principles of Underwater Sound, Principles of Underwater Sound for Engineers (3rd ed.). Los Altos Hills, California: Peninsula Publishing.

Urban-R., J., L. Rojas-Bracho, H. Perez-Cortes, A. Gomez-Gallardo, S. L. Swartz, S. Ludwig and R. L. Brownell, Jr. (2003). "A review of gray whales (*Eschrichtius robustus*) on their wintering grounds in Mexican waters." Journal of Cetacean Research and Management 5(3): 281-295.

Urban-Ramirez, J. and D. Aurioles-Gamboa (1992). "First record of the pygmy beaked whale *Mesoplodon peruvianus* in the North Pacific." Marine Mammal Science 8(4): 420-425.

Van Waerebeek, K., F. Felix, B. Haase, D. Palacios, D. M. Mora-Pinto and M. Munoz-Hincapie. (1998). "Inshore records of the striped dolphin, *Stenella coeruleoalba*, from the Pacific coast of South America." Reports of the International Whaling Commission 48: 525-532.

Van Waerebeek, K., Baker, A. N., Felix, F., Gedamke, J., Iñiguez, M., Sanino, G. P., . . . Wang, Y. (2007). Vessel collisions with small cetaceans worldwide and with large whales in the southern hemisphere, an initial assessment. Latin American Journal of Aquatic Mammals, 6(1), 43-69.

Van Waerebeek, K., J. C. Reyes, A. J. Read and J. S. McKinnon. (1990). Preliminary observations of bottlenose dolphins from the Pacific coast of South America. In. The Bottlenose Dolphin S. Leatherwood and R. R. Reeves. New York, NY, Academic Press**:** 143-154.

Verboom, W. C. & Kastelein, R. A. (2003). Structure of harbour porpoise (Phocoena phocoena) acoustic signals with high repetition rates J. A. Thomas, C. Moss and M. Vater (Eds.), Echolocation in bats and dolphins (pp. 40-43). University of Chicago Press.

Villadsgaard, A., Wahlberg, M. & Tougaard, J. (2007). Echolocation signals of wild harbour porpoises, Phocoena phocoena. Journal of Experimental Biology, 2010, 56-64.

Visser, I. N. & Fertl, D. (2000). Stranding, resighting, and boat strike of a killer whale (*Orcinus orca*) off New Zealand. *Aquatic Mammals, 26.3*, 232-240.

Wade, P.R. (1994). Abundance and Population Dynamics of Two Eastern Pacific Dolphins, Stenella attenuata and Stenella longirostris orientalis. (Doctoral dissertation). University of California, San Diego.

Wade, P. R., Kennedy, A., LeDuc, R., Barlow, J., Carretta, J., Shelden, K., . . . Clapham, P. J. (2010, February 23). The world's smallest whale population? [Research Support, U.S. Gov't, Non-P.H.S.]. Biology letters, 7(1), 83-85. 10.1098/rsbl.2010.0477 Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/20591853

Wade, P. R. and T. Gerrodette (1993). "Estimates of cetacean abundance and distribution in the eastern tropical Pacific." Reports of the International Whaling Commission 43: 477-493.

Wade, P. R., J. M. Ver Hoef and D. P. DeMaster (2009). "Mammal-eating killer whales and their prey — trend data for pinnipeds and sea otters in the North Pacific Ocean do not support the sequential megafaunal collapse hypothesis." Marine Mammal Science 25(3): 737-747.

Walker, W. A. and J. H. Coe (1990). Survey of Marine Debris ingestion by Odontocete Cetaceans. In: R.S. Shomura and M.L. Godfrey (eds.), Proceedings of the Second International Conference on Marine Debris, NOAA Technical Memoorandum, NMFS, NOAA-TM-NMFS-SWFSC-154, manuscript on file, pp 747-774.

Walker, M. M., Kirschvink, J. L., Ahmed, G. & Dizon, A. E. (1992). Evidence that fin whales respond to the geomagnetic field during migration. *Journal of Experimental Biology, 171*, 67-78.

Walker, W. A. and M. B. Hanson (1999). "Biological observations on Stejneger's beaked whale, *Mesoplodon stejnegeri*, from strandings on Adak Island, Alaska." Marine Mammal Science **15**(4): 1314-1329.

Walker, W. A., J. G. Mead and R. L. Brownell, Jr. (2002). "Diets of Baird's beaked whales *Berardius bairdii*, in the southern Sea of Okhotsk and off the Pacific Coast of Honshu, Japan." Marine Mammal Science **18**: 902-919.

Walker, R. J., Keith, E. O., Yankovsky, A. E. & Odell, D. K. (2005). Environmental correlates of cetacean mass stranding sites in Florida. *Marine Mammal Science, 21*(2), 327-335.

Wang, J. Y. and S. C. Yang. (2006). "Unusual cetacean stranding events of Taiwan in 2004 and 2005." Journal of Cetacean Research and Management 8(3): 283-292.

Wang, J. Y., S. C. Yang and H. C. Liao. (2001). "Species composition, distribution and relative abundance of cetaceans in the waters of southern Taiwan: Implications for conservation and eco-tourism." Journal of the National Parks of Taiwan 11(2): 136-158.

Ward, E. J., H. Chirakkal, M. Gonzalez-Suarez, D. Aurioles-Gamboa, E. E. Holmes and L. Gerber. (2010). "Inferring spatial structure from time-series data: using multivariate state-space models to detect metapopulation structure of California sea lions in the Gulf of California, Mexico." Journal of Applied Ecology 47: 47-56.

Ward, W. D., Glorig, A. & Sklar, D. L. (1958). Dependency of temporary threshold shift at 4 kc on intensity and time. Journal of the Acoustical Society of America, 30, 944-954.

Ward, W. D., Glorig, A. & Sklar, D. L. (1959a). Relation between recovery from temporary threshold shift and duration of exposure. Journal of the Acoustical Society of America, 31(5), 600-602.

Ward, W. D., Glorig, A. & Sklar, D. L. (1959b). Temporary Threshold Shift from Octave-Band Noise: Applications to Damage-Risk Criteria. Journal of the Acoustical Society of America, 31(4), 522-528.

Ward, W. D. (1997). Effects of high-intensity sound M. J. Crocker (Ed.), Encyclopedia of Acoustics (pp. 1497-1507). New York, NY: Wiley.

Waring, G. T., T. Hamazaki, D. Sheehan, G. Wood and S. Baker. (2001). "Characterization of beaked whale (Ziphiidae) and sperm whale (*Physeter macrocephalus*) summer habitat in shelf-edge and deeper waters off the northeast U.S." Marine Mammal Science **17**(4): 703-717.

Wartzok, D. & Ketten, D. R. (1999). Marine Mammal Sensory Systems J. E. Reynolds III and S. A. Rommel (Eds.), Biology of Marine Mammals (pp. 117-175). Washington, D.C.: Smithsonian Institution Press.

Wartzok, D., Popper, A. N., Gordon, J. & Merrill, J. (2003). Factors affecting the responses of marine mammals to acoustic disturbance. Marine Technology Society Journal, 37(4), 6-15.

Watkins, W. A. (1981). Reaction of three species of whales Balaenoptera physalus, Megaptera novaeangliae, and Balaenoptera edeni to implanted radio tags. Deep-Sea Research, 28A(6), 589-599.

Watkins, W. A. (1986). Whale reactions to human activities in Cape Cod waters. Marine Mammal Science, 2(4), 251-262.

Watkins, W. A. & Schevill, W. E. (1975). Sperm whales (Physeter catodon) react to pingers. Deep-Sea Research, 22, 123-129.

Watkins, W. A., Moore, K. E. & Tyack, P. (1985). Sperm whale acoustic behavior in the southeast Caribbean. Cetology, 49: 1-15.

Watkins, W. A., M. A. Daher, A. Samuels and D. P. Gannon (1997). "Observations of *Peponocephala electra*, the melon-headed whale, in the southeastern Caribbean." Caribbean Journal of Science 33(1-2): 34-40.

Watkins, W. A., Daher, M. A., DiMarzio, N. A., Samuels, A., Wartzok, D., Fristrup, K. M., . . . Spradlin, T. R. (1999). Sperm whale surface activity from tracking by radio and satellite tags. Marine Mammal Science, 15(4), 1158-1180.

Watkins, W. A., M. A. Daher, G. M. Reppucci, J. E. George, D. L. Martin, N. A. DiMarzio and D. P. Gannon (2000). "Seasonality and distribution of whale calls in the North Pacific." Oceanography 13(1): 62-67.

Watters, D.L., M. M. Yoklavich, M. S. Love, D. M. Schroeder. (2010). "Assessing Marine Debris in Deep Seafloor Habitats off California." Marine Pollution Bulletin 60:131–138.

Watwood, S. L. & Buonantony, D. M. (2012). Dive Distribution and Group Size Parameters for Marine Species Occurring in Navy Training and Testing Areas in the North Atlantic and North Pacific Oceans. (NUWC-NPT Technical Document 12,085) Naval Undersea Warfare Center Division, Newport.

Wedemeyer G.A., Barton B.A. and McLeay D.J. (1990). Stress and acclimation. In: Methods for fish biology C.B. Shreck and P.B. Moyle, Eds. Amer. Fish Soc. Symp. Maryland, pp. 451 – 489.

Weller, D. W. (2008). Predation on marine mammals. In Encyclopedia of Marine Mammals. W. F. Perrin, B. Würsig and J. G. M. Thewissen. San Diego, CA, Academic Press: 923-931.

Weller, D. W., B. Wursig, H. Whitehead, J. C. Norris, S. K. Lynn, R. W. Davis, N. Clauss and P. Brown. (1996). "Observations of an interaction between sperm whales and short-finned pilot whales in the Gulf of Mexico." Marine Mammal Science 12(4): 588-593.

Weller, D. W., Burdin, A. M., Wursig, B., Taylor, B. L. and Brownell, R. L. (2002). The western gray whale: a review of past exploitation, current status and potential threats. *Journal of Cetacean Research and Management, 4*(1), 7-12.

Weller, D. W., A. Klimek, A. L. Bradford, J. Calambokidis, A. R. Lang, B. Gisborne, A. M. Burdin, W. Szaniszlo, J. Urbán, A. Gomez-Gallardo Unzueta, S. Swartz and R. L. Brownell. (2012). "Movements of gray whales between the western and eastern North Pacific." Endangered Species Research 18(3): 193-199.

Weller, D.W., Bettridge, S., Brownell, R.L., Jr., Laake, J.L., Moore, J.E., Rosel, P.E., Taylor, B.L and Wade, P. R. (2013). Report of the National Marine Fisheries Service gray whale stock identification workshop. U.S. Department of Commerce, NOAA Tech. Memo. NMFS-SWFSC-507.

Wells, R. S., C. A. Manire, L. Byrd, D. R. Smith, J. G. Gannon, D. Fauqiuer and K. D. Mullin. (2009). "Movements and dive patterns of a rehabilitated Risso's dolphin, Grampus griseus, in the Gulf of Mexico and Atlantic Ocean." Marine Mammal Science 25(2): 420-429.

Wells, R. S. & Scott, M. D. (1997). Seasonal incidence of boat strikes on bottlenose dolphins near Sarasota, Florida. Marine Mammal Science, 13(3), 475-480.

Wells, R. S. and M. D. Scott.(1999). Bottlenose dolphin *Tursiops truncatus* (Montagu, 1821). In. Handbook of Marine Mammals, Volume 6: The Second Book of Dolphins and the Porpoises. S. H. Ridgway and R. Harrison. San Diego, CA, Academic Press**:** 137-182.

Wells, R. S. and M. D. Scott. (2008). Common bottlenose dolphin *Tursiops truncatus*. In. Encyclopedia of Marine Mammals. W. F. Perrin, W. B. and J. G. M. Thewissen, Academic Press**:** 249-255.

Werth, A. J. (2006a). "Mandibular and dental variation and the evolution of suction feeding in Odontoceti." Journal of Mammalogy 87(3): 579-588.

Werth, A. J. (2006b). "Odontocete suction feeding: Experimental analysis of water flow and head shape." Journal of Morphology 267: 1415-1428.

West, K. L., W. A. Walker, R. W. Baird, W. White, G. Levine, E. Brown and D. Schofield. (2009). "Diet of pygmy sperm whales (*Kogia breviceps*) in the Hawiian Archipelago." Marine Mammal Science 25(4): 931-943.

West, K. L., Sanchez, S., Rotstein, D., Robertson, K. M., Dennison, S., Levine, G., . . . Jensen, B. (2012). A Longman's beaked whale (*Indopacetus pacificus*) strands in Maui, Hawaii, with first case of morbillivirus in the central Pacific. *Marine Mammal Science*, n/a-n/a. 10.1111/j.1748-7692.2012.00616.x Retrieved from http://dx.doi.org/10.1111/j.1748-7692.2012.00616.x

White, M. J., J. Norris, D. Ljungblad, K. Baron and G. di Sciara. (1977). Auditory Thresholds of Two Beluga Whales, *Delphinapterus leucas*. San Diego, California, Report by Hubbs/Sea World Research Institute for Naval Ocean System Center, Report 78-109.

Whitehead, H. (2003). *Sperm Whales: Social Evolution in the Ocean*, University of Chicago Press**:** 431.

Whitehead, H. (2008). Sperm whale *Physeter macrocephalus*. In. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen, Academic Press**:** 1091-1097.

Whitehead, H., A. Coakes, N. Jaquet and S. Lusseau. (2008). "Movements of sperm whales in the tropical Pacific." Marine Ecology Progress Series 361: 291-300.

Wilkin, S. M. (2003). Nocturnal foraging ecology and activity budget of the sea otter (Enhydra lutris) in Elkhorn Slough, California Master's thesis, San Francisco State University.

Williams, R., D. E. Bain, J. K. B. Ford and A. W. Trites. (2002a). Behavioural responses of male killer whales to a "leapfrogging" vessel. *Journal of Cetacean Research and Management* 4(3): 305-310.

Williams, R., D. Lusseau, and P. S. Hammond (2006). Estimating relative energetic costs of human disturbance to killer whales (*Orcinus orca*). Biological Conservation 133: 301–311.

Williams, R., D. E. Bain, J. C. Smith and D. Lusseau. (2009). Effects of vessels on behaviour patterns of individual southern resident killer whales *Orcinus orca*. *Endangered Species Research* 6: 199-209.

Williams, R. and L. Thomas (2007). "Distribution and abundance of marine mamals in the coastal waters of British Columbia, Canada." Journal of Cetacean Research and Management 9(1): 15-28.

Wilson, S. C. (1978). *Social Organization and Behavior of Harbor Seals,* Phoca vitulina concolor*, in Maine*. Washington, DC, Smithsonian Institution Press.

Wolski, L. F., Anderson, R. C., Bowles, A. E. & Yochem, P. K. (2003). Measuring hearing in the harbor seal (Phoca vitulina): Comparison of behavioral and auditory brainstem response techniques. *Journal of the Acoustical Society of America,* 113(1), 629-637. doi: 10.1121/1.1527961.

Wursig, B., S. K. Lynn, T. A. Jeffereson and K. D. Mullin. (1998). Behaviour of cetaceans in the northern Gulf of Mexico relative to survey ships and aircraft. *Aquatic Mammals* **24**(1): 41-50.

Wursig, B., T. A. Jefferson and D. J. Schmidly. (2000). The Marine Mammals of the Gulf of Mexico, Texas A&M University Press**:** 232.

Würsig, B. and W.J. Richardson. (2009). Noise, effects of. Pp. 765–772. In: Perrin, W.F., Würsig, B., and J.G.M. Thewissen, Eds. The Encyclopedia of Marine Mammals, Ed. 2. Academic/Elsevier Press, San Diego, Ca. 1316 pp.

Yamada, T. (1998). Stejneger's beaked whale, *Mesoplodon stejnegeri*, True 1885. In. Redbook Data on Aquatic Flora and Fauna, Part III. Aquatic Mammals. Japan Fisheries Agency, Japan Fisheries Resource Conservation Association**:** 53-59.

Yamada, T. K. (1997). "Strandings of cetacea to the coasts of the Sea of Japan - with special reference to *Mesoplodon stejnegeri*." IBI Reports 7: 9-20.

Yelverton, J. T. & Richmond, D. R. (1981). Underwater Explosion Damage Risk Criteria for Fish, Birds, and Mammals. Presented at the 102nd Meeting of the Acoustical Society of America Miami Beach, FL.

Yelverton, J. T., D. R. Richmond, E. R. Fletcher and R. K. Jones (1973). Safe distances from underwater explosions for mammals and birds. Albuquerque, New Mexico, Lovelace Foundation for Medical Education and Research: 66.

Yelverton, J. T., Richmond, D. R., Hicks, W., Saunders, K. & Fletcher, E. R. (1975). The Relationship Between Fish Size and Their Response to Underwater Blast Defense Nuclear Agency (Ed.), [Topical Report]. (DNA 3677T, pp. 40). Washington, D.C.: Lovelace Foundation for Medical Education and Research.

Yazvenko, S. B., McDonald, T. L., Blokhin, S. A., Johnson, S. R., Melton, H. R., Newcomer, M. W., . . . Wainwright, P. W. (2007). Feeding of western gray whales during a seismic survey near Sakhalin Island, Russia. Environmental Monitoring and Assessment, 134, 93-106.

Yuen, M. M. L., Nachtigall, P. E., Breese, M. & Supin, A. Y. (2005). Behavioral and auditory evoked potential audiograms of a false killer whale (Pseudorca crassidens). Journal of the Acoustical Society of America, 118(4), 2688-2695.

Zagzebski, K. A., F. M. D. Gulland, M. Haulena, M. E. Lander, D. J. Greig, L. J. Gage, M. B. Hanson, P. K. Yochem and B. S. Stewart. (2006). "Twenty-five years of rehabilitation of odontocetes stranded in central and northern California, 1977 to 2002." Aquatic Mammals 32(3): 334-345.

Zavala-Gonzalez, A. and E. Mellink (2000). "Historical exploitation of the California sea lion, *Zalophus californianus*, in Mexico." Marine Fisheries Review 62(1): 35-40.

Zimmer, W. M. X. & Tyack, P. L. (2007). Repetitive Shallow Dives Pose Decompression Risk in Deep-Diving Beaked Whales. Marine Mammal Science, 23(4), 888-925. 10.1111/j.1748-7692.2007.00152.x

Zoeger, J., Dunn, J. R. & Fuller, M. (1981). Magnetic material in the head of the common pacific dolphin. Science, 213(4510), 892-894. Retrieved from http://www.jstor.org/stable/1686928.

Hawaii-Southern California Training and Testing Activities Final Environmental Impact Statement/ Overseas Environmental Impact Statement

Volume 2

August 2013

HSTT EIS/OEIS Project Manager
Naval Facilities Engineering Command, Pacific/EV21.CS
258 Makalapa Dr., Ste 100
Pearl Harbor, HI 96860-3134

3.5 Sea Turtles

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

3.5 Sea Turtles

SEA TURTLE SYNOPSIS

The United States Department of the Navy considered all potential stressors, and the following have been analyzed for sea turtles:

- Acoustic (sonar and other active acoustic sources; underwater explosives; pile driving; swimmer defense airguns; weapons firing, launch, and impact noise; aircraft noise; and vessel noise)
- Energy (electromagnetic devices)
- Physical disturbance and strike (vessels and in-water devices, military expended materials, seafloor devices)
- Entanglement (fiber optic cables and guidance wires, parachutes)
- Ingestion (munitions, military expended materials other than munitions)
- Secondary

Preferred Alternative

- Acoustic: Pursuant to the Endangered Species Act (ESA), the use of sonar and other active acoustic sources, and underwater explosives may affect and is likely to adversely affect ESA-listed green, hawksbill, olive ridley, leatherback, and loggerhead sea turtles. Pile driving and swimmer defense airguns may affect but are not likely to adversely affect the green sea turtle, and would have no effect on hawksbill, olive ridley, leatherback, or loggerhead sea turtles. Weapons firing, launch and impact noise, and vessel and aircraft noise may affect but are not likely to adversely affect ESA-listed sea turtles.
- Energy: Pursuant to the ESA, the use of electromagnetic devices may affect but is not likely to adversely affect ESA-listed green, hawksbill, olive ridley, leatherback, and loggerhead turtles.
- Physical Disturbance or Strike: Pursuant to the ESA, use of vessels may affect and is likely to adversely affect ESA-listed green, hawksbill, olive ridley, leatherback, and loggerhead sea turtles. The use of in-water devices, military expended materials, and seafloor devices may affect, but is not likely to adversely affect ESA-listed sea turtles.
- Entanglement: Pursuant to the ESA, fiber optic cables, guidance wires, and parachutes may affect but are not likely to adversely affect ESA-listed green, hawksbill, olive ridley, leatherback, and loggerhead sea turtles.
- Ingestion: Pursuant to the ESA, the potential for ingestion of military expended materials may affect but is not likely to adversely affect ESA-listed green, hawksbill, olive ridley, leatherback, and loggerhead sea turtles.
- Secondary: Pursuant to the ESA, secondary stressors may affect but are not likely to adversely affect sea turtles because changes in sediment, water, and air quality from explosives, explosive byproducts and unexploded ordnance, metals and chemicals are not likely to be detectable, and no detectable changes in growth, survival, propagation, or population-levels of sea turtles are anticipated.

3.5.1 INTRODUCTION

Section 3.5 analyzes potential impacts on sea turtles found in the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area). Section 3.5.1 introduces sea turtle species and taxonomic groups. Section 3.5.2 describes the affected environment. The analysis and summary of potential impacts of the Proposed Action are provided in Section 3.5.4.

The status of sea turtle populations is determined primarily from assessments of the adult female nesting population. Much less is known about other life stages of these species (Mrosovsky et al. 2009, Schofield et al. 2010, Witt et al. 2010). The National Research Council (2010) recently reviewed the current state of sea turtle research, and concluded that relying too much on nesting beach data limits a more complete understanding of sea turtles and the evaluation of management options for their overall health and recovery.

In 2012, NMFS designated critical habitat for the leatherback sea turtle in California (from Point Arena to Point Vincente) and from Cape Flattery, Washington, to Winchester Bay, Oregon, out to the 2,000 mile (mi.) (3,218.7 kilometer [km]) depth contour (National Marine Fisheries Service 2012). This designated critical habitat is north of the Southern California (SOCAL) Range Complex boundary; therefore, the U.S. Department of the Navy (Navy) has determined that training and testing activities would not affect critical habitat for the leatherback sea turtle. None of the primary constituent elements of the designated critical habitat would be impacted.

The five sea turtles found in the Study Area are listed under the Endangered Species Act (ESA) as endangered or threatened. Section 3.0 discusses the regulatory framework of the ESA. The status, presence, and nesting occurrence of sea turtles in the Study Area are listed by region in Table 3.5-1.

Table 3.5-1: Status and Presence of Endangered Species Act-Listed Sea Turtles in the Hawaii-Southern California Training and Testing Study Area

Species Name and Regulatory Status			Presence in Study Area		
Common Name	**Scientific Name**	**Endangered Species Act Status**	**Open Ocean/ Transit Corridor**	**California Current/ Southern California**	**Insular Pacific-Hawaiian**
Family Cheloniidae (hard-shelled sea turtles)					
Green sea turtle	*Chelonia mydas*	Threatened, Endangered[1]	Yes	Yes	Yes*
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered[2]	Yes	Yes	Yes*
Loggerhead sea turtle	*Caretta caretta*	Endangered[3]	Yes	Yes	Yes
Olive ridley sea turtle	*Lepidochelys olivacea*	Threatened, Endangered[4]	Yes	Yes	Yes**

Table 3.5-1: Status and Presence of Endangered Species-Act Listed Sea Turtles in the Hawaii-Southern California Training and Testing Study Area (continued)

Species Name and Regulatory Status			Presence in Study Area		
Common Name	**Scientific Name**	**Endangered Species Act Status**	**Open Ocean/ Transit Corridor**	**California Current/ Southern California**	**Insular Pacific-Hawaiian**
Family Dermochelyidae (leatherback sea turtle)					
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	Yes	Yes	Yes

Notes:

[1] As a species, the green sea turtle is listed as Threatened. However, the Florida and Mexican Pacific Coast nesting populations are listed as Endangered. Green sea turtles found in the Study Area may include individuals from the Mexican Pacific Coast population.

[2] Research suggests that green and hawksbill sea turtles may be present in all life stages (Musick and Limpus 1997; National Marine Fisheries Service [NMFS] and U.S. Fish and Wildlife Service 2007b).

[3] The only distinct population segment of loggerheads that occurs in the Study Area—the North Pacific Ocean distinct population segment—is listed as Endangered.

[4] NMFS and U.S. Fish and Wildlife Service only consider the breeding populations of Mexico's Pacific coast as Endangered. Other populations are listed as Threatened (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f).

* Indicates nesting activity within the Study Area portion. Only green sea turtles and hawksbill sea turtles are known to nest regularly in the Study Area.

** There have been four documented olive ridley sea turtle nesting events in the main Hawaiian Islands: one on Oahu in 2009 at Marine Corps Base Hawaii, Kaneohe; one at Paia, Maui, in 1985; and two on Hawaii Island in 2002 and 2011.

3.5.2 AFFECTED ENVIRONMENT

Sea turtles are highly migratory, and are present in coastal and open ocean waters of the Study Area. Most sea turtles prefer to live in warm waters because they are cold-blooded reptiles. Leatherbacks are the exception, and are more likely to be found in colder waters at higher latitudes because of their unique ability to maintain an internal body temperature higher than that of the environment (Dutton 2006). Habitat use varies among species and within the life stages of individual species, correlating primarily with the distribution of preferred food sources, as well as the locations of nesting beaches.

Habitat and distribution vary among species and life stages, and are discussed further in the species profiles. Little information is available about a sea turtle's stage of life after hatching. Open-ocean juveniles spend an estimated 2 to 14 years drifting, foraging, and developing. Because of the general lack of knowledge of this period, it has been described as "the lost years." After this period, juvenile hawksbill (*Eretmochelys imbricata*), olive ridley (*Lepidochelys olivacea*), loggerhead (*Caretta caretta*), and green (*Chelonia mydas*) turtles settle into coastal habitat, with individuals often remaining faithful to a specific home range until adulthood (Bjorndal and Bolten 1988; National Marine Fisheries Service and U.S. Fish and Wildlife 1991). Leatherback turtles remain primarily in the open ocean throughout their lives, except for mating in coastal waters and females going ashore to lay eggs. All species can migrate long distances across large expanses of the open ocean, primarily between nesting and feeding grounds (National Marine Fisheries Service and U.S. Fish and Wildlife 2007c).

All sea turtle species are believed to use a variety of orientation mechanisms on land and at sea (Lohmann et al. 1997). After emerging from the nest, hatchling turtles use visual cues, such as light wavelengths and shape patterns, to find the ocean (Lohmann et al. 1997). Once in the ocean, hatchlings use wave cues to navigate offshore (Lohmann and Lohmann 1992). In the open ocean, turtles in all life stages are thought to orient to the earth's magnetic field to position themselves in oceanic currents; this helps them locate seasonal feeding and breeding grounds and return to their nesting sites (Lohmann and Lohmann 1996a; Lohmann et al. 1997). The stimuli that help sea turtles find their nesting beaches are still poorly understood, particularly the fine-scale navigation that occurs as turtles approach the site, and could also include chemical and acoustic cues.

3.5.2.1 Diving

Sea turtle dive depth and duration varies by species, the age of the animal, the location of the animal, and the activity (i.e., foraging, resting, migrating). The diving behavior of a particular species or individual has implications for mitigation and monitoring. In addition, their relative distribution through the water column is an important consideration when conducting acoustic exposure analyses. The following text briefly describes the dive behavior of each species.

Green sea turtle. In the open ocean, Hatase et al. (2006) observed that green sea turtles dive to a maximum of 260 feet (ft.) or 79 meters (m). Open-ocean resting dives rarely exceed 50 ft. (15 m), while most open-ocean foraging dives average about 80 ft. (24 m) (Hatase et al. 2006). A difference in duration between night and day dives was observed, with day dives lasting 1 to 18 minutes and night dives averaging 35 to 44 minutes (Rice and Balazs 2008). In their coastal habitat, green sea turtles typically make dives shallower than 100 ft. (31 m), with most dives not exceeding 58 ft. (18 m) (Hays et al. 2004; Rice and Balazs 2008). Green sea turtles are known to forage and also rest at depths of 65 to 165 ft. (20 to 50 m) (Balazs 1980; Brill et al. 1995).

Hawksbill turtle. Hawksbill turtles make short, active foraging dives during the day, and longer resting dives at night (Blumenthal et al. 2009; Storch et al. 2005; Van Dam and Diez 1996). Lutcavage and Lutz (1997) cited a maximum dive duration of 73.5 minutes for a female hawksbill in the U.S. Virgin Islands. Van Dam and Diez (1996) reported that foraging dives at a study site in the northern Caribbean ranged from 19 to 26 minutes at depths of 25 to 35 ft. (8 to 11 m), with resting night dives ranging from 35 to 47 minutes (Van Dam and Diez 1996). Foraging dives of immature hawksbills are shorter, ranging from 8.6 to 14 minutes in duration (Van Dam and Diez 1996), with a mean and maximum depth of 5 ft. (1.5 m) and 65 ft. (20 m), respectively (Blumenthal et al. 2009; Van Dam and Diez 1996).

Loggerhead turtle. Loggerhead turtles foraging in nearshore habitat dive to the seafloor (average depth 165 to 490 ft. [50 to 149 m]) and those in open-ocean habitat dive in the 0 to 80 ft. (0 to 24 m) depth range (Hatase et al. 2007). Dive duration was significantly longer at night, and increased in warmer waters. The average overall dive duration was 25 minutes, although dives exceeding 300 minutes were recorded. Turtles in open-ocean habitat exhibited mid-water resting dives at around 45 ft. (14 m), where they could remain for many hours. This (resting) appears to be the main function of many of the night dives recorded (Hatase et al. 2007). Another study on coastal foraging loggerheads by Sakamoto et al. (1993) found that virtually all dives were shallower than 100 ft. (31 m).

On average, loggerhead turtles spend over 90 percent of their time underwater (Byles 1988; Renaud and Carpenter 1994). Studies investigating dive characteristics of loggerheads under various conditions confirm that loggerheads do not dive particularly deep in the open-ocean environment (approximately 80 ft. [24 m]) but will forage to bottom depths of at least 490 ft. (149 m) in coastal habitats (Hatase et al. 2007; Polovina et al. 2002; Soma 1985).

Olive ridley sea turtle. Most studies on olive ridley diving behavior have been conducted in shallow coastal waters (Beavers and Cassano 1996, Sakamoto et al. 1993), however, Polovina et al. (2002) radio tracked two olive ridleys (and two loggerheads) caught in commercial fisheries. The results showed that the olive ridleys dove deeper than loggerheads, but spent only about 10 percent of time at depth under 100 ft. (31 m). Daily dives of 200 m (656 ft.) occurred, with one dive recorded at 254 m (833 ft.)

(Polovina et al. 2002). The deeper-dive distribution of olive ridleys is also consistent with their oceanic habitat, which differs from the loggerhead habitat. Olive ridleys are found south of the loggerhead habitat in the central portion of the subtropical gyre. The oceanography of this region is characterized by a warm surface layer, a deep thermocline depth, an absence of strong horizontal temperature gradients, and physical or biological fronts (Polovina et al. 2002).

Leatherback sea turtle. The leatherback is the deepest diving sea turtle, with a recorded maximum depth of 4,200 ft. (1,280 m), although most dives are much shallower (usually less than 820 ft. [250 m]) (Hays et al. 2004; Sale et al. 2006). Diving activity (including surface time) is influenced by a suite of environmental factors (e.g., water temperature, availability and vertical distribution of food resources, bathymetry) that result in spatial and temporal variations in dive behavior (James et al. 2006; Sale et al. 2006). Leatherbacks dive deeper and longer in the lower latitudes than in the higher latitudes (James et al. 2005a), where they are known to dive in waters with temperatures just above freezing (James et al. 2006; Jonsen et al. 2007). James et al. (2006) noted that dives in higher latitudes are punctuated by longer surface intervals, perhaps in part to thermoregulate (i.e., bask). Tagging data also revealed that changes in individual turtle diving activity appear to be related to water temperature, suggesting an influence of seasonal prey availability on diving behavior (Hays et al. 2004). In their warm-water nesting habitats, dives are likely constrained by bathymetry adjacent to nesting sites during this time (Myers and Hays 2006). For example, patterns of relatively deep diving are recorded off St. Croix in the Caribbean (Eckert et al. 1986) and Grenada (Myers and Hays 2006) in areas where deep waters are close to shore. A maximum depth of 1,560 ft. (476 m) was recorded (Eckert et al. 1986), although even deeper dives were inferred where dives exceeded the maximum range of the time depth recorder (Eckert et al. 1989). Shallow diving occurs where shallow water is close to the nesting beach in areas such as the China Sea (Eckert et al. 1996), Costa Rica (Southwood et al. 1999), and French Guiana (Fossette et al. 2007).

Information on the diving behavior of each species of sea turtle was compiled in a Technical Report (U.S. Department of the Navy 2011) that summarizes time-at-depth for the purpose of distributing animals within the water column in the acoustic exposure model.

3.5.2.2 Hearing and Vocalization

The auditory system of the sea turtle appears to work via water and bone conduction, with lower-frequency sound conducted through skull and shell, and does not appear to function well for hearing in air (Lenhardt et al. 1983, 1985). Sea turtles do not have external ears or ear canals to channel sound to the middle ear, nor do they have a specialized eardrum. Instead, fibrous and fatty tissue layers on the side of the head may be the sound-receiving membrane in the sea turtle, a function similar to that of the eardrum in mammals, or may serve to release energy received via bone conduction (Lenhardt et al. 1983). Sound is transmitted to the middle ear, where sound waves cause movement of cartilaginous and bony structures that interact with the inner ear (Ridgway 1969). Unlike mammals, the cochlea of the sea turtle is not elongated and coiled, and likely does not respond well to high frequencies, a hypothesis supported by a limited amount of information on sea turtle auditory sensitivity (Ridgway 1969, Bartol 1999).

Investigations suggest that sea turtle auditory sensitivity is limited to low-frequency bandwidths, such as the sound of waves breaking on a beach. The role of underwater low-frequency hearing in sea turtles is unclear. Sea turtles may use acoustic signals from their environment as guideposts during migration and as cues to identify their natal beaches (Lenhardt et al. 1983). Sea turtles are low-frequency hearing specialists, typically hearing frequencies from 30 to 2,000 Hertz (Hz), with a range of maximum sensitivity between 100 and 800 Hz (Bartol 1999, Ridgway 1969, Lenhardt 1994, Bartol and Ketten 2006, Lenhardt 2002). Hearing below 80 Hz is less sensitive but still potentially usable (Lenhardt 1994). Greatest sensitivities are from 300 to 400 Hz for the green sea turtle (Ridgway 1969) and around 250 Hz or below for juvenile loggerheads (Bartol 1999). Bartol et al. (1999) reported that the range of effective hearing for juvenile loggerhead sea turtles is from at least 250 to 750 Hz using the auditory brainstem response technique. Juvenile and sub-adult green sea turtles detect sounds from 100 to 500 Hz underwater, with maximum sensitivity at 200 and 400 Hz (Bartol and Ketten 2006). Auditory brainstem response recordings on green sea turtles showed a peak response at 300 Hz (Yudhana et al. 2010). Juvenile Kemp‘s ridley turtles detected underwater sounds from 100 to 500 Hz, with a maximum sensitivity between 100 and 200 Hz (Bartol and Ketten 2006). Audiometric information is not available for leatherback sea turtles; however, their anatomy suggests they would hear similarly to other sea turtles. Functional hearing is assumed for this analysis to be 10 Hz to 2 kilohertz (kHz).

Sub-adult green sea turtles show, on average, the lowest hearing threshold at 300 Hz (93 decibels [dB] referenced to[re] 1 micro Pascal [µPa]), with thresholds increasing at frequencies above and below 300 Hz, when thresholds were determined by auditory brainstem response (Bartol and Ketten 2006). Auditory brainstem response testing was also used to detect thresholds for juvenile green sea turtles (lowest threshold 93 dB re 1 µPa at 600 Hz) and juvenile Kemp’s ridley sea turtles (thresholds above 110 dB re 1 µPa across hearing range) (Bartol and Ketten 2006). Auditory thresholds for yearling and two-year-old loggerhead sea turtles were also recorded. Both yearling and two-year-old loggerhead sea turtles had the lowest hearing threshold at 500 Hz (yearling: approximately 81 dB re 1 µPa and two-year-olds: approximately 86 dB re 1 µPa), with thresholds increasing rapidly above and below that frequency (Ketten and Bartol 2006). In terms of sound production, nesting leatherback turtles were recorded producing sounds (sighs or belch-like sounds) up to 1,200 Hz with most energy ranging from 300 to 500 Hz (Bartol and Ketten 2006).

3.5.2.3 General Threats

The sea turtle species in the Study Area have unique life histories and habitats; however, threats are common among all species. On beaches, wild domestic dogs, pigs, and other animals ravage sea turtle nests. Humans continue to harvest eggs and nesting females in some parts of the world, threatening some Pacific Ocean sea turtle populations (Maison et al. 2010). Coastal development can cause beach erosion and introduce non-native vegetation, leading to a subsequent loss of nesting habitat. It can also introduce or increase the intensity of artificial light, confusing hatchlings and leading them away from the water, thereby increasing the chances of hatchling mortality. Threats in nearshore foraging habitats include fishing and habitat degradation. Fishing can injure or drown juvenile and adult sea turtles. Habitat degradation, such as poor water quality, invasive species, and disease, can alter ecosystems, limiting the availability of food and altering survival rates. See Chapter 4 (Cumulative Impacts), for further descriptions of threats to sea turtles and ongoing conservation concerns.

Bycatch in commercial fisheries, ship strikes, and marine debris are primary threats in the offshore environment (Lutcavage 1997). One comprehensive study estimated that, worldwide, 447,000 sea turtles are killed each year from bycatch in commercial fisheries (Wallace 2010). Precise data are lacking for sea turtle mortalities directly caused by ship strikes. However, live and dead turtles are often found with deep cuts and fractures indicative of collision with a boat hull or propeller (Lutcavage 1997; Hazel 2007). Marine debris can also be a problem for sea turtles through entanglement or ingestion. Floating plastic garbage can be mistakenly ingested by sea turtles. Leatherback sea turtles in particular may mistake a floating plastic garbage as jellyfish, an important component of the leatherback diet (Mrosovsky et al. 2009). Other marine debris, including derelict fishing gear and cargo nets, can entangle and drown turtles of all life stages.

Global climate change trends are toward increasing ocean and air temperatures, increasing acidification of oceans, and sea level rise; these trends may adversely impact turtles in all life stages (Chaloupka, Kamezaki, et al. 2008; Mrosovsky et al. 2009; Schofield et al. 2010; Witt et al. 2010). Effects include embryo deaths caused by high nest temperatures, skewed sex ratios because of increased sand temperature, loss of nesting habitat to beach erosion, coastal habitat degradation (e.g., coral bleaching), and alteration of the marine food web, which can decrease the amount of prey species. Each sea turtle recovery plan has detailed descriptions of threats in the nesting and marine environment, ranking the seriousness of threats in each of the U.S. Pacific coast states and territories (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998a, b, c, d, e, f).

3.5.2.4 Green Sea Turtle (*Chelonia mydas*)

The green sea turtle is found in tropical and subtropical coastal and open ocean waters, between 30 degrees (°) North (N) and 30° South (S). Major nesting beaches are found throughout the western and eastern Atlantic, Indian, and western Pacific Oceans, and are found in more than 80 countries worldwide (Hirth 1997).

3.5.2.4.1 Status and Management

The green sea turtle was listed under the ESA in July 1978 because of excessive commercial harvest, a lack of effective protection, evidence of declining numbers, and habitat degradation and loss (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007a). The green sea turtle breeding populations off Florida and the Pacific coast of Mexico are listed as endangered, and all other populations are listed as threatened. Genetic studies indicate that the eastern, western, and central Pacific Ocean populations of green sea turtles are distinct, and may require independent management (Dutton et al. 1998; Dutton et al. 2008); however, green sea turtles found in the Study Area may include individuals from the Mexican Pacific Coast population. Critical habitat has not been designated in the Pacific Ocean. Recovery plans have been prepared for Pacific Ocean green sea turtles (western and central Pacific populations) and eastern Pacific Ocean green sea turtle populations (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998a,b).

3.5.2.4.2 Habitat and Geographic Range

Green sea turtles nest on beaches within the Insular Pacific-Hawaiian Large Marine Ecosystem, while they feed and migrate throughout all waters of the Study Area. Green sea turtles likely to occur in the Study Area come from eastern Pacific Ocean and Hawaiian nesting populations. There are very few reports of turtles from southern Pacific Ocean populations occurring in the northern Pacific Ocean (Limpus et al. 2009).

Green sea turtle eggs incubate in the sand for approximately 48 to 70 days. Green sea turtle hatchlings are 2 inches (in.) (5 centimeters [cm]) long, and weigh approximately 1 ounce (oz.) (28 grams [g]). When they leave the nesting beach, hatchlings begin an oceanic phase (Carr 1987), floating passively in current systems (gyres), where they develop (Carr and Meylan 1980). Hatchlings live at the surface in the open ocean for approximately 1 to 3 years (Hirth 1997). Upon reaching the juvenile stage (estimated at 5 to 6 years and shell length of 8 to 10 in. [20 to 25 cm]), they move to lagoons and coastal areas that are rich in seagrass and algae (Bresette et al. 2006; Musick and Limpus 1997). The optimal habitats for late juveniles and adults are warm, quiet, shallow waters (depths of 10 to 33 ft.) (3 to 10 m), with seagrasses and algae, that are near reefs or rocky areas used for resting (Makowski et al. 2006). This habitat is where they will spend most of their lives (Bjorndal and Bolten 1988; Makowski et al. 2006; National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991). A small number of green sea turtles appear to remain in the open ocean for extended periods, perhaps never moving to coastal feeding sites (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007a; Pelletier et al. 2003).

Green sea turtles are known to live in the open ocean during the first 5 to 6 years of life, but little is known about preferred habitat or general distribution during this life phase. Migratory routes within the open ocean are unknown. The main source of information on distribution in the Study Area comes from catches in U.S. fisheries. About 57 percent of green sea turtles (primarily adults) captured in longline fisheries in the North Pacific Subtropical Gyre and North Pacific Transition Zone come from the endangered Mexican nesting population, while 43 percent are from the threatened Hawaiian nesting populations. The Hawaii-based longline tuna fishery is active on the high seas, between 15 °N and 35° N and 150° West (W) to 180° W. The Hawaii-based longline swordfish fishery is active on the high seas northeast of the Hawaiian Islands in the North Pacific Transition Zone (Gilman et al. 2007). These findings suggest that green sea turtles found on the high seas of the western and central Pacific Ocean are from these two populations. Though few observations of green sea turtles in the offshore waters along the U.S. Pacific coast have been verified, their occurrence within the nearshore waters from Baja California to Alaska indicates a presence in the California Current Large Marine Ecosystem (Stinson 1984), including San Diego Bay.

Green sea turtles are estimated to reach sexual maturity at 20 to 50 years of age. This prolonged time to maturity has been attributed to their low-energy plant diet (Bjorndal 1995), and may be the highest age for maturity of all sea turtle species (Chaloupka and Musick 1997; Hirth 1997; National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007a).

Once mature, green sea turtles may reproduce for 17 to 23 years (Carr et al. 1978). They return to their birth beaches to nest every 2 to 5 years (Hirth 1997). This irregular pattern can cause wide year-to-year changes in numbers of nesting females at a given nesting beach. Each female nests three to five times per season, laying an average of 115 eggs in each nest (clutch). A female green sea turtle may deposit 9 to 33 clutches in a lifetime. With an average of approximately 100 eggs per nest, a female green sea turtle may lay 900 to 3,300 eggs in a lifetime (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007a).

When green sea turtles are not breeding, adults live in coastal feeding areas that they sometimes share with juveniles (Seminoff and Marine Turtle Specialist Group Green Turtle Task Force 2004). Green sea turtles of all ages have a dedicated home range, in which they repeatedly visit the same feeding and breeding areas (Bresette et al. 1998; Makowski et al. 2006).

The green sea turtle is the most common sea turtle species in the Hawaii region of the Study Area, occurring in the coastal waters of the main Hawaiian Islands throughout the year and commonly migrating seasonally to the Northwestern Hawaiian Islands to reproduce. The first recorded green sea turtle nest on the Island of Hawaii occurred in 2011. Green sea turtles are found in inshore waters around all of the main Hawaiian Islands and Nihoa Island, where reefs, their preferred habitats for feeding and resting, are most abundant. They are also common in an oceanic zone surrounding the Hawaiian Islands. This area is frequently inhabited by adults migrating to the Northwestern Hawaiian Islands to reproduce during the summer and by ocean-dwelling individuals that have yet to settle into coastal feeding grounds of the main Hawaiian Islands. Farther offshore, green sea turtles occur in much lower numbers and densities.

Green sea turtles have been sighted in Pearl Harbor, but do not nest in the harbor; they are routinely seen in the outer reaches of the entrance channel (U.S. Department of the Navy 2001b). The number of resident turtles at the entrance channel is estimated at 30 to 40, with the largest number occurring at Tripod Reef and the Outfall Extension Pipe. They are also found beneath the outfall pipe of the Fort Kamehameha wastewater treatment plant, at depths of approximately 65 ft. (20 m) (Smith 2010). Green sea turtles are also regularly seen in West Loch (Smith et al. 2006). In the spring of 2010, two green sea turtles nested at Pacific Missile Range Facility for the first time in more than a decade, with successful hatching in August 2010 (O'Malley 2010). Green sea turtles are also common at all three landing beaches of U.S. Marine Corps Base Hawaii in Kaneohe Bay, where they forage in the shallow water seagrass beds (U.S. Department of the Navy 2002).

More than 90 percent of all Hawaiian Island green sea turtle breeding and nesting occurs at French Frigate Shoals in the Northwestern Hawaiian Islands, the largest nesting colony in the central Pacific Ocean, where 200 to 700 females nest each year (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007a). A large foraging population resides in and returns to the shallow waters surrounding the main Hawaiian Islands (especially around Maui and Kauai), where they are known to come ashore at several locations on all eight of the main Hawaiian Islands for basking or nesting.

Green sea turtles are widely distributed in the subtropical coastal waters of southern Baja California, Mexico, and Central America, several hundred kilometers (km) south of the Study Area (Cliffton et al. 1995; National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998b). The main group of eastern Pacific Ocean green sea turtles is found on the breeding grounds of Michoacán, Mexico, from August through January and year-round in the feeding areas, such as those on the western coast of Baja California, along the coast of Oaxaca, and in the Gulf of California (the Sea of Cortez) (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998b). Bahía de Los Angeles in the Gulf of California has been identified as an important foraging area for green sea turtles (Seminoff et al. 2003). Eastern Pacific Ocean green sea turtles have been reported as far north as British Columbia (48.15° N) (Eckert 1993; National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998b). The western coasts of Central America, Mexico, and the United States constitute a shared habitat for this population (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998b). The green sea turtle is not known to nest on Southern California beaches.

In general, turtle sightings increase during summer as warm water moves northward along the coast (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998b). Sightings may also be more numerous in warmer years compared to colder years. In waters south of Point Conception, Stinson (1984) found this seasonal sighting pattern to be independent of interyear temperature fluctuations. More sightings occurred during warmer years north of Point Conception. Stinson also reported that more than 60 percent of eastern Pacific Ocean green sea turtles observed in California were in areas where the water was less than 165 ft. (50 m) deep, often observed along shore in areas of eelgrass.

San Diego Bay is home to a resident population of green sea turtles (Dutton and McDonald 1990; Stinson 1984). A 20-year monitoring program of these turtles indicates an annual abundance of between 16 and 61 turtles (Eguchi et al. 2010). Eelgrass beds and marine algae are particularly abundant in the southern half of the bay, and green sea turtles are frequently observed foraging on these items (Dutton et al. 2002; U.S. Department of the Navy and San Diego Unified Port District 2011). Until December 2010, the southern part of San Diego Bay was warmed by the effluent from the Duke Energy power plant, a fossil fuel power generation facility in operation since 1960. Green sea turtles are known to congregate in this area. The closure of the power plant may impact these resident turtles and alter movement patterns. Ultrasonic tracking studies have shown that green sea turtles in southern San Diego Bay have relatively small home ranges (Dutton et al. 2002). Between 2009 and 2011, MacDonald et al. (2012) used acoustic telemetry to track 25 green sea turtles in San Diego Bay. The results of the study suggest that resident turtles likely do not spend much, if any, time foraging in central or northern San Diego Bay, where human activities are greatest (including Navy activities). A few sea turtles have been observed in northern San Diego Bay, but these are likely transient green sea turtles that enter the bay in warmer months (MacDonald et al. 2012). Another green sea turtle population resides in Long Beach, California, although less is known about this population (Eguchi et al. 2010).

Ocean waters off Southern California and northern Baja California are also designated as areas of occurrence because of the presence of rocky ridges and channels and floating kelp habitats suitable for green sea turtle foraging and resting (Stinson 1984); however, these waters are often at temperatures below the thermal preferences of this primarily tropical species.

3.5.2.4.3 Population and Abundance

Based on data from 46 nesting sites around the world, between 108,761 and 150,521 female green sea turtles nest each year (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007a), which is a 48 to 65 percent decline in the number of females nesting annually over the past 100 to 150 years (Seminoff and Marine Turtle Specialist Group Green Sea Turtle Task Force 2004). Of nine major nesting populations in the Pacific Ocean, four appear to be increasing (Hawaii, Mexico, Japan, Heron Island), three appear to be stable (Galapagos, Guam, Mexico), and the trend is unknown for two (Central American Coast and Raine Island). In addition to these 9 sites, at least 166 smaller nesting sites are scattered across the western Pacific Ocean, with an estimated 22,800 to 42,580 females nesting in the Pacific Ocean each year (Maison et al. 2010; National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007a). Outside of the United States, the harvest of eggs and females for their meat on nesting beaches across the Pacific Ocean remains a primary threat to the species (Maison et al. 2010).

The only nesting population in the Study Area is in Hawaii, with 200 to 700 females nesting annually at French Frigate Shoals, as well as nesting on the Big Island of Hawaii and other minor nesting grounds on other main Hawaiian Islands (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007b). Four other populations are located in the eastern Pacific Ocean, south of the Study Area, with nesting occurring along the western Mexico coast, as well as within the Gulf of California (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007a). The Hawaiian population is under review for being considered a distinct stock. Individuals spend most of their lives within the Insular Pacific-Hawaiian Large Marine Ecosystem. This population appears to have increased gradually over the past 30 years, with near-capacity nesting at French Frigate Shoals (Balazs and Chaloupka 2006; Chaloupka et al. 2008b).

3.5.2.4.4 Predator and Prey Interactions

The green sea turtle is the only sea turtle that is mostly herbivorous (Mortimer 1995), although its diet changes throughout its life. While at the surface, hatchlings feed on floating patches of seaweed and, at shallow depths, on comb jellies and gelatinous eggs, appearing to ignore large jellyfish (Salmon et al. 2004). While in the open ocean, juveniles smaller than 8 to 10 in. (20 to 25 cm) eat worms, small crustaceans, aquatic insects, grasses, and algae (Bjorndal 1997). After settling into a coastal habitat, juveniles eat mostly seagrass or algae (Balazs et al. 1994; Mortimer 1995). Some juveniles and adults that remain in the open ocean, and even those in coastal waters, also consume jellyfish, sponges, and sea pens (Blumenthal et al. 2009; Godley et al. 1998; Hatase et al. 2006; Heithaus et al. 2002; National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007a; Parker and Balazs 2005).

Predators of green sea turtles vary according to turtle location and size. Land predators that feed on eggs and hatchlings include ants, crabs, birds, and mammals, such as dogs, raccoons, and feral pigs. Aquatic predators, mostly fish and sharks, impact hatchlings most heavily in nearshore areas. Sharks are also the primary predators of juvenile and adult turtles (Stancyk 1982).

3.5.2.5 Hawksbill Sea Turtle (*Eretmochelys imbricata*)

The hawksbill turtle is the most tropical of the world's sea turtles, rarely occurring higher than 30° N or 30° S in the Atlantic, Pacific, and Indian Oceans (Lazell 1980). It inhabits coastal waters in more than 108 countries and nests in at least 70 countries (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007b).

3.5.2.5.1 Status and Management

The hawksbill turtle is listed as endangered under the ESA (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998c). Critical habitat has not been designated for the hawksbill in the Pacific Ocean. While the current listing as a single global population remains valid at this time, data may support separating populations at least by ocean basin under the distinct population segment policy (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007b), which would lead to specific management plans for each designated population. The hawksbill shell has been prized for centuries by artisans and their patrons for jewelry and other adornments. This trade, prohibited under the Convention on International Trade in Endangered Species, remains a critical threat to the species (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007b).

3.5.2.5.2 Habitat and Geographic Range

Hawksbills are considered the most coastal of the sea turtles that inhabit the Study Area, with juveniles and adults preferring coral reef habitats (National Marine Fisheries Service 2010b). Reefs provide shelter for resting hawksbills day and night, and they are known to visit the same resting spot repeatedly. Hawksbills are also found around rocky outcrops and high-energy shoals—optimum sites for sponge growth—as well as in mangrove-lined bays and estuaries (National Marine Fisheries Service 2010b).

Hatchling and early juvenile hawksbills have also been found in the open ocean, in floating mats of seaweed (Maison et al. 2010; Musick and Limpus 1997). Although information about foraging areas is largely unavailable due to research limitations, juvenile and adult hawksbills may also be present in open ocean environments (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007b). Very little is known about the open ocean habitat and distribution of hawksbills in the Transit Corridor.

Hawksbills are mostly found in the coastal waters of the eight main islands of the Hawaiian Island chain. Stranded or injured hawksbills are occasionally found in the Northwestern Hawaiian Islands (Parker et al. 2009). Hawksbills are the second-most-common species in the offshore waters of the Hawaiian Islands, yet they are far less abundant than green sea turtles (Chaloupka et al. 2008b). The lack of hawksbill sightings during aerial and shipboard surveys likely reflects the species' small size and difficulty in identifying them from a distance.

Hawksbills have been captured in Kiholo Bay and Kau (Hawaii), Palaau (Molokai), and Makaha (Oahu) (Hawaii Department of Land and Natural Resources 2002). Strandings have been reported in Kaneohe and Kahana Bays (Oahu) and throughout the main Hawaiian Islands (Eckert 1993; National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998c). No stranding data are available for Niihau (U.S. Department of the Navy 2001a). Hawksbills primarily nest on the southeastern beaches of the Island of Hawaii (Aki et al. 1994). Since 1991, 81 nesting female hawksbills have been tagged on the

Island of Hawaii at various locations. This number does not include nesting females from Maui or Molokai, which would add a small number to the total. Post-nesting hawksbills have been tracked moving between Hawaii and Maui over the deep waters of the Alenuihaha Channel (Parker et al. 2009). Only two hawksbills have ever been sighted in the Pearl Harbor entrance channel, and none have been sighted inside the harbor (Smith 2010).

Water temperature in the Southern California region of the Study Area is generally too low for hawksbills, and they are rare. Nesting is rare in the eastern Pacific Ocean region, and does not occur along the U.S. west coast (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998c; Witzell 1983). Stinson (1984) did not mention the hawksbill turtle in her summary of sea turtle occurrences in eastern north Pacific waters from Baja California to the Gulf of Alaska, and no hawksbill sightings have been confirmed along the U.S. west coast in recent history (Eckert 1993; National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007b). If hawksbills were to occur in the Southern California region of the Study Area, it would most likely be during an El Niño event, when waters along the California current are unusually warm (National Marine Fisheries Service 2008).

Hawksbills were once thought to be a nonmigratory species because of the proximity of suitable nesting beaches to coral reef feeding habitats and the high rates of marked turtles recaptured in these areas; however, tagging studies have shown otherwise. For example, a post-nesting female traveled 995 miles (mi.) (1,601 kilometers [km]) from the Solomon Islands to Papua New Guinea (Meylan 1995), indicating that adult hawksbills can migrate distances comparable to those of green and loggerhead sea turtles.

Research suggests that movements of Hawaiian hawksbills are relatively short, with individuals generally migrating through shallow coastal waters and few deepwater transits between the islands. Nine hawksbill turtles were tracked within the Hawaiian Islands using satellite telemetry. Turtles traveled from 55 to 215 mi. (89 to 346 km) and took between 5 and 18 days to complete the trip from nesting to foraging areas (Parker et al. 2009).

Foraging dive durations are often a function of turtle size, with larger turtles diving deeper and longer. Shorter and more active foraging dives occur predominantly during the day, while longer resting dives occur at night (Blumenthal et al. 2009; Storch et al. 2005; Van Dam and Diez 2000). Lutcavage and Lutz (1997) cited a maximum dive duration of 73.5 minutes for a female hawksbill in the U.S. Virgin Islands. Van Dam and Diez (2000) reported that foraging dives at a study site in the northern Caribbean ranged from 19 to 26 minutes at depths of 26 to 33 ft. (8 to 10 m), with resting night dives from 35 to 47 minutes. Foraging dives of immature hawksbills are shorter, ranging from 8.6 to 14 minutes, with a mean and maximum depth of 16.4 and 65.6 ft. (5 and 20 m), respectively (Van Dam and Diez 1996). Blumenthal et al. (2009) reported consistent diving characteristics for juvenile hawksbill in the Cayman Islands, with an average daytime dive depth of 25 ft. (8 m), a maximum depth of 140 ft. (43 m), and a mean nighttime dive depth of 15 ft. (5 m). A change in water temperature affects dive duration; cooler water temperatures in the winter result in increased nighttime dive durations (Storch et al. 2005).

3.5.2.5.3 Population and Abundance

A lack of nesting beach surveys for hawksbill turtles in the Pacific Ocean and the poorly understood nature of this species' nesting have made it difficult for scientists to assess the population status of hawksbills in the Pacific (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998c; Seminoff, Nichols, et al. 2003). An assessment of 25 sites around the world indicates that hawksbill nesting has declined by at least 80 percent over the last three generations (105 years in the Atlantic and 135 years in the Indo-Pacific Ocean) (Meylan and Donnelly 1999). Only five regional populations remain worldwide (two in Australia, and one each in Indonesia, the Seychelles, and Mexico), with more than 1,000 females nesting annually (Meylan and Donnelly 1999). The largest of these regional populations is in the South Pacific Ocean, where 6,000 to 8,000 hawksbills nest off the Great Barrier Reef (Limpus 1992).

As with all other turtle species, hawksbill hatchlings enter an oceanic phase, and may be carried great distances by surface currents. Although little is known about their open ocean stage, younger juvenile hawksbills have been found in association with brown algae in the Pacific Ocean (Musick and Limpus 1997; Parker 1995; Witherington and Hirama 2006; Witzell 1983) before settling into nearshore habitats as older juveniles. Preferred habitat is coral reefs, but hawksbills also inhabit seagrass, algal beds, mangrove bays, creeks, and mud flats (Mortimer and Donnelly 2008). Some juveniles may use the same feeding grounds for a decade or more (Meylan 1999), while others appear to migrate among several sites as they age (Musick and Limpus 1997). Indo-Pacific hawksbills are estimated to mature at between 30 and 38 years of age (Mortimer and Donnelly 2008).

Once they are sexually mature, hawksbill turtles undertake breeding migrations between foraging grounds and breeding areas at intervals of several years (Dobbs et al. 1999; Mortimer and Bresson 1999; Witzell 1983). Although females tend to return to breed where they were born (Bowen and Karl 1997), they may have foraged hundreds or thousands of kilometers from their birth beaches as juveniles, Returning to nest at their birth beaches, these sea turtles are believed to return to their juvenile foraging grounds (Mortimer and Donnelly 2008).

Hawksbills are solitary nesters on beaches throughout the tropics and subtropics. During the nesting season, female hawksbills return to their birth beaches every 2 to 3 years at night. A female hawksbill lays between three and five clutches during a single nesting season, which contain an average of 130 eggs per clutch (Mortimer and Bresson 1999; Richardson et al. 1999). In Hawaii, the nesting seasons runs approximately from May through December (Aki et al. 1994).

The Hawksbill Sea Turtle (*Eretmochelys imbricata*) 5-year Review: Summary and Evaluation (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007b) assessed nesting abundance and nesting trends in all regions that the hawksbill turtles inhabit. Where possible, historical population trends were determined, and most showed declines for the 20 to 100 year period of evaluation. Recent trends for 42 of the sites indicated that 69 percent were decreasing, seven percent were stable, and that 24 percent were increasing. Seven of the 83 sites occur in the central Pacific Ocean and one occurs in the eastern Pacific Ocean (Baja California, Mexico), all with decreasing long-term population trends; only the Hawaii site has a recent increasing trend. Hawksbills in the eastern Pacific Ocean are probably the most endangered sea turtle population in the world (Gaos and Yañez 2008). Hawksbills sometimes nest in the southern part of the Baja Peninsula, while juveniles and subadults are seen foraging in coastal waters regularly. No nesting occurs on the western coast of the United States. Hawksbills in the U.S. Pacific region nest only on eastern beaches of the Island of Hawaii (5 to 10 nesting females annually, although 13 were reported in 2011 [Rivers 2011]), as well as in the Northwestern Hawaiian Islands. (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007b).

3.5.2.5.4 Predator and Prey Interactions

Hawksbills eat both animals and algae during the early juvenile stage, feeding on prey such as sponges, algae, mollusks, crustaceans, and jellyfish (Bjorndal 1997). Older juveniles and adults are more specialized, feeding primarily on sponges, which comprise as much as 95 percent of their diet in some locations, although the diet of adult hawksbills in the Indo-Pacific region includes other invertebrates and algae (Meylan 1988; Witzell 1983). The shape of their mouth allows hawksbills to reach into holes and crevices of coral reefs to find sponges and other invertebrates.

Predators of hawksbills vary according to turtle location and size. Land predators on eggs and hatchlings include ants, crabs, birds, and mammals, such as dogs, raccoons, and feral pigs. Aquatic predators, mostly fish and sharks, impact hatchlings most heavily in nearshore areas. Sharks are also the primary predators of juvenile and adult turtles (Stancyk 1982).

3.5.2.6 Loggerhead Sea Turtle (*Caretta caretta*)

Loggerhead sea turtles are one of the larger species of turtle, named for their large blocky heads that support powerful jaws used to feed on hard-shelled prey. The loggerhead is found in temperate to tropical regions of the Atlantic, Pacific, and Indian Oceans and in the Mediterranean Sea (Conant et al. 2009).

3.5.2.6.1 Status and Management

The loggerhead was the subject of a complete stock analysis conducted to identify distinct population segments within the global population (Conant et al. 2009). Three distinct population segments occur in the Pacific Ocean: North Pacific, South Pacific, and Southeast Indo-Pacific Ocean. Genetic data (Bowen et al. 1995; Resendiz et al. 1998) and tagging data (Conant et al. 2009) indicate that the South Pacific and Southeast Indo-Pacific Ocean nesting populations rarely, if ever, are found in northern Pacific Ocean waters. North Pacific Ocean loggerheads nest exclusively in Japan. Based on a review of census data collected from most of the Japanese beaches from the 1950s through the 1990s, Kamezaki et al. (2003) concluded that the annual loggerhead nesting population in Japan declined 50 to 90 percent in recent decades. Loggerheads are declining and at risk of extirpation from the northern Pacific Ocean. This drop in numbers is primarily the result of fishery bycatch from the coastal pound net fisheries off Japan, coastal fisheries that affect juvenile foraging populations off Baja California, and un-described fisheries that likely affect loggerheads in the South China Sea and the northern Pacific Ocean (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007d). In September 2011, NMFS listed all three Pacific Ocean distinct population segments of loggerhead sea turtles as endangered (76 FR 588868). Although two petitions to designate critical habitat have been submitted to NMFS (Turtle Island Restoration Network [July 16, 2007] and the Center for Biological Diversity [November 16, 2007], as cited in National Marine Fisheries Service 2010a), critical habitat has yet to be proposed and designated for Pacific Ocean loggerheads.

3.5.2.6.2 Habitat and Geographic Range

The loggerhead turtle is found in habitats ranging from coastal estuaries to the open ocean (Dodd 1988). Most of the loggerheads observed in the eastern North Pacific Ocean are believed to come from beaches in Japan where the nesting season is late May to August (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998e). Migratory routes can be coastal or can involve crossing deep ocean waters (Schroeder et al. 2003). The species can be found hundreds of kilometers out to sea, as well as in inshore areas, such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and shipwrecks are often used as feeding areas. The nearshore zone provides crucial foraging habitat, as well as internesting and overwintering habitat.

Loggerheads typically nest on beaches close to reef formations and adjacent to warm currents (Dodd 1988). They prefer nesting beaches facing the open ocean or along narrow bays (Conant et al. 2009). Nesting beaches tend to be wide and sandy, backed by low dunes and fronted by a flat sandy approach from the water (Miller et al. 2003). Nests are typically laid between the high tide line and the dune front (Hailman and Elowson 1992).

Pacific Ocean loggerheads appear to use the entire North Pacific Ocean during development. There is substantial evidence that the North Pacific Ocean stock makes two transoceanic crossings. The first crossing (west to east) is made immediately after they hatch from the nesting beach in Japan, while the second (east to west) is made when they reach either the late juvenile or adult life stage at the foraging grounds in Mexico. Offshore, juvenile loggerheads forage in or migrate through the North Pacific Subtropical Gyre as they move between North American developmental habitats and nesting beaches in Japan. The highest densities of loggerheads can be found just north of Hawaii in the North Pacific Transition Zone (Polovina et al. 2000).

The North Pacific Transition Zone is defined by convergence zones of high productivity that stretch across the entire northern Pacific Ocean from Japan to California (Polovina et al. 2001). Within this gyre, the Kuroshio Extension Bifurcation Region is an important habitat for juvenile loggerheads (Polovina et al. 2006). These turtles, whose oceanic phase lasts a decade or more, have been tracked swimming against the prevailing current, apparently to remain in the areas of highest productivity. Juvenile loggerheads originating from nesting beaches in Japan migrate through the North Pacific Transition Zone en route to important foraging habitats in Baja California, and are likely to be found in the Transit Corridor of the Study Area (Bowen et al. 1995).

National Marine Fisheries Service and U.S. Fish and Wildlife Service (1998e) listed four sighting records of this species for the Hawaiian Islands, all juveniles. A single male loggerhead turtle has also been reported to visit Lehua Channel and Keamano Bay (located off the northern coast of Niihau) every June through July (U.S. Department of the Navy 2001a, 2002). Only one loggerhead stranding has been recorded in the Hawaiian Islands since 1982 (National Marine Fisheries Service 2004). While incidental catches of loggerheads in the Hawaii-based longline fishery indicate that they use these waters during migrations and development (Polovina et al. 2000), their occurrence in the offshore waters of the Hawaii portion of the Study Area is believed to be rare.

The loggerhead turtle is known to occur at sea in the Southern California portion of the Study Area, but does not nest on Southern California beaches. Loggerhead turtles primarily occupy areas where the sea surface temperature is between 59° Fahrenheit (F) and 77°F (15°C and 25°C). In U.S. waters, most records of loggerhead sightings, stranding events, and incidental bycatch have been of juveniles documented from the nearshore waters of Southern California. In general, turtle sightings increase during the summer, peaking from July to September off Southern California and southwestern Baja California (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998e; Stinson 1984).

During El Niño events, foraging loggerheads from Mexican waters may expand their range north into Southern California waters. For this reason, U.S. Pacific Ocean waters east of 120° W longitude are closed to the large mesh drift gillnet fishery targeting swordfish and thresher shark during June, July and August during a forecast or occurring El Nino event (National Marine Fisheries Service 2003). These waters are considered an area of occurrence during the warm-water period. The area of occurrence during the cold-water period is cut along the 64°F (18°C) isotherm (a line on a map representing changes of volume or pressure under conditions of constant temperature). Loggerheads are generally not found in waters colder than 60.8°F (16°C), so the area north of the 60.8°F (16°C) isotherm is depicted as an area of rare occurrence (National Marine Fisheries Service 2003).

The loggerhead embarks on transoceanic migrations, and has been reported as far north as Alaska and as far south as Chile. Loggerheads foraging in and around Baja California originate from breeding areas in Japan (Conant et al. 2009), while Australian stocks appear to migrate to foraging grounds off the coasts of Peru and Chile (Alfaro-Shigueto et al. 2004).

Diving profiles in open ocean and nearshore habitats appear to be based on the location of the food source, with turtles foraging in the nearshore habitat diving to the seafloor (average depth 165 - 330 ft.) (50 - 101 m) and those in the open ocean habitat diving exclusively in the 0 to 80 ft. (0 - 24 m) depth range (Hatase et al. 2007). Dive duration increased in warmer waters. The average foraging dive duration was 25 minutes, although night resting dives to depths of 45 ft. (14 m) longer than 300 minutes were recorded. Resting appears to be the main function of night dives (Hatase et al. 2007).

A diving study of two longline-caught loggerheads in the Central North Pacific Ocean showed that the turtles spent about 40 percent of their time in the top 3 ft. (0.9 m), 70 percent of the dives were no deeper than 15 ft. (4.6 m), and virtually all of their time was spent in water shallower than 330 ft. (101 m) (Polovina et al. 2002).

3.5.2.6.3 Population and Abundance

The global population of loggerhead turtles is estimated at 43,320 to 44,560 nesting females (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007d). The largest nesting populations occur in the subtropics on the western rims of the Atlantic and Indian Oceans. The largest nesting aggregation in the Pacific Ocean occurs in southern Japan, where fewer than 1,000 females breed annually (Kamezaki et al. 2003). Seminoff et al. (2004) carried out aerial surveys for loggerhead turtles along the Pacific Coast of the Baja California Peninsula, Mexico an area long thought to be critical habitat for juveniles. Surveys were carried out from September to October 2005 and encompassed nearly 7,000 km of track-line with offshore extents to 170 km. More than 400 turtles were sighted. Loggerheads were the most prevalent (77 percent of all sightings). Olive ridleys (12 percent), green turtles (7 percent), and leatherback turtles (less than 1 percent) were also sighted.

Females lay three to five clutches of eggs, and sometimes lay additional clutches, during a single nesting season (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007d). Mean clutch size is approximately 100 to 130 eggs (Dodd 1988). The temperature of a viable nest ranges between 79°F and 90°F (26°C and 32°C). Eggs incubate for approximately two months before they hatch (Mrosovsky 1980). As with all sea turtles, an incubation temperature near the upper end of the viable range (90°F [32°C]) produces all females, and an incubation temperature near the lower end (79°F [26°C]) produces all male hatchlings (Mrosovsky 1980).

Hatchlings travel to oceanic habitats, and often are found in seaweed drift lines (Carr 1986, 1987; Witherington and Hirama 2006). Loggerheads spend the first 7 to 11.5 years of their lives in the open ocean (Bolten 2003). At about 14 years old, some juveniles move to nearshore habitats close to their birth area, while others remain in the oceanic habitat or move back and forth between the two (Musick and Limpus 1997). Turtles may use the same nearshore developmental habitat all through maturation or may move among different areas, finally settling in an adult foraging habitat. Loggerheads reach sexual maturity at around 35 years of age, and move from subadult to adult coastal foraging habitats (Godley et al. 2003; Musick and Limpus 1997). Data from Japan (Hatase et al. 2002), Cape Verde (Hawkes et al. 2006), and Florida (Reich et al. 2007) indicate that at least some of the adult population forage in the open ocean.

3.5.2.6.4 Predator and Prey Interactions

In both open ocean and nearshore habitats, loggerheads are primarily carnivorous, although they also consume some algae (Bjorndal 1997; Dodd 1988). Both juveniles and adults forage in coastal habitats, where they feed primarily on the bottom, although they also capture prey throughout the water column (Bjorndal 2003). Adult loggerheads feed on a variety of bottom-dwelling animals, such as crabs, shrimp, sea urchins, sponges, and fish. They have powerful jaws that enable them to feed on hard-shelled prey, such as whelks and conch. During migration through the open sea, they eat jellyfish, mollusks, flying fish, and squid.

Polovina et al. (2006) found that juvenile loggerheads in the western North Pacific Ocean at times swim against weak prevailing currents because they are attracted to areas of high productivity. Similar observations have been made in the Atlantic (Hawkes et al. 2006). These results suggest that the location of currents and associated frontal eddies is important to the loggerhead’s foraging during its open ocean stage (McClellan and Read 2007).

3.5.2.7 Olive Ridley Sea Turtle (*Lepidochelys olivacea*)

The olive ridley is a relatively small, hard-shelled sea turtle named for its olive green top shell. The olive ridley is known as an open ocean species, but can be found in coastal areas. They are found in tropical waters of the south Atlantic, Indian, and Pacific Oceans. While the olive ridley is the most abundant sea turtle species in the world (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f), with some of the largest nesting beaches occurring along the Pacific coast of Central America, few data about its occurrence in the Study Area are available.

3.5.2.7.1 Status and Management

The Mexican Pacific Ocean coast nesting population has been classified as endangered because of extensive overharvesting of olive ridley turtles in Mexico, which caused a severe population decline (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f). Olive ridleys in the Study Area likely belong to this population. All other populations are listed under the ESA as threatened (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f). Before this commercial exploitation, the olive ridley was highly abundant in the eastern tropical Pacific Ocean, probably outnumbering all other sea turtle species combined in the area (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f). Today, this population appears to be stable or increasing (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007e), although the decline of the species continues at several important nesting beaches in Central America. Critical habitat has not been designated for the olive ridley.

Available information indicates that the population could be separated by ocean basins under the distinct population segment policy (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007e). Based on genetic data, the worldwide olive ridley population is composed of four main lineages: east India, Indo-Western Pacific, Atlantic, and eastern Pacific Ocean (Bowen et al. 1998; Shankar et al. 2004). Furthermore, genetic diversity of the eastern Pacific Ocean subpopulation nesting on the Baja California Peninsula may indicate that this population should be considered as a distinct management unit (Lopez-Castro and Rocha-Olivares 2005).

3.5.2.7.2 Habitat and Geographic Range

Most olive ridley turtles lead a primarily open ocean existence (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f). Outside of the breeding season, the turtles disperse, but little is known of their foraging habitats or migratory behavior. Neither males nor females migrate to one specific foraging area, but tend to roam and occupy a series of feeding areas in the open ocean (Plotkin et al. 1994). The olive ridley has a large range in tropical and subtropical regions in the Pacific Ocean, and is generally found between 40° N and 40° S. Both adult and juvenile olive ridley turtles typically inhabit offshore waters, foraging from the surface to a depth of 490 ft. (149.4 m) (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f).

The second-most-important nesting area for olive ridley turtles, globally, occurs in the eastern Pacific Ocean, along the western coast of southern Mexico and northern Costa Rica, with stragglers nesting as far north as southern Baja California (Fritts et al. 1982) and as far south as Peru (Brown and Brown 1995). Individuals occasionally occur in waters as far north as California and as far south as Peru, spending most of their life in the oceanic zone (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007e).

Data collected during tuna fishing cruises from Baja California to Ecuador, and from the Pacific coast to almost 150° W, indicated that the two most important areas in the Pacific Ocean for the olive ridley turtles are the Central American coast and the nursery and feeding area off Colombia and Ecuador. In these areas, both adults (mostly females) and juveniles are often seen (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f).

In the open ocean of the eastern Pacific Ocean, olive ridley turtles are often seen near flotsam (floating debris), possibly feeding on associated fish and invertebrates (Pitman 1992). Although no estimates are available, the highest densities of olive ridley turtles are likely found just south of Hawaii, as their distribution in the central Pacific Ocean is primarily tropical (Polovina et al. 2004). About 18 percent of the sea turtles incidentally caught by the Hawaii-based longline fishery, which operates throughout this region, are olive ridley turtles (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f, National Marine Fisheries Service 2011). Arenas and Hall (1992) found that 75 percent of sea turtles associated with floating objects in the eastern tropical Pacific Ocean were olive ridley turtles, which were present in 15 percent of the observations; this finding suggests that flotsam may provide the turtles with food, shelter, and orientation cues in an otherwise featureless landscape.

An estimated 31 olive ridley turtles have stranded in the Hawaiian Islands between 1982 and 2003 (Chaloupka et al. 2008b).Few sightings have been recorded in the nearshore waters of the main Hawaiian Islands and Nihoa. Available information suggests that olive ridley turtles traverse through the oceanic waters surrounding the Hawaiian Islands during foraging and developmental migrations. Genetic analysis of olive ridley turtles captured in the Hawaii-based longline fishery showed that 67 percent originated from the eastern Pacific Ocean (Mexico and Costa Rica), and 33 percent of the turtles were from the Indian and western Pacific Ocean rookeries (Polovina et al. 2004). These turtles were captured in deep, offshore waters of the Hawaiian Islands, primarily during spring and summer. Based on the oceanic habitat preferences of this species throughout the Pacific Ocean, this species is likely more prevalent year round in waters off the Hawaiian Islands beyond the 330 ft. (101 m) isobath, with only rare occurrences inside this isobath.

The olive ridley turtle occurs off the coast of southern and central California, but is not known to nest on California beaches. Olive ridley turtles are occasionally seen in shallow waters (less than 165 ft.) (50 m) deep), although these sightings are relatively rare (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f). In general, turtle sightings increase during summer as warm water moves northward along the coast (Steiner and Walder 2005; Stinson 1984). Sightings may also be more numerous in warm years compared with cold years.

Pacific Ocean at-sea density and abundance were estimated for olive ridley turtles that occurred just south of California (Eguchi et al. 2007). This study produced density estimates from shipboard line-transects conducted between 1992 and 2006 in the eastern tropical Pacific Ocean, in an area defined by 5° N, 120° W, and 25° N and the coastlines of Mexico and Central America. The average density calculated from this study was 0.10 turtle per square mile (0.26 turtle per square kilometer), with a minimum of 0.16 and maximum of 0.4 turtle per square mile (minimum of 0.40 and maximum of 1.04 turtle per square kilometer).

Olive ridley turtles are found primarily in the open ocean between 73°F and 82°F (23°C and 28°C), so the entire Study Area has been listed as an area of occurrence for olive ridley turtles during summer months. The entire Study Area has been listed as an area of rare occurrence during the winter, when water temperatures are low.

The Pacific Ocean population migrates throughout the Pacific Ocean, from their nesting grounds in Mexico and Central America to the North Pacific Ocean (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007e). The post-nesting migration routes of olive ridley turtles tracked via satellite from Costa Rica traversed thousands of kilometers of deep oceanic waters from Mexico to Peru, and more than 1,865 mi. (3,000 km) out into the central Pacific Ocean (Plotkin et al. 1994). Tagged turtles nesting in Costa Rica were recovered as far south as Peru, as far north as Oaxaca, Mexico, and offshore to a distance of 1,080 nautical miles (nm) (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f).

Groups of 100 or more turtles have been observed as far offshore as 120° W, at about 1,620 nm from shore (Arenas and Hall 1992). Sightings of large groups of olive ridley turtles at sea reported by Oliver in 1946 (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f) may indicate that turtles travel in large flotillas between nesting beaches and feeding areas (Márquez M. 1990). Specific post-breeding migratory pathways to feeding areas do not appear to exist, although olive ridley turtles swim hundreds to thousands of kilometers over vast oceanic areas.

Olive ridley turtles can dive and feed at considerable depths (260 to 1,000 ft.) (79 to 305 m) (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f), although only about 10 percent of their time is spent at depths greater than 330 ft. (101 m) (Eckert et al. 1986; Polovina et al. 2002). In the eastern tropical Pacific Ocean, at least 25 percent of their total dive time is spent between 65 and 330 ft. (20 and 101 m) (Parker et al. 2003). In the North Pacific Ocean, two olive ridley turtles tagged with satellite-linked depth recorders spent about 20 percent of their time in the top meter and about 10 percent of their time deeper than 330 ft. (101 m); a daily maximum depth exceeded 490 ft. (149 m) at least once in 20 percent of the days, with one dive recorded at 835 ft. (255 m). While olive ridley turtles are known to forage to great depths, 70 percent of the dives from this study were no deeper than 15 ft. (4.6 m) (Polovina et al. 2002).

3.5.2.7.3 Population and Abundance

The olive ridley is the most abundant sea turtle in the world (Pritchard 1997) and the most abundant sea turtle in the open ocean waters of the eastern tropical Pacific Ocean (Pitman 1990). They nest in nearly 60 countries worldwide, with an estimated 800,000 females nesting annually (National Marine Fisheries Service 2010b). This is a dramatic decrease over the past 50 years, where the population from the five

Mexican Pacific Ocean beaches was previously estimated at 10 million adults (Cliffton et al. 1995). The number of olive ridley turtles occurring in U.S. territorial waters is believed to be small (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f). At-sea abundance surveys conducted along the Mexican and Central American coasts between 1992 and 2006 provided an estimate of 1.39 million turtles in the region, which was consistent with the increases seen on the eastern Pacific Ocean nesting beaches between 1997 and 2006 (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007e).

Little is known about the age and sex distribution, growth, birth and death rates, or immigration and emigration of olive ridley turtles. Hatchling survivorship is unknown, although presumably, as with other turtles, many die during the early life stages. Both adults and juveniles occur in open sea habitats, though sightings are relatively rare. The median age to sexual maturity is 13 years, with a range of 10–18 years (Zug et al. 2006).

Olive ridley turtles use two types of nesting strategies. In 18 locations around the world, they conduct annual synchronized nesting, a phenomenon known as an “arribada” (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f), where hundreds to tens of thousands of olive ridley turtles emerge over a period of a few days. In the eastern Pacific Ocean, arribada nesting occurs throughout the year, although it peaks from September to December (Fretey 2001). Arribadas occur on several beaches in Mexico, Nicaragua, Costa Rica, and Panama. Olive ridley turtles also lay solitary nests throughout the world, although little attention has been given to this nesting strategy because of the dominant interest in arribada research (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007e). Solitary nesting occurs in at least 46 countries throughout the world (Kalb and Owens 1994), including along nearly the entire Pacific Ocean coast of Mexico, with the greatest concentrations closer to arribada beaches. In Hawaii, olive ridleys have been known to nest sporadically on the Island of Maui, at U.S. Marine Corps Base Hawaii on Oahu in 2009, and on the Ka’u coast on the Island of Hawaii in 2010.

Females and males begin to group in “reproductive patches” near their nesting beaches 2 months before the nesting season, and most mate near the nesting beaches, although mating has been observed throughout the year as far as 565 mi. (909 km) from the nearest mainland (Pitman 1990). Arribadas usually last from three to seven nights, and due to the sheer number of nesters, later arrivers disturb and dig up many existing nests, lowering overall survivorship during this phase (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f). A typical female produces two clutches per nesting season, averaging 105 eggs at 15 to 17 day intervals for lone nesters and 28 day intervals for mass nesters (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f; Plotkin et al. 1994). Studies show that females that nested in arribadas remain within 3 mi. (4.8 km) of the beach most of the time during the internesting period (Kalb and Owens 1994). Incubation time from egg deposition to hatching is approximately 55 days (Pritchard and Plotkin 1995). Hatchlings emerge weighing less than 1 oz. (less than 28 g) and measuring about 1.5 inches (3.8 cm).

3.5.2.7.4 Predator and Prey Interactions

Olive ridley sea turtles are primarily carnivorous. They consume a variety of prey in the water column and on the seafloor, including snails, clams, tunicates, fish, fish eggs, crabs, oysters, sea urchins, shrimp, and jellyfish (Fritts 1981; Márquez M. 1990; Mortimer 1995; Polovina et al. 2004). Olive ridleys are subject to predation by the same predators as other sea turtles, such as sharks on adult olive ridleys, fish and sharks on hatchlings, and various land predators on hatchlings (e.g., ants, crabs, birds, and mammals) (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998f).

3.5.2.8 Leatherback Sea Turtle (*Dermochelys coriacea*)

Leatherback turtles have several unique characteristics. They are distinguished from other sea turtles in the Study Area by their leathery shell, and they are the largest species of sea turtle; adults can reach 6.5 ft. (2 m) in length (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992). Leatherbacks are also the most migratory sea turtles, and are able to tolerate colder water than other species (Hughes et al. 1998; James and Mrosovsky 2004). Leatherbacks are the deepest-diving sea turtle (Hays et al. 2004). They are found in tropical to temperate regions of the Atlantic, Indian, and Pacific Oceans. Leatherbacks are known as an open ocean species, but can also rarely be found in coastal waters within the Study Area.

3.5.2.8.1 Status and Management

The leatherback turtle is listed as a single population, and is classified as endangered under the ESA. Although the U.S. Fish and Wildlife Service and NMFS believe the current listing is valid, preliminary information indicates an analysis and review of the species (e.g., genetic differences between leatherback stocks) should be conducted to determine if some stocks should be designated as distinct populations (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007c; Turtle Expert Working Group 2007). This effort is critical to focus efforts to protect the species, because the status of individual stocks varies widely across the world. Most stocks in the Pacific Ocean are faring poorly, where nesting populations have declined more than 80 percent (Sarti-Martinez 2000), while western Atlantic and South African populations are generally stable or increasing (Turtle Expert Working Group 2007). In 2012, NMFS designated critical habitat for the leatherback sea turtle in California (from Point Arena to Point Vincente) and from Cape Flattery, Washington, to Winchester Bay, Oregon, out to the 2,000 mi. (3,219 km) depth contour (National Marine Fisheries Service 2012). As stated previously, this critical habitat designation is north of the SOCAL Range Complex boundary.

By 2004, 203 nesting beaches from 46 countries around the world had been identified (Dutton 2006). The leatherback sea turtle has been reported to nest on the Island of Lanai in the past. Although these data are beginning to form a global perspective, unidentified sites likely exist, and incomplete or no data are available for many other sites. Genetic studies have been used to identify two discrete leatherback populations in the Pacific Ocean (Dutton 2006), an eastern Pacific Ocean population, which nests between Mexico and Ecuador, and a western Pacific Ocean population, which nests in numerous countries, including Australia, Fiji, Indonesia, and China. Leatherbacks have been in decline in all major Pacific basin rookeries (nesting areas/groups) (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007c; Turtle Expert Working Group 2007) for at least the last two decades (Gilman 2008; Sarti-Martinez et al. 1996; Spotila et al. 1996; Spotila et al. 2000). Causes for this decline include the nearly complete harvest of eggs and high levels of mortality during the 1980s, primarily in the high seas driftnet fishery, which is now banned (Chaloupka et al. 2004; Eckert and Sarti-Martinez 1997; Gilman 2008; Sarti-Martinez et al. 1996). With only four major rookeries remaining in the western Pacific Ocean and two in the eastern Pacific Ocean, the Pacific leatherback is at an extremely high risk of extinction (Gilman 2008).

3.5.2.8.2 Habitat and Geographic Range

The leatherback turtle is the most widely distributed of all sea turtles, found from tropical to subpolar oceans, and nests on tropical and occasionally subtropical beaches (Gilman 2008; Myers and Hays 2006; National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992). Found from 71° N to 47° S, it has the most extensive range of any adult turtle (Eckert 1995). Adult leatherback turtles forage in temperate and subpolar regions in all oceans, and migrate to tropical nesting beaches between 30° N and 20° S. Leatherbacks have a wide nesting distribution, primarily on isolated mainland beaches in tropical oceans (mainly in the Atlantic and Pacific Oceans, with few in the Indian Ocean) and temperate oceans (southwest Indian Ocean) (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992), and to a lesser degree on some islands.

Hatchling leatherbacks head out to the open ocean, but little is known about their distribution for the first four years (Musick and Limpus 1997). Sightings of turtles smaller than 55 in. (140 cm) indicate that some juveniles remain in coastal waters in some areas (Eckert et al. 1999). Most of the eastern Pacific Ocean nesting stocks migrate south, away from the Study Area (Dutton unpublished data).

Few quantitative data are available concerning the seasonality, abundance, or distribution of leatherbacks in the central northern Pacific Ocean. Satellite tracking studies and occasional incidental captures of the species in the Hawaii-based longline fishery indicate that deep ocean waters are the preferred habitats of leatherback turtles in the central Pacific Ocean (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007c). The primary migration corridors for leatherbacks are across the North Pacific Subtropical Gyre, with the eastward migration route possibly to the north of the westward migration (Dutton unpublished data).

The primary data available for leatherbacks in the North Pacific Transition Zone come from longline fishing bycatch reports, as well as several satellite telemetry data sets (Benson et al. 2007). Leatherbacks from both eastern and western Pacific Ocean nesting populations migrate to northern Pacific Ocean foraging grounds, where longline fisheries operate (Dutton et al. 1998). Leatherbacks from nesting beaches in the Indo-Pacific region have been tracked migrating thousands of kilometers through the North Pacific Transition Zone to summer foraging grounds off the coast of northern California (Benson et al. 2007). Based on the genetic sampling of 18 leatherback turtles caught in the Hawaiian longline fishery, about 94 percent originated from western Pacific Ocean nesting beaches (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2007c). The remaining 6 percent of the leatherback turtles found in the open ocean waters north and south of the Hawaiian Islands represent nesting groups from the eastern tropical Pacific Ocean.

Leatherback turtles are regularly sighted by fishermen in offshore waters surrounding the Hawaiian Islands, generally beyond the 3,800 ft. (1,158 m) contour, and especially at the southeastern end of the island chain and off the northern coast of Oahu (Balazs 1995). Leatherbacks encountered in these waters, including those caught accidentally in fishing operations, may be migrating through the Insular Pacific-Hawaiian Large Marine Ecosystem (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998d). Sightings and reported interactions with the Hawaii longline fishery commonly occur around seamount habitats above the Northwestern Hawaiian Islands (from 35° N to 45° N and 175° W to 180° W) (Skillman and Balazs 1992; Skillman and Kleiber 1998).

The leatherback turtle occurs within the entire Insular Pacific-Hawaiian Large Marine Ecosystem beyond the 330 ft. (101 m) isobath; inshore of this isobath is the area of rare leatherback occurrence. Incidental captures of leatherbacks have also occurred at several offshore locations around the main Hawaiian Islands (McCracken 2000). Although leatherback bycatches are common off the island chain, leatherback-stranding events on Hawaiian beaches are uncommon. Since 1982, only five leatherbacks have stranded in the Hawaiian Islands (Chaloupka et al. 2008b). Leatherbacks were not sighted during any of the aerial surveys, all of which took place over waters lying close to the Hawaiian shoreline. Leatherbacks were also not sighted during any of the NMFS shipboard surveys; their deep diving capabilities and long submergence times reduce the probability that observers could spot them during marine surveys. One leatherback turtle was observed along the Hawaiian shoreline during monitoring surveys in 2006 (Rivers 2011).

In the eastern North Pacific Ocean, leatherback turtles are broadly distributed from the tropics to as far north as Alaska, where 19 occurrences were documented between 1960 and 2001 (Eckert 1993; Hodge and Wing 2000). Stinson (1984) concluded that the leatherback was the most common sea turtle in U.S. waters north of Mexico. Aerial surveys off California, Oregon, and Washington indicate that most leatherbacks occur in waters over the continental slope, with a few beyond the continental shelf (Eckert 1993). While the leatherback is known to occur throughout the California Current Large Marine Ecosystem, it is not known to nest anywhere along the U.S. Pacific Ocean coast. In general, turtle sightings increase during summer, as warm water moves northward along the coast (Stinson 1984). Sightings may also be more numerous in warm years than in cold years.

Leatherback turtles are regularly seen off the western coast of the United States, with the greatest densities found off central California. Off central California, sea surface temperatures are highest during the summer and fall, and oceanographic conditions create favorable habitat for leatherback turtle prey (jellyfish). Satellite telemetry data indicate that these animals are within the California Current Large Marine Ecosystem, as well as that portion of the Study Area that is included within it (Benson et al. 2007). There is some evidence that they follow the 61°F (16°C) isotherm into Monterey Bay, and the length of their stay apparently depends on prey availability (Starbird et al. 1993). Satellite telemetry studies link leatherback turtles off the U.S. west coast to one of the two largest remaining Pacific Ocean breeding populations in Jamursba Medi, Indonesia. Thus, nearshore waters off central California represent an important foraging region for the critically endangered Pacific Ocean leatherback turtle. There were 96 sightings of leatherbacks within 50 km of Monterey Bay from 1986 to 1991, mostly by recreational boaters (Starbird et al. 1993).

Numerous NMFS survey sightings of leatherbacks have been recorded in the waters of Southern California, with nearly all of those sightings occurring in deeper waters seaward of the Channel Islands. Satellite-tracking studies from 2002 have demonstrated that leatherbacks migrate south from nearshore waters off central and northern California (such as Monterey Bay) along the U.S. west coast before they head west toward nesting grounds (Dutton unpublished data).

The leatherback is the most oceanic and wide-ranging of sea turtles, undertaking extensive migrations along distinct depth contours for hundreds to thousands of kilometers (Hughes et al. 1998; Morreale et al. 1996). After they nest, female leatherbacks migrate from tropical waters to more temperate latitudes that support high densities of jellyfish in the summer. Late juvenile and adult leatherback turtles are known to range from mid-ocean to the continental shelf and nearshore waters (Frazier 2001), foraging in coastal areas in temperate waters and offshore areas in tropical waters (Frazier 2001). Their movements appear to be linked to the seasonal availability of their prey and the requirements of their reproductive cycle (Davenport and Balazs 1991). Trans-Pacific Ocean migrations have been reported, including a 6,385 mi. (10,276 km) migration from a nesting beach in Papua New Guinea to foraging grounds off the coast of Oregon (Benson et al. 2007).

Recent information on leatherbacks tagged off the U.S. west coast revealed an important migratory corridor, from central California to south of the Hawaiian Islands, that leads to western Pacific Ocean nesting beaches (Dutton unpublished data). Leatherback turtles have been sighted and reported stranded as far north as Alaska (60° N) and as far south as San Diego (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998d).

Eighty percent of the leatherback's time at sea is spent diving (Fossette et al. 2007). The leatherback is the deepest diving sea turtle, with recorded depths of at least 4,035 ft. (1,230 m) (Hays, Metcalfe et al. 2004), although most dives are much shallower, usually less than 655 ft. (200 m) (Hays, Houghton et al. 2004; Sale et al. 2006). Leatherbacks spend most of their time in the upper 215 ft. (66 m) of the water column (Jonsen et al. 2007). Diving is influenced by many factors, including water temperature and local availability and vertical distribution of food resources, resulting in variations in dive times and distances (James et al. 2006; Sale et al. 2006).

The dive time limit for the leatherback is estimated at between 33 and 67 minutes (Hays, Houghton, et al. 2004; Hays, Metcalfe, et al. 2004; Southwood et al. 1999), with typical durations of 6.9 to 14.5 minutes (Eckert et al. 1996). During migrations or long-distance movements, leatherbacks travel within 15 ft. (4.8 m) of the surface (Eckert 2002), making scouting dives to sample prey density and to feed on whatever is available (James et al. 2006; Jonsen et al. 2007).

In warm waters, leatherbacks dive deeper and longer (James et al. 2005), spending only short periods at the surface between dives (Eckert et al. 1986). While diving in colder waters, sometimes just above freezing, leatherbacks make shorter dives and spend up to 50 percent of their time at or near the surface (James et al. 2006; Jonsen et al. 2007).

3.5.2.8.3 Population and Abundance

The major nesting populations of the Eastern Pacific Ocean stock occur in Mexico Costa Rica, Panama, Colombia, Ecuador, and Nicaragua (Chaloupka et al. 2004; Dutton et al. 1999; Eckert and Sarti-Martinez 1997; Márquez M. 1990; Sarti-Martinez et al. 1996; Spotila et al. 1996), with the largest ones in Mexico and Costa Rica. There are 28 known nesting sites for the western Pacific Ocean stock, with an estimated 5,000 to 9,100 leatherback nests annually across the western tropical Pacific Ocean, from Australia and Melanesia (Papua New Guinea, Solomon Islands, Fiji, and Vanuatu) to Indonesia, Thailand, and China (Chaloupka et al. 2004; Chua 1988; Dutton 2006; Hirth et al. 1993; Suarez et al. 2000).

Leatherback hatchlings are approximately 2 to 3 in. (5 to 7.6 cm) long and weigh approximately 1.4 to 1.8 oz. (40 to 51 g). As with other sea turtle species, limited information is available on the open ocean habitats used by hatchling and early juvenile leatherbacks (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992). Leatherbacks whose shell length is less than 40 in. (102 cm) have only been sighted in waters at least 79°F (26°C), restricting their habitat primarily to the tropics (Eckert 2002; Sarti-Martinez 2000). Other than a general association with warm waters, the distribution of hatchling and early juvenile leatherbacks is not known. Upwelling areas, such as equatorial convergence zones, are nursery grounds for hatchling and early juvenile leatherbacks, because these areas provide a good supply of prey (Musick and Limpus 1997). Individuals with a curved shell length of less than 57 in. (145 cm) are considered to be juveniles (Eckert 2002; NMFS 2001).

Leatherbacks are likely the fastest developing of all sea turtle species, reaching adulthood at 13 to 14 years (range 2 to 22 years) (Turtle Expert Working Group 2007; Zug and Parham 1996), and can live to 30 years or more (Sarti-Martinez 2000). Throughout their lives, leatherbacks are essentially oceanic, yet they enter coastal waters to forage and reproduce (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992). The species is not typically associated with coral reefs, but is occasionally encountered in deep ocean waters near prominent island chains, such as deep waters off the Hawaiian Island chain (Eckert 1993). There is evidence that leatherbacks are associated with oceanic front systems, such as shelf breaks and the edges of oceanic gyre systems, where their prey is concentrated (Eckert 1993).

The leatherback's unique anatomy and metabolism, compared to all other turtle species (Bradshaw et al. 2007; Goff and Stenson 1988; Greer et al. 1973; Mrosovsky and Pritchard 1971; Neill and Stevens 1974; Paladino et al. 1990), allows them to maintain a core body temperature higher than that of the surrounding water, thereby allowing them to tolerate colder waters (Frair et al. 1972; James and Mrosovsky 2004). As juveniles grow, this ability is enhanced, allowing leatherbacks to expand their ranges into the cooler waters (Eckert 2002).

Nesting leatherbacks prefer wide sandy beaches backed with vegetation (Eckert 1987; Hirth and Ogren 1987). In the water, they prefer habitat characterized by steep drop-offs or mud banks without coral or rock formations (Turtle Expert Working Group 2007). For both the western and eastern Pacific Ocean populations, the nesting season extends from October through March, with a peak in December. The single exception is the Jamursba-Medi (Papua) stock, which nests from April to October, with a peak in August (Chaloupka et al. 2004). Typical clutches are 50 to more than 150 eggs, with the incubation period lasting around 65 days. Females lay an average of five to seven clutches in a single season (with a maximum of 11) with intervals of 8 to 10 days or longer (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992). Females remain in the general vicinity of the nesting habitat for their breeding period, which can last up to four months (Eckert, Eckert, Adams, et al. 1989; Keinath and Musick 1993), although they may nest on several islands in a chain during a single nesting season (Pritchard 1982). Mating is thought to occur before or during the migration from temperate to tropical waters (Eckert and Eckert 1988).

3.5.2.8.4 Predator/Prey Interactions

Leatherbacks lack the crushing and chewing plates characteristic of sea turtles that feed on hard-bodied prey (National Marine Fisheries Service 2010b). Instead, they have pointed tooth-like cusps and sharp-edged jaws that are perfectly adapted for a diet of soft-bodied prey, such as jellyfish and salps (Bjorndal 1997; Grant and Ferrell 1993; James and Herman 2001; National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992; Salmon et al. 2004). Leatherbacks feed from the surface as well as at depth, diving to 4,035 ft. (1,240 m) (Davenport 1988; Eckert et al. 1989; Eisenberg and Frazier 1983; Grant and Ferrell 1993; Hays et al. 2004; James et al. 2005; Salmon et al. 2004). Leatherbacks in the Caribbean may synchronize their diving patterns with the daily vertical migration of a deep-water ecosystem of fishes, crustaceans, gelatinous salps, and siphonophores, known as the deep scattering layer, which moves toward the surface of the ocean at dusk and rapidly descends in the morning (Eckert et al. 1989; Eckert et al. 1986). A similar vertical migration of small fish and crustacean species has been studied in the Insular Pacific-Hawaiian Large Marine Ecosystem, which migrates from approximately 1,300 to 2,300 ft. (396 to 701 m) during the day to near the surface at night (Benoit-Bird et al. 2001). It is unknown whether this type of foraging is widespread for leatherbacks (Eckert et al. 1989). Those individuals studying known feeding grounds have observed leatherbacks foraging on jellyfish at the surface (Grant and Ferrell 1993; James and Herman 2001; Starbird et al. 1993). Leatherbacks are subject to predation by the same predators as other sea turtles, such as sharks, certain fish preying on hatchlings, and various land predators preying on hatchlings (e.g., ants, crabs, birds, and mammals) (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2009).

3.5.3 Environmental Consequences

This section evaluates how and to what degree the activities described in Chapter 2 (Description of Proposed Action and Alternatives) could impact sea turtles known to occur within the Study Area. Tables 2.8-1 through 2.8-5 present the baseline and proposed training and testing activity locations for each alternative (including number of events and ordnance expended). Each sea turtle substressor is introduced, analyzed by alternative, and analyzed for training activities and testing activities, and then an ESA determination is made by substressor. Stressors applicable to sea turtles in the Study Area analyzed below include the following:

- Acoustic (sonar, other active acoustic sources, underwater explosives, pile driving, swimmer defense airguns, vessel noise, weapons firing, launch, and impact noise, and aircraft noise)
- Energy (electromagnetic devices)
- Physical disturbance and strike (vessels and in-water devices, military expended materials, seafloor devices)
- Entanglement (fiber optic cables and guidance wires, parachutes)
- Ingestion (munitions, military expended materials other than munitions)
- Secondary

Each of these stressors is analyzed for its potential impacts on sea turtles. The specific analyses of the training and testing activities consider these stressors within the context of the geographic range of the species.

3.5.3.1 Acoustic Stressors

3.5.3.1.1 Sound Producing and Explosive Activities

Assessing whether sounds may disturb or injure an animal involves understanding the characteristics of the acoustic sources, the animals that may be present near the sound, and the effects that sound may have on the physiology and behavior of those animals.

The methods used to predict acoustic effects on sea turtles build upon the Conceptual Framework for Assessing Effects from Sound-Producing Activities (Section 3.0.5.7.1). Additional research specific to sea turtles is presented where available.

3.5.3.1.2 Analysis Background and Framework

A range of impacts on sea turtles could occur depending on the sound source. The impacts of exposure to non-explosive, sound-producing activities or to sounds produced by an explosive detonation could include permanent or temporary hearing loss, changes in behavior, and physiological stress. In addition, potential impacts of an explosive impulse can range from physical discomfort to non-lethal and lethal injuries. Immediate non-lethal injury includes slight injury to internal organs and injury to the auditory system, which could reduce long-term fitness. Immediate lethal injury would be a result of massive combined trauma to internal organs as a direct result of proximity to the point of detonation.

3.5.3.1.2.1 Direct Injury

Direct injury from non-impulsive sound sources, such as sonar, is unlikely because of relatively lower peak pressures and slower rise times than potentially injurious sources such as explosives and impact pile driving. Non-impulsive sources also lack the strong shock waves that are associated with explosions. Therefore, primary blast injury and barotrauma would not result from exposure to non-impulsive sources such as sonar, and are only considered for explosive detonations.

The potential for trauma in sea turtles exposed to impulsive sources (e.g., explosions) has been inferred from tests of submerged terrestrial mammals exposed to underwater explosions (Ketten et al. 1993; Richmond et al. 1973; Yelverton et al. 1973). The effects of an underwater explosion on a sea turtle depend upon several factors, including size, type, and depth of both the animal and the explosive, depth of the water column, and distance from the charge to the animal. Smaller sea turtles would generally be more susceptible to injury. The compression of blast-sensitive, gas-containing organs when a sea turtle increases depth reduces likelihood of injury to these organs. The location of the explosion in the water column and the underwater environment determines whether most energy is released into the water or the air and influences the propagation of the blast wave.

Primary Blast Injury and Barotrauma

The greatest potential for direct, non-auditory tissue impacts is primary blast injury and barotrauma after exposure to the shock waves of high-amplitude impulsive sources, such as explosions. Primary blast injury refers to those injuries that result from the initial compression of a body exposed to the high pressure of a blast or shock wave. Primary blast injury is usually limited to gas-containing structures (e.g., lung and gut) and the pressure-sensitive components of the auditory system (discussed below) (Office of the Surgeon General 1991; Craig and Hearn 1998), although additional injuries could include concussive brain damage and cranial, skeletal, or shell fractures (Ketten 1995). Barotrauma refers to injuries caused when large pressure changes occur across tissue interfaces, normally at the boundaries of air-filled tissues such as the lungs. Primary blast injury to the respiratory system, as measured in terrestrial mammals, may consist of lung bruising, collapsed lung, traumatic lung cysts, or air in the chest cavity or other tissues (Office of the Surgeon General 1991). These injuries may be fatal depending on the severity of the trauma. Rupture of the lung may introduce air into the vascular system, possibly producing air blockage that can cause a stroke or heart attack by restricting oxygen delivery to these organs. Although often secondary in life-threatening severity to pulmonary blast trauma, the gastrointestinal tract can also suffer bruising and tearing from blast exposure, particularly in air-containing regions of the tract. Potential traumas include internal bleeding, bowel perforation, tissue tears, and ruptures of the hollow abdominal organs. Although hemorrhage of solid organs (e.g., liver, spleen, and kidney) from blast exposure is possible, rupture of these organs is rarely encountered. Non-lethal injuries could increase a sea turtle's risk of predation, disease, or infection.

Auditory Trauma

Components of the auditory system that detect smaller or more gradual pressure changes can also be damaged when overloaded at high pressures with rapid rise times. Rupture of the eardrum, while not necessarily a serious or life-threatening injury, may lead to permanent hearing loss (Ketten 1995, 1998). No data exist to correlate the sensitivity of the sea turtle eardrum and middle and inner ear to trauma from shock waves from underwater explosions (Viada et al. 2008).

The specific impacts of bulk cavitation on sea turtles are unknown (see Section 3.0.4.1.4.2 for an explanation of cavitation following an explosive detonation). The presence of a sea turtle within the cavitation region created by the detonation of small charges could annoy, injure, or increase the severity of the injuries caused by the shock wave, including injuries to the auditory system or lungs. The area of cavitation from a large charge, such as those used in ship shock trials, is expected to be an area of almost complete total physical trauma for smaller animals (Craig and Rye 2008). An animal located at (or near) the cavitation closure depth would be subjected to a short duration ("water hammer") pressure pulse; however, direct shock wave impacts alone would be expected to cause auditory system injuries and could cause internal organ injuries.

3.5.3.1.2.2 Hearing Loss

Hearing loss could effectively reduce the distance over which sea turtles can detect biologically relevant sounds. Both auditory trauma (a direct injury discussed above) and auditory fatigue may result in hearing loss, but the mechanisms responsible for auditory fatigue differ from auditory trauma. Hearing loss due to auditory fatigue is also known as threshold shift, a reduction in hearing sensitivity at certain frequencies. Threshold shift is the difference between hearing thresholds measured before and after an intense, fatiguing sound exposure. Threshold shift occurs when hair cells in the ear fatigue, causing them to become less sensitive over a small range of frequencies related to the sound source to which an animal was exposed. The actual amount of threshold shift depends on the amplitude, duration, frequency, and temporal pattern of the sound exposure. No studies are published on inducing threshold shift in sea turtles; therefore, the potential for the impact on sea turtles is inferred from studies of threshold shift in other animals.

Temporary threshold shift (TTS) is a hearing loss that recovers to the original hearing threshold over a period. An animal may not even be aware of a TTS. It does not become deaf, but requires a louder sound stimulus (relative to the amount of TTS) to detect a sound within the affected frequencies. TTS may last several minutes to several days, depending on the intensity and duration of the sound exposure that induced the threshold shift (including multiple exposures).

Permanent threshold shift (PTS) is a permanent loss of hearing sensitivity at a certain frequency range. PTS is non-recoverable due to the destruction of tissues within the auditory system. The animal does not become deaf, but requires a louder sound stimulus (relative to the amount of PTS) to detect a sound within the affected frequencies. As the name suggests, the effect is permanent.

3.5.3.1.2.3 Auditory Masking

Auditory masking occurs when a sound prevents or limits the distance over which an animal detects other biologically relevant sounds. When a noise has a sound level above the sound of interest, and in a similar frequency band, auditory masking could occur (see Section 3.0.5.7.1, Conceptual Framework for Assessing Effects from Sound-Producing Activities). Any sound above ambient noise levels and within an animal's hearing range could cause masking. The degree of masking increases with increasing noise levels; a noise that is just-detectable over ambient levels is unlikely to actually cause any substantial masking, whereas a louder noise may mask sounds over a wider frequency range. In addition, a continuous sound would have more potential for masking than a sound with a low duty cycle. In the open ocean, ambient noise levels are between about 60 and 80 dB re 1 µPa, especially at lower frequencies (below 100 Hz) and inshore, ambient noise levels, especially around busy ports, can exceed 120 dB re 1 µPa.

Unlike auditory fatigue, which always results in a localized stress response, behavioral changes resulting from auditory masking may not be coupled with a stress response. Another important distinction between masking and hearing loss is that masking only occurs in the presence of the sound stimulus, whereas hearing loss can persist after the stimulus is gone.

Little is known about how sea turtles use sound in their environment. Based on knowledge of their sensory biology (Bartol and Ketten 2006; Levenson et al. 2004; Bartol and Musick 2003), sea turtles may be able to detect objects within the water column (e.g., vessels, prey, predators) via some combination of auditory and visual cues. However, research examining the ability of sea turtles to avoid collisions with vessels shows they may rely more on their vision than auditory cues (Hazel et al. 2007). Similarly, while sea turtles may rely on acoustic cues to identify nesting beaches, they appear to rely on other non-acoustic cues for navigation, such as magnetic fields (Lohmann and Lohmann 1996) and light (Avens and Lohman 2003). Additionally, they are not known to produce sounds underwater for communication. As a result, sound may play a limited role in a sea turtle's environment. Therefore, the potential for masking may be limited.

3.5.3.1.2.4 Physiological Stress

Sea turtles may exhibit a behavioral response or combinations of behavioral responses upon exposure to anthropogenic sounds. If a sound is detected, a stress response (i.e., startle or annoyance) or a cueing response (based on a past stressful experience) can occur. Sea turtles naturally experience stressors within their environment and as part of their life histories. Changing weather and ocean conditions, exposure to diseases and naturally occurring toxins, lack of prey availability, social interactions with members of the same species, nesting, and interactions with predators all contribute to stress. Anthropogenic activities could provide additional stressors above and beyond those that occur in the absence of human activity.

Immature Kemp's ridley sea turtles show physiological responses to the acute stress of capture and handling through increased levels of the stress hormone corticosterone, along with biting and rapid flipper movement (Gregory and Schmid 2001). Kemp's ridley sea turtles are not found in the HSTT Study Area; however, they are closely related to olive ridley sea turtles, which are found in the Study Area. Studies involving Kemp's ridley sea turtles are applicable to olive ridleys when comparative studies for olive ridley sea turtles are lacking. Captive olive ridley hatchlings showed heightened blood glucose levels indicating physiological stress (Rees et al. 2008, Zenteno 2008). Repeated exposure to stressors, including human disturbance such as vessel disturbance and anthropogenic sound, may result in negative consequences to the health and viability of an individual or population (Gregory and Schmid 2001). Factors to consider when predicting a stress or cueing response is whether an animal is naïve or has prior experience with a stressor. Prior experience with a stressor may be of particular importance as repeated experience with a stressor may dull the stress response via acclimation.

3.5.3.1.2.5 Behavioral Reactions

The response of a sea turtle to an anthropogenic sound will depend on the frequency, duration, temporal pattern, and amplitude of the sound, as well as the animal's prior experience with the sound and the context in which the sound is encountered (i.e., what the animal is doing at the time of the exposure). Distance from the sound source and whether it is perceived as approaching or moving away could also affect the way a sea turtle responds to a sound. Potential behavioral responses to anthropogenic sound could include startle reactions, disruption of feeding, disruption of migration, changes in respiration, alteration of swim speed, alteration of swim direction, and area avoidance.

Studies of sea turtle responses to sounds are limited. A few studies examined sea turtle reactions to airguns, which produce broadband impulsive sound. O'Hara and Wilcox (1990) attempted to create a sound barrier at the end of a canal using seismic airguns. They reported that loggerhead turtles kept in a 984 ft. by 148 ft. (300 m by 45 m) enclosure in a 10 m deep canal maintained a standoff range of 98 ft. (30 m) from airguns fired simultaneously at intervals of 15 seconds, with strongest sound components within the 25 to 1,000 Hz frequency range. McCauley et al. (2000) estimated that the received level at which turtles avoided sound in the O'Hara and Wilcox (1990) experiment was 175 to 176 dB re 1 µPa root mean square.

Moein Bartol et al. (1995) investigated the use of air guns to repel juvenile loggerhead sea turtles from hopper dredges. Sound frequencies of the airguns ranged from 100 to 1,000 Hz at three levels: 175, 177, and 179 dB re 1 µPa at 1 m. The turtles avoided the airguns during the initial exposures (mean range of 24 m), but additional trials several days afterward did not elicit statistically significant avoidance. They concluded that this was due to either habituation or a temporary shift in the turtles' hearing capability.

McCauley et al. (2000) exposed caged green and loggerhead sea turtles to an approaching-departing single air gun to gauge behavioral responses. The trials showed that above a received level of 166 dB re 1 µPa (root mean square), the turtles noticeably increased their swimming activity compared to non-operational periods, with swimming time increasing as air gun levels increased during approach. Above 175 dB re 1 µPa (root mean square), behavior became more erratic, possibly indicating the turtles were in an agitated state (McCauley et al. 2000). The authors noted that the point at which the turtles showed the more erratic behavior and exhibited possible agitation would be expected to approximately equal the point at which active avoidance would occur for unrestrained turtles (McCauley et al. 2000).

No obvious avoidance reactions by free-ranging sea turtles, such as swimming away, were observed during a multi-month seismic survey using airgun arrays, although fewer sea turtles were observed when the seismic airguns were active than when they were inactive (Weir 2007). The author noted that sea state and the time of day affected both airgun operations and sea turtle surface basking behavior, making it difficult to draw conclusions from the data.

No studies have been performed to examine the response of sea turtles to sonar. However, based on their limited range of hearing, they may respond to sources operating below 2 kHz but are unlikely to sense higher frequency sounds (see Section 3.5.3.1.2, Analysis Background and Framework).

3.5.3.1.2.6 Repeated Exposures

Repeated exposures of an individual to sound-producing activities over a season, year, or life stage could cause reactions with energetic costs that can accumulate over time to cause long-term consequences for the individual. Conversely, some sea turtles may habituate to or become tolerant of repeated exposures over time, learning to ignore a stimulus that in the past was not accompanied by any overt threat, such as high levels of ambient noise found in areas of high vessel traffic (Hazel et al. 2007). In an experiment, after initial avoidance reactions, loggerhead sea turtles habituated to repeated exposures to airguns of up to a source level of 179 dB re 1 µPa in an enclosure. The habituation behavior was retained by the sea turtles when exposures were separated by several days (Moein Bartol et al. 1995).

3.5.3.1.3 Acoustic Impacts Thresholds and Criteria

The Navy considers two primary categories of sound sources in its analyses of sound impacts to sea turtles: impulsive sources (e.g., explosives, airguns, weapons firing, and impact pile driving) and non-impulsive sources (e.g., sonar, pingers, and countermeasure devices). General definitions of impulsive and non-impulsive sound sources are provided below. Acoustic impacts criteria and thresholds were developed in cooperation with NMFS for sea turtle exposures to various sound sources. These acoustic impacts criteria are summarized in Table 3.5-2 and Table 3.5-3.

Table 3.5-2: Sea Turtle Impact Threshold Criteria for Non-Impulsive Sources

Physiological Thresholds		
Onset[1] PTS	Onset[1] TTS	Injury (Vibratory Pile Driving)
198 dB SEL (T)	178 dB SEL (T)	190 dB re 1 µPa SPL root mean square

[1] (T): Turtle Weighting Function. When the cetacean criteria were weighted to correlate with Type II frequency weighting, the turtle threshold was inadvertently lowered by 17 dB, even though Type II weighting is not applied to sea turtle hearing. This resulted in an increased number of model-predicted turtle impacts, although the actual impacts are expected to be substantially lower.

Notes: dB = decibels, PTS = permanent threshold shift, TTS = temporary threshold shift, SEL = sound exposure level, SPL = sound pressure level

These criteria can be used to estimate the number of sea turtles impacted by testing and training activities that emit sound or explosive energy, as well as the severity of the immediate impacts. These criteria are used to quantify impacts from explosives, airguns, pile driving, sonar, and other active acoustic sources. These criteria are also useful for qualitatively assessing activities that indirectly impart sound to water, such as firing of weapons and aircraft flights.

Table 3.5-3: Sea Turtle Impact Threshold Criteria for Impulsive Sources

Impulsive Sound Exposure Impact	Threshold Value
Onset Mortality[1] (1% Mortality Based on Extensive Lung Injury)	$= 91.4M^{1/3}\left(1+\frac{D_{Rm}}{10.081}\right)^{1/2} Pa-s$
Onset Slight Lung Injury[1]	$= 39.1M^{1/3}\left(1+\frac{D_{Rm}}{10.081}\right)^{1/2} Pa-s$
Onset Slight Gastrointestinal Tract Injury	237 dB re 1 μPa SPL (104 psi)
Onset PTS	187 dB re 1 μPa²-s SEL (T[2]) or 230 dB re 1 μPa Peak SPL
Onset TTS	172 dB re 1 μPa²-s SEL (T[2]) or 224 dB re 1 μPa Peak SPL
Impact Pile Driving (Injury)	190 dB re 1 μPa SPL root mean square[3]

[1] M = mass of animals (kg) as shown for each species in Table 3.5-4, D_{Rm} = depth of animal (m). Impulse calculated over a delivery time that is the lesser of the initial positive pressure duration or 20 percent of the natural period of the assumed-spherical lung adjusted for animal size and depth.
[2] Turtle Weighting Function. When the cetacean criteria were weighted to correlate with Type II frequency weighting, the turtle threshold was inadvertently lowered by 17 dB, even though Type II weighting is not applied to sea turtle hearing. This resulted in an increased number of model-predicted turtle impacts, although the actual impacts are expected to be substantially lower.
[3] The interval for determining the root mean square is that which contains 90% of the total energy within the envelope of the pulse. This windowing procedure for impulse signals removes uncertainty about where to set the exact temporal beginning or end of the signal, which may be obscured by ambient noise.
Notes: kg = kilograms, m = meters, PTS = permanent threshold shift, TTS = temporary threshold shift, SEL = sound exposure level, SPL = sound pressure level

3.5.3.1.3.1 Categories of Sounds as Defined for Thresholds and Criteria

Categories of sound are discussed in Section 3.0.4 (Acoustic and Explosives Primer). Impulsive and non-impulsive sounds are described again below with details specific to assigning acoustic and explosive criteria for predicting impacts to sea turtles.

3.5.3.1.3.2 Impulsive Sounds

Impulsive sounds (including explosions) have a steep pressure rise or rapid pressure oscillation, which is the primary reason the impacts of these sounds are considered separately from non-impulsive sounds. Impulsive sounds usually rapidly decay with only one or two peak oscillations and are of very short duration (usually 0.1 second or shorter). Rapid pressure changes may produce mechanical damage to the ear or other structures that would not occur with slower rise times found in non-impulsive signals. Impulsive sources analyzed in this document include explosives, airguns, sonic booms, weapons firing, and impact pile-driving.

3.5.3.1.3.3 Non-Impulsive Sounds

Non-impulsive sounds typically contain multiple pressure oscillations without a rapid rise time, although the total duration of the signal may still be quite short (0.1 second or shorter for some high-frequency sources). Such sounds are typically characterized by a root mean square average sound pressure level or energy level over a specified period. Sonar and other active acoustic sources (e.g., pingers) are analyzed as non-impulsive sources in this document.

Intermittent non-impulsive sound sources produce sound for only a small fraction of the time that the source is in use (a few seconds or a fraction of a second, e.g., sonar and pingers), with longer silent periods in between the sound. Continuous sources are those that transmit sound for all of the time they are being used, often for many minutes, hours, or days. Vibratory pile driving, vessel noise, and aircraft noise are continuous noise sources analyzed in this document.

3.5.3.1.3.4 Criteria for Mortality and Injury from Explosives

There is a considerable body of laboratory data on actual injuries from impulsive sounds, usually from explosive pulses, obtained from tests with a variety of vertebrate species (e.g., Goertner et al. 1994; Richmond et al. 1973; Yelverton et al. 1973). Based on these studies, potential impacts, with decreasing likelihood of serious injury or lethality, include onset of mortality, onset of slight lung injury, and onset of slight gastrointestinal injury.

In the absence of data specific to sea turtles, criteria developed to assess impacts to protected marine mammals are also used to assess impacts to protected sea turtles. These criteria are discussed below.

3.5.3.1.3.5 Criteria for Mortality and Slight Lung Injury

In air or submerged, the most commonly reported internal bodily injury to sea turtles from explosive detonations is hemorrhaging in the fine structure of the lungs. The likelihood of internal bodily injury is related to the received impulse of the underwater blast (pressure integrated over time), not peak pressure or energy (Richmond et al. 1973; Yelverton and Richmond 1981; Yelverton et al. 1973; Yelverton et al. 1975). Therefore, impulse is used as a metric upon which internal organ injury can be predicted. Onset mortality and onset slight lung injury are defined as the impulse level that would result in one percent mortality (most survivors have moderate blast injuries and should survive) and zero percent mortality (recoverable, slight blast injuries) in the exposed population, respectively. Criteria for onset mortality and onset slight lung injury were developed using data from explosive impacts on mammals (Yelverton and Richmond 1981).

The impulse required to cause lung damage is related to the volume of the lungs. The lung volume is related to both the size (mass) of the animal and compression of gas-filled spaces at increasing water depth. Turtles have relatively low lung volume to body mass and a relatively stronger anatomical structure compared to mammals; therefore application of the criteria derived from studies of impacts of explosives on mammals is conservative.

Table 3.5-4 provides a nominal conservative body mass for each sea turtle species, based on juvenile mass. Juvenile body masses were selected for analysis given the early rapid growth of these reptiles (newborn turtles weigh less than 0.5 percent of maximum adult body mass). In addition, small turtles tend to remain at shallow depths in the surface pressure release zone, reducing potential exposure to injurious impulses. Therefore, use of hatchling weight would provide unrealistically low thresholds for estimating injury to sea turtles. The use of juvenile body mass rather than hatchling body mass was chosen to produce reasonably conservative estimates of injury.

The scaling of lung volume to depth is conducted for all species because data come from experiments with terrestrial animals held near the water's surface. The calculation of impulse thresholds consider depth of the animal to account for compression of gas-filled spaces that are most sensitive to impulse injury. The impulse required for a specific level of injury (impulse tolerance) is assumed to increase proportionally to the square root of the ratio of the combined atmospheric and hydrostatic pressures at a specific depth with the atmospheric pressure at the surface (Goertner 1982). Additionally, to reach the threshold for onset slight lung injury or onset mortality, the critical impulse value must be delivered during a period that is the lesser of the initial positive pressure duration or 20 percent of the natural period of the assumed-spherical lung adjusted for size and depth of the animal. Therefore, as depth increases or animal size decreases, impulse delivery time decreases (Goertner 1982).

Table 3.5-4: Species-Specific Masses for Determining Onset of Extensive and Slight Lung Injury Thresholds

Common Name	Juvenile Mass (kilograms)	Reference
Loggerhead turtle	8.4	Southwood et al (1999)
Green turtle	8.7	Wood and Wood (1993)
Hawksbill turtle	7.4	Okuyama et al. (2010)
Olive ridley turtle	6.3	McVey and Wibbels (1984) and Caillouet et al. (1995)[1]
Leatherback turtle	34.8	Jones (2009)

[1] McVey and Wibbles (1984) and Caillouet et al. (1995) measured masses for Kemp's ridley turtles, a closely related species to the olive ridley.

Very little information exists about the impacts of underwater detonations on sea turtles. Impacts of explosive removal operations on sea turtles range from non-injurious impacts (e.g., acoustic annoyance, mild tactile detection, or physical discomfort) to varying levels of injury (i.e., non-lethal and lethal injuries) (Klima et al. 1988; Viada et al. 2008). Often, impacts of explosive events on turtles must be inferred from documented impacts on other vertebrates with lungs or other-gas containing organs, such as mammals and most fishes (Viada et al. 2008). The methods used by Goertner (1982) to develop lung injury criteria for marine mammals may not be directly applicable to sea turtles, as it is not known what degree of protection to internal organs from the shock waves is provided to sea turtles by their shell (Viada et al. 2008). However, the general principles of the Goertner model are applicable, and should provide a protective approach to assessing potential impacts on sea turtles. The Goertner method predicts a minimum primary positive impulse value for onset of slight lung injury and onset of mortality, adjusted for assumed lung volume (correlated to animal mass) and depth of the animal. These equations are shown in Table 3.5-3.

3.5.3.1.3.6 Criteria for Onset of Gastrointestinal Tract Injury

Without data specific to sea turtles, data from tests with terrestrial animals are used to predict onset of gastrointestinal tract injury. Gas-containing internal organs, such as lungs and intestines, were the principle damage sites from shock waves in submerged terrestrial mammals (Clark and Ward 1943, Greaves et al. 1943, Richmond et al. 1973, Yelverton et al. 1973). Furthermore, slight injury to the gastrointestinal tract may be related to the magnitude of the peak shock wave pressure over the hydrostatic pressure, and would be independent of the animal's size and mass (Goertner 1982). Slight contusions to the gastrointestinal tract were reported during small charge tests (Richmond et al. 1973), when the peak was 237 dB re 1 µPa. Therefore, this value is used to predict onset of gastrointestinal tract injury in sea turtles exposed to explosions.

Frequency Weighting

Animals generally do not hear equally well across their entire hearing range. Several studies using green, loggerhead, and Kemp's ridley turtles suggest sea turtles are most sensitive to low-frequency sounds, although this sensitivity varies slightly by species and age class (Bartol and Ketten 2006, Bartol et al. 1999, Lenhardt 1994, Ridgway et al. 1969). Sea turtles possess an overall hearing range of approximately 100 Hz to 1 kHz, with an upper limit of 2 kHz (Bartol and Ketten 2006, Bartol et al. 1999, Lenhardt 1994, Ridgway et al. 1969).

Because hearing thresholds are frequency-dependent, an auditory weighting function was developed for sea turtles (turtle-weighting, or T-weighting). The T-weighting function simply defines lower and upper frequency boundaries beyond which sea turtle hearing sensitivity decreases. The single frequency cutoffs at each end of the frequency range where hearing sensitivity begins to decrease are based on the most liberal interpretations of sea turtle hearing abilities (10 Hz and 2 kHz). These boundaries are precautionary and exceed the demonstrated or anatomy-based hypothetical upper and lower limits of sea turtle hearing. Figure 3.5-1 shows the sea turtle auditory weighting function with lower and upper boundaries of 10 Hz and 2 kHz, respectively.

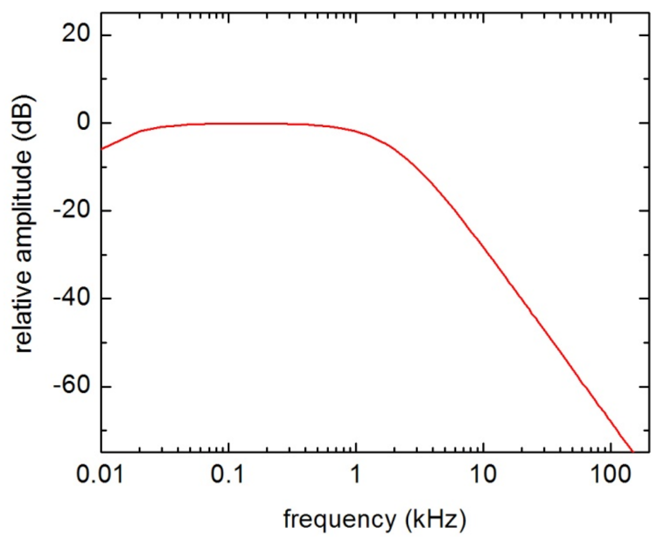


Figure 3.5-1: Auditory Weighting Function for Sea Turtles (T-weighting)

The T-weighting function adjusts the received sound level, based on sensitivity to different frequencies, emphasizing frequencies to which sea turtles are most sensitive and reducing emphasis on frequencies outside of their estimated useful range of hearing. For example, a 160 dB re 1 µPa tone at 10 kHz, far outside sea turtle best range of hearing, is estimated to be perceived by a sea turtle as a 130 dB re 1 µPa sound (i.e., 30 dB lower). Stated another way, a sound outside of the range of best hearing would have to be more intense to have the same impact as a sound within the range of best hearing. Weighting functions are further explained in Section 3.0.4, Acoustic and Explosives Primer.

3.5.3.1.3.7 Criteria for Hearing Loss Temporary and Permanent Threshold Shift

Whereas TTS represents a temporary reduction of hearing sensitivity, PTS represents tissue damage that does not recover and permanent reduced sensitivity to sounds over specific frequency ranges (see Section 3.5.3.1.2.2, Hearing Loss). To date, no known data are available on potential hearing impairments (i.e., TTS and PTS) in sea turtles. Sea turtles, based on their auditory anatomy (Bartol and Musick 2003; Lenhardt et al. 1985; Wartzok and Ketten 1999; Wever 1978; Wyneken 2001), almost certainly have poorer absolute sensitivity (i.e., higher thresholds) across much of their hearing range than do the mid-frequency cetacean species. Therefore, applying TTS and PTS criteria derived from mid-frequency cetaceans to sea turtles should provide a protective approach to estimating acoustic impacts to sea turtles (PTS and TTS data are not available for low-frequency cetaceans). Criteria for hearing loss due to onset of TTS and PTS are based on sound exposure level (for non-impulsive and impulsive sources) and peak pressure (for impulsive sources only).

To determine the sound exposure level, the turtle weighting function is applied to the acoustic exposure to emphasize only those frequencies within a sea turtle's hearing range. Multiple exposures within any 24-hour period are considered one continuous exposure for the purposes of calculating the received sound exposure level for a given individual. This conservatively assumes no recovery of hearing between exposures during a 24-hour period. The weighted sound exposure level is then compared to weighted threshold values for TTS and PTS. If the weighted exposure level meets or exceeds the weighted threshold, then the physiological impact (TTS or PTS) is assumed to occur. For impacts from exposures to impulsive sources, the metric (peak pressure or sound exposure level) and threshold level that results in the longest range to impact is used to predict impacts. Exposures are not calculated for sound sources with a nominal frequency outside the upper and lower frequency hearing limits for sea turtles.

In addition to being discussed below, thresholds for onset of TTS and PTS for impulsive and non-impulsive sounds are summarized in Tables 3.5-2 and 3.5-3.

3.5.3.1.3.8 Criteria for Non-Impulsive Temporary Threshold Shift

Based on best available science regarding TTS in marine vertebrates (Finneran et al. 2002; Southall et al. 2007) and the lack of information regarding TTS in sea turtles, the total T-weighted sound exposure level of 178 dB re 1 micro Pascal squared second (μPa^2-s) is used to estimate exposures resulting in TTS for sea turtles. The T-weighting function is used in conjunction with this non-pulse criterion, which effectively provides an upper cutoff of 2 kHz.

The T-weighted non-impulsive TTS threshold of 178 dB re 1 μPa^2-s sound exposure level was inadvertently based on Type II weighted cetacean TTS data rather than Type I weighted cetacean TTS data. This resulted in incorrectly lowering the turtle TTS threshold by 17 dB. The sea turtle non-impulsive TTS threshold, based on mid-frequency cetacean data, should be 17 dB higher than 178 dB re 1 μPa^2-s. Because an incorrectly lowered threshold was used to quantitatively analyze acoustic impacts on sea turtles in this EIS/OEIS, the quantitative impacts presented herein for non-impulsive TTS are conservative (i.e., over-predicted).

3.5.3.1.3.9 Criteria for Impulsive Temporary Threshold Shift

Based on best available science regarding TTS in marine vertebrates (Finneran et al. 2005; Finneran et al. 2000; Finneran et al. 2002; Nachtigall et al. 2003; Nachtigall et al. 2004; Schlundt et al. 2000) and the lack of information regarding TTS in sea turtles, the respective total T-weighted sound exposure level of 172 dB re 1 μPa^2-s or peak pressure of 224 dB re 1 μPa (23 pounds per square inch [psi]) is used to estimate exposures resulting in TTS for sea turtles. The T-weighting function is applied when using the sound exposure level-based thresholds to predict TTS.

3.5.3.1.3.10 Criteria for Non-Impulsive Permanent Threshold Shift

Since no studies were designed to intentionally induce PTS in sea turtles, levels for onset of PTS for these animals must be estimated using TTS data and relationships between TTS and PTS established in terrestrial mammals. Permanent threshold shift can be estimated based on the growth rate of a threshold shift and the level of threshold shift required to potentially become non-recoverable. A variety of terrestrial and marine mammal data show that threshold shifts up to 40 to 50 dB may be recoverable, and that 40 dB is a reasonable upper limit of a threshold shift that does not induce PTS (Southall et al. 2007; Ward et al. 1958; Ward et al. 1959). This analysis assumes that continuous-type exposures producing threshold shifts of 40 dB or more always result in some amount of PTS.

Data from terrestrial mammal testing (Ward et al. 1958, 1959) show TTS growth of 1.5 to 1.6 dB for every 1 dB increase in sound exposure level. The difference between minimum measureable TTS onset (6 dB) and the 40 dB upper safe limit of TTS yields a difference of 34 dB. When divided by a TTS growth rate of 1.6 dB TTS per dB sound exposure level, there is an indication that an increase in exposure of a 21.25 dB sound exposure level would result in 40 dB of TTS. For simplicity and conservatism, the number was rounded down to 20 dB sound exposure level.

Therefore, non-impulsive exposures of 20 dB sound exposure level above those producing a TTS may be assumed to produce a PTS. The onset of TTS threshold of 195 dB re 1 μPa^2-s for sea turtles has a corresponding onset of PTS threshold of 198 dB re 1 μPa^2-s. The T-weighting function is applied when using the sound exposure level-based thresholds to predict PTS (see Table 3.5-2).

The T-weighted non-impulsive TTS threshold of 178 dB re 1 μPa^2-s sound exposure level was inadvertently based on Type II weighted cetacean TTS data rather than Type I weighted cetacean TTS data. This resulted in incorrectly lowering the turtle TTS threshold by 17 dB; consequently, also incorrectly lowering the sea turtle PTS threshold by 17 dB. The sea turtle non-impulsive PTS threshold, based on mid-frequency cetacean data, should be 17 dB higher than 198 dB re 1 μPa^2-s. Because an incorrectly lowered threshold was used to quantitatively analyze acoustic impacts to sea turtles in this EIS/OEIS, the quantitative impacts presented herein for non-impulsive PTS are conservative (i.e., over-predicted).

3.5.3.1.3.11 Criteria for Impulsive Permanent Threshold Shift

Because marine mammal and sea turtle PTS data from impulsive exposures do not exist, onset of PTS levels for these animals are estimated by adding 15 dB to the sound exposure level-based TTS threshold and adding 6 dB to the peak pressure-based thresholds. These relationships were derived by Southall et al. (2007) from impulsive noise TTS growth rates in chinchillas. This results in onset of PTS thresholds of total weighted sound exposure level of 187 dB re 1 μPa^2-s or peak pressure of 230 dB re 1 μPa for sea turtles. The T-weighting function is applied when using the sound exposure level-based thresholds to predict PTS.

3.5.3.1.3.12 Criteria for Behavioral Responses

A sea turtle's behavioral responses to sound are assumed to be variable and context specific. For instance, a single impulse may cause a brief startle reaction. A sea turtle may swim farther away from the sound source, increase swimming speed, change surfacing time, and decrease foraging if the stressor continues to occur. For each potential behavioral change, the magnitude of the change ultimately would determine the severity of the response; most responses would be short-term avoidance reactions.

A few studies reviewed in Section 3.5.3.1.2.5 (Behavioral Reactions), investigated behavioral responses of sea turtles to impulsive sounds emitted by airguns (McCauley et al. 2000; Moein Bartol et al. 1995; O'Hara and Wilcox 1990). There are no studies of sea turtle behavioral responses to sonar. Cumulatively, available airgun studies indicate that perception and a behavioral reaction to a repeated sound may occur with sound pressure levels greater than 166 dB re 1 µPa root mean square, and that more erratic behavior and avoidance may occur at higher thresholds around 175 to 179 dB re 1 µPa root mean square (McCauley et al. 2000; Moein Bartol et al. 1995; O'Hara and Wilcox 1990). A received level of 175 dB re 1 µPa root mean square is more likely to be the point at which avoidance may occur in unrestrained turtles, with a comparable sound exposure level of 160 dB re 1 μPa^2-s (McCauley et al. 2000).

Airgun studies used sources that fired repeatedly over some duration. For single impulses at received levels below threshold shift (hearing loss) levels, the most likely behavioral response is assumed to be a startle response. Since no further sounds follow the initial brief impulse, the biological significance is considered to be minimal.

Based on the limited information regarding significant behavioral reactions of sea turtles to sound, behavioral responses to sounds are qualitatively assessed for sea turtles.

3.5.3.1.3.13 Criteria for Pile-Driving and Swimmer Defense Airguns

Existing NMFS risk criteria are applied to the unique sounds generated by pile-driving and swimmer defense airguns. Because there are no data specific to sea turtles upon which to base criteria, the Navy's analysis used criteria developed for injury to pinnipeds from impact pile-driving as criteria for injury to sea turtles (National Marine Fisheries Service 2005). Therefore, the threshold value for injury to sea turtles from impact and vibratory pile driving and airguns is 190 dB re 1 µPa sound pressure level root mean square.

3.5.3.1.4 Quantitative Analysis

A number of computer models and mathematical equations can be used to predict how energy spreads from a sound source (e.g., sonar or underwater detonation) to a receiver (e.g., sea turtle). See the Acoustic Primer Section (Section 3.0.4) for background information about how sound travels through the water. All modeling is an estimation of reality, with simplifications made both to facilitate calculations by focusing on the most important factors and to account for unknowns. For analysis of underwater sound impacts, basic models calculate the overlap of energy and marine life using assumptions that account for the many, variable, and often unknown factors that can greatly influence the result. Assumptions in previous Navy models intentionally erred on the side of overestimation when there were unknowns or when the addition of other variables was not likely to substantively change the final analysis. For example, because the ocean environment is extremely dynamic and information is often limited to a synthesis of data gathered over wide areas requiring many years of research, known information tends to be an average of the wide seasonal or annual variation that is actually present. The Equatorial Pacific El Niño disruption of the ocean-atmosphere system is an example of dynamic change where unusually warm ocean temperatures are likely to result in the redistribution of marine life and alter the propagation of underwater sound energy. Previous Navy modeling, therefore, made some assumptions indicative of a maximum theoretical propagation for sound energy (such as a perfectly reflective ocean surface and a flat seafloor). More complex computer models build upon basic modeling by factoring in additional variables in an effort to be more accurate by accounting for such things as bathymetry and an animal's likely presence at various depths.

For quantification of estimated marine mammal and sea turtle impacts resulting from sounds produced during Navy activities, the Navy developed a set of data and new software tools. This new approach is the resulting evolution of the basic modeling approaches used by the Navy previously, and reflects a much more complex and comprehensive modeling approach as described below.

3.5.3.1.5 Navy Acoustic Effects Model

For this analysis of Navy training and testing activities at sea, the Navy developed a set of software tools and compiled data for estimating acoustic impacts. These databases and tools collectively form the Navy Acoustics Effects Model. Details of the Navy Acoustics Effects Model processes and the description and derivation of the inputs are presented in the Technical Report (Determination of Acoustic Effects on Marine Mammals and Sea Turtles for Navy Training and Testing Events). The following paragraphs provide an overview of the Navy Acoustics Effects Model process and its more critical data inputs.

The Navy Acoustic Effects Model improves upon previous modeling efforts in several ways. First, unlike earlier methods that modeled sources individually, the Navy Acoustic Effects Model can run all sources within a scenario simultaneously, providing a more realistic depiction of the potential effects of an activity. Second, previous models calculated sound received levels within set volumes of water and spread animals uniformly across the volumes; in the Navy Acoustic Effects Model, animats are distributed non-uniformly based on higher resolution species-specific density, depth distribution, and group size information, and animats serve as dosimeters, recording energy received at their location in the water column. Third, a fully three-dimensional environment is used for calculating sound propagation and animat exposure in the Navy Acoustic Effects Model, rather than a two-dimensional environment where the worse case sound pressure level across the water column is always encountered. Finally, current efforts incorporate site-specific bathymetry, sound speed profiles, wind speed, and bottom properties into the propagation modeling process rather than the flat-bottomed provinces used during earlier modeling. The following paragraphs provide an overview of the Navy Acoustic Effects Model process and its more critical data inputs.

Using the best available information on the estimated density of sea turtles in the area being modeled, the Navy Acoustics Effects Model derives an abundance (total number individuals) and distributes the resulting number of virtual animals (“animats”) into an area bounded by the maximum distance that energy propagates out to a criterion threshold value (energy footprint). These animats are distributed based on density differences across the area and known depth distributions (dive profiles). Animats change depths every 4 minutes but do not otherwise mimic actual animal behaviors (such as avoidance or attraction to a stimulus).

Schecklman et al. (2011) argue that static distributions underestimate acoustic exposure compared to a model with fully three-dimensionally moving animals. However, their static method is different from the Navy Acoustic Effects Model in several ways. First, they distribute the entire population at depth with respect to the species-typical depth distribution histogram, and those animats remain static at that position throughout the entire simulation. In the Navy Acoustic Effects Model, animats are placed horizontally dependent upon non-uniform density information, and then move up and down over time within the water column by interrogating species-typical depth distribution information. Second, for the static method they calculate acoustic received level for designated volumes of the ocean and then sum the animats that occur within that volume, rather than using the animats themselves as dosimeters, as in the Navy Acoustic Effects Model. Third, Schecklman et al. (2011) run 50 iterations of the moving distribution to arrive at an average number of exposures, but because they rely on uniform horizontal density (and static depth density), only a single iteration of the static distribution is realized. In addition to moving the animats vertically, the Navy Acoustic Effects Model overpopulates the animats over a non-uniform density and then resamples the population a number of times to arrive at an average number of exposures as well. Tests comparing fully moving distributions and static distributions with vertical position changes at varying rates were compared during development of the Navy Acoustic Effects Model. For position updates occurring more frequently than every 5 minutes, the number of estimated exposures were similar between the Navy Acoustic Effects Model and the fully moving distribution, however, computational time was much longer for the fully moving distribution.

Navy Acoustics Effects Model calculates the likely propagation for various levels of energy (sound or pressure) resulting from each non-impulse or impulse source used during a training or testing event. This is done taking into account an event location's actual bathymetry and bottom types (e.g., reflective), and estimated sound speeds and sea surface roughness. Platforms (such as a ship using one or more sound sources) are modeled as moving across an area, the size of which is representative of what would normally occur during a training or testing scenario. The model uses typical platform speeds and event durations. Moving source platforms either travel along a predefined track or move along straight-line tracks from a random initial course, reflecting at the edges of a predefined boundary. Static sound sources are stationary in a fixed location for the duration of a scenario. Modeling locations were chosen based on historical data from ongoing activities and in an effort to include all the environmental variation within the study area where similar events might occur in the future.

The Navy Acoustics Effects Model then tracks the energy received by each animat within the energy footprint of the event and calculates the number of animats having received levels of energy exposures that fall within defined impact thresholds. Predicted effects to the animats within a scenario are then tallied and the highest order effect (based on severity of criteria; e.g., PTS over TTS) predicted for a given animat is assumed. Each scenario or each 24-hour period for scenarios lasting greater than 24 hours is independent of all others, and therefore, the same individual marine animal could be impacted during each independent scenario or 24-hour period. In a few instances, although the activities occur within the Study Area, sound may propagate beyond the boundary of the Study Area. Any exposures occurring outside the boundary of the Study Area are counted as if they occurred within the Study Area.

3.5.3.1.6 Model Assumptions and Limitations

There are limitations to the data used in the Navy Acoustics Effects Model, and results must be interpreted within the context of these assumptions. Output from the Navy Acoustic Effects Model relies heavily on the quality of both the input parameters and impact thresholds and criteria. When there was a lack of definitive data to support an aspect of the modeling (such as lack of well-described diving behavior for all marine species), conservative assumptions believed to overestimate the number of exposures were chosen:

- Animats are modeled as being underwater and facing the source and therefore always predicted to receive the maximum sound level at their position within the water column (e.g., the model does not account for conditions such as body shading or an animal raising its head above water).
- Multiple exposures within any 24-hour period are considered one continuous exposure for the purposes of calculating temporary or permanent hearing loss, because there are insufficient data to estimate a hearing recovery function for the time between exposures.
- Animats do not move horizontally (but change their position vertically within the water column), which may overestimate physiological impacts such as hearing loss, especially for slow-moving or stationary sound sources in the model.
- Animats are stationary horizontally and therefore do not avoid the sound source, unlike in the wild where animals would most often avoid exposures at higher sound levels, especially those exposures that may result in permanent hearing loss (PTS).
- Animats receive the full impulse of the initial positive pressure wave due to an explosion, although the impulse-based thresholds (onset mortality and onset slight lung injury) assume an

impulse delivery time adjusted for animal size and depth. Therefore, these impacts are overestimated at greater distances and increased depths.

- Mitigation measures implemented during training and testing activities that reduce the likelihood of exposing a sea turtle to higher levels of acoustic energy near the most powerful sound sources (see Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring) were not considered in the model.

3.5.3.1.6.1 Sea Turtle Densities

The Navy used the best available density estimates for green sea turtles available within nearshore waters of Hawaii and California. Because of the lack of density estimates for other sea turtle species within the Study Area more associated with open ocean habitats, sea turtle species were combined into a “Pacific guild” for modeling. In other words, green, hawksbill, loggerhead, leatherback, and olive ridley sea turtles were all included as a group to account for open ocean occurrences of sea turtle species in all life stages. A similar approach was taken for marine mammal modeling where certain cetacean species lacked continuous density estimates throughout the Study Area. All species density distributions matched the expected distributions from published literature and NMFS stock assessments.

A quantitative analysis of impacts on a species requires data on the abundance and concentration of the species population in the potentially impacted area. The most appropriate metric for this type of analysis is density, which is the number of animals present per unit area. There is no single source of density data for every area of the world, species, and season because of the fiscal costs, resources, and effort involved in providing survey coverage to sufficiently estimate density. Therefore, to characterize the marine species density for large areas such as the Study Area, the Navy compiled data from several sources. To compile and structure the most appropriate database of marine species density data, the Navy developed a protocol to select the best available data sources based on species, area, and time (season). The resulting Geographic Information System database called the Navy Marine Species Density Database includes seasonal density values for every marine mammal and sea turtle species present within the Study Area (U.S. Department of the Navy 2011). All species density distributions matched the expected distributions from published literature and the NMFS stock assessments.

In this analysis, sea turtle density data were used as an input in the Navy Acoustic Effects Model in their original temporal and spatial resolution. Seasons are defined as winter (December through February), spring (March through May), summer (June through August), and fall (September through November). The density grid cell spatial resolution varied, depending on the original data source used. Where data sources overlap, there might be a sudden increase or decrease in density due to different derivation methods or survey data utilized. This is an artifact of attempting to use the best available data for each geographic region. Any attempt to smooth the datasets would either increase or decrease adjacent values, and would inflate the error of those values.

3.5.3.1.7 Impacts from Sonar and Other Active Acoustic Sources

Sonar and other active acoustic sound sources emit sound waves into the water to detect objects, safely navigate, and communicate. These systems are used for anti-submarine warfare, mine warfare, navigation, sensing of oceanographic conditions (e.g., sound speed profile), and communication. General categories of sonar systems are described in Section 2.3 and Section 3.0.5.3.1 (Acoustic Stressors).

Potential direct impacts on sea turtles from exposure to sonar or other non-impulsive underwater active acoustic sources include hearing loss from threshold shift (permanent or temporary), masking of other biologically relevant sounds, physiological stress, or changes in behavior (see Section 3.5.3.1.2, Analysis Background and Framework). Direct injury or barotrauma from a primary blast would not occur from exposure to these sources due to slower rise times and lower peak pressures. As stated above, a TTS can be mild and recovery can take place within a matter of minutes to days and, therefore, is unlikely to cause long-term consequences to individuals or populations. There is no research to indicate whether sea turtles with PTS would suffer long-term consequences. Sea turtles probably do not rely on their auditory systems as a primary sense, although little is known about how sea turtles use the narrow range of low-frequency sounds they might perceive in their environment (see Section 3.5.3.1.2.3, Auditory Masking). Some individuals that experience some degree of permanent hearing loss may have decreased abilities to find resources such as prey or nesting beaches or detect other relevant sounds such as vessel noise, which may lead to long-term consequences for the individual. Similarly, the effect of masking on sea turtles is difficult to assess.

There is little information about sea turtle responses to sound. The intensity of their behavioral response to a perceived sound could depend on several factors, including species, the animal's age, reproductive condition, past experience with the sound exposure, behavior (foraging or reproductive), the received level from the exposure, and the type of sound (impulse or non-impulse) and duration of the sound (see Section 3.0.5.7.1, Conceptual Framework for Assessing Effects from Sound-Producing Activities). Behavioral responses may be short-term (seconds to minutes) and of little immediate consequence for the animal, such as simply orienting to the sound source. Alternatively, there may be a longer term response over several hours such as moving away from the sound source. However, exposure to loud sounds resulting from Navy testing and training at sea would likely be brief because ships and other participants are constantly moving and the animal would likely be moving as well. Animals that are resident during all or part of the year near Navy ports, piers, and near-shore facilities or on fixed Navy ranges are the most likely to experience multiple or repeated exposures. A sea turtle could be exposed to sonar or other active acoustic sources several times in its lifetime, but the potential for habituation is unknown. Most exposures would be intermittent and short-term when considered over the duration of a sea turtle's life span. In addition, most sources emit sound at frequencies that are higher than the best hearing range of sea turtles.

Most sonar and other active acoustic sources used during testing and training use frequency ranges that are higher than the estimated hearing range of sea turtles (10 Hz-2 kHz). Therefore, most of these sources have no impact on sea turtle hearing. Only sonar with source levels greater than 160 dB re 1 µPa using frequencies within the hearing range of sea turtles were modeled for potential acoustic impacts on sea turtles. Other active acoustic sources with low source level, narrow beam width, downward-directed transmission, short pulse lengths, frequencies above known hearing ranges, or some combination of these factors are not anticipated to result in impacts to sea turtles. These sources are the same or analogous to sound sources analyzed by other agencies and ruled on by NMFS to not result in impacts to protected species, including sea turtles, and therefore were not modeled and are addressed qualitatively in this EIS/OEIS (see Section 2.3.7.2 for a review of NMFS past rules regarding these sources). These sources generally have frequencies greater than 200 kHz and source levels less than 160 dB re 1 µPa. The types of sources with source levels less than 160 dB are primarily hand-held sonar, range pingers, transponders, and acoustic communication devices.

Within this acoustics analysis, the numbers of sea turtles that may experience some form of hearing loss were predicted using the Navy Acoustics Effects Model (Section 3.5.3.1.5, Navy Acoustic Effects Model). To quantify the impacts of acoustic exposures to sea turtles, testing and training activities were modeled that employ acoustic sources using frequencies in the hearing range of sea turtles. These activities and the acoustic source classes used are listed in Table 3.5-5. Most sonar and active acoustic sources used during testing and training use frequencies outside of the estimated hearing range of turtles.

Table 3.5-5: Activities and Active Acoustic Sources Modeled and Quantitatively Analyzed for Acoustic Impacts on Sea Turtles

Activity	Acoustic Source Class[1]
Training Activity	
ASW for Composite Training Unit Exercise	ASW2
ASW for Joint Task Force Exercise	ASW2
ASW for Rim of the Pacific Exercise	ASW2
Multi-Strike Group Exercise	ASW2
Integrated ASW Course	ASW2
Group Sail	ASW2
Undersea Warfare Exercise	ASW2
Ship ASW Readiness and Evaluation Measuring	ASW2
TRACKEX/TORPEX-Surface	ASW1, MF12
TRACKEX-Maritime Patrol Aircraft (EER Sonobuoys)	ASW2
Testing Activity	
ASW Tracking Test - Maritime Patrol Aircraft	ASW2
Sonobuoy Lot Acceptance Test	ASW2
Surface Combatant Sea Trial: Pierside Sonar Testing	MF9, MF10
Surface Combatant Sea Trial: ASW Testing	MF9, MF10
Littoral Combat Ship Mission Package Testing: ASW	MF12
Surface Ship Sonar Testing/Maintenance (in OPAREAs and Ports)	MF9, MF10
Special Warfare Testing	MF9
Pierside Integrated Swimmer Defense Testing	LF4, MF8
Passive Mobile ISR Sensor Systems	LF5
Unmanned Vehicle Development and Payload Testing	MF9

[1] Characteristics of acoustic source classes are described in Section 2.3.7.
Notes: ASW = anti-submarine warfare; TRACKEX = tracking exercise; TORPEX = torpedo exercise; EER = Extended Echo Ranging; ISR = Intelligence, Surveillance, and Reconnaissance; OPAREAs = Operating Areas; LF = Low Frequency; MF = Mid Frequency

3.5.3.1.7.1 Model-Predicted Impacts

Table 3.5-6 and Table 3.5-7 show impacts on sea turtles predicted by the Navy Acoustics Effects Model. The exposure estimates for each alternative represent the total number of exposures and not necessarily the number of individuals exposed, as a single individual may be exposed several times during a year. The predicted acoustic impacts do not account for avoidance behavior or mitigation measures, such as establishing shut-down zones for certain sonar systems (see Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring).

Table 3.5-6: Annual Total Model-Predicted Impacts on Sea Turtles for Training Activities Using Sonar and other Active Non-Impulsive Acoustic Sources

Sea Turtle Species/Guild[1]	No Action Alternative		Alternative 1		Alternative 2	
	Temporary Threshold Shift	Permanent Threshold Shift	Temporary Threshold Shift	Permanent Threshold Shift	Temporary Threshold Shift	Permanent Threshold Shift
Green sea turtle	0	0	0	0	0	0
Pacific Guild	397	0	412	0	412	0

[1] A Pacific guild of sea turtles was created for modeling purposes, due to the lack of density data for species other than green sea turtles. A similar approach was taken for marine mammal modeling.

Notes: The timing, locations, and numbers of these activities would not substantially differ from year to year under each alternative.

Table 3.5-7: Annual Total Model-Predicted Impacts on Sea Turtles for Testing Activities Using Sonar and other Active Non-Impulsive Acoustic Sources

Sea Turtle Species/Guild[1]	No Action Alternative		Alternative 1		Alternative 2	
	Temporary Threshold Shift	Permanent Threshold Shift	Temporary Threshold Shift	Permanent Threshold Shift	Temporary Threshold Shift	Permanent Threshold Shift
Green sea turtle	549	119	616	97	616	97
Pacific Guild	185	0	400	0	400	0

[1] A Pacific guild of sea turtles was created for modeling purposes, due to the lack of density data for species other than green sea turtles. A similar approach was taken for marine mammal modeling.

Notes: The timing, locations, and numbers of these activities would not substantially differ from year to year under each alternative.

3.5.3.1.7.2 No Action Alternative

Training Activities

Training activities under the No Action Alternative include activities that produce non-impulsive noise from the use of sonar and other active acoustic sources that fall within the hearing range of sea turtles. These activities could occur throughout the HSTT Study Area open ocean areas. A more-detailed description of these activities, the number of events, and their proposed locations is presented in Table 2.8-1 of Chapter 2 (Description of Proposed Action and Alternatives). Use of sonar and other active acoustic sources during training activities is discussed in Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources).

Model-predicted acoustic impacts on sea turtles from exposure to sonar and other active acoustic sources for annually recurring training activities under the No Action Alternative are shown in Table 3.5-6. Because these sound sources would typically be used beyond 12 nm from shore, they are unlikely to impact sea turtles near nesting beaches in Hawaii or sea turtles in coastal waters of Southern California.

If a source uses a frequency within a sea turtle’s hearing range, and if the sea turtle is close enough to perceive the sound, the sea turtle may exhibit short-term behavioral reactions, such as swimming away or diving to avoid the area around the source; or it may exhibit no reaction at all. A small number of sea turtles may experience TTS, which could temporarily affect perception of sound within a limited frequency range. Sea turtles that reside during all or part of the year on a Navy range complex may be exposed several times throughout the year to sound from sonar and other active acoustic sources. Exposures to sonar and other active acoustic sources in open water areas would be intermittent and geographically variable. Pronounced reactions to acoustic stimuli could lead to a sea turtle expending energy and missing opportunities to forage or breed. In most cases acoustic exposures are intermittent, allowing time to recover from an incurred energetic cost, resulting in no long-term consequence.

Because model-predicted impacts are conservative and most impacts would be short-term, potential impacts are not expected to result in substantial changes to behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment, and are not expected to result in population-level impacts. Although some individuals may experience long-term impacts, population-level impacts are not expected.

Pursuant to the ESA, the use of sonar and other active acoustic sources during training activities under the No Action Alternative may affect, and is likely to adversely affect, green, hawksbill, leatherback, loggerhead, and olive ridley sea turtles.

Testing Activities

Testing activities under the No Action Alternative include activities that produce in-water noise from sonar or other active non-impulsive acoustic sources that falls within the hearing range of sea turtles. These activities are anti-submarine warfare, surface combatant sea trials, anti-submarine warfare testing, unmanned underwater vehicles demonstrations, special warfare testing, towed equipment testing, unmanned underwater vehicles testing, semi-stationary equipment testing, and pierside integrated swimmer defense testing. These activities, the number of events, and their proposed locations are described in Tables 2.8-2 to 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives). Model-predicted acoustic impacts on sea turtles from exposure to sonar and other active acoustic sources under the No Action Alternative are shown in Table 3.5-7 for annually recurring testing activities for one year of testing activities.

The model predicts that only green sea turtles experience PTS because of testing with sonar and other active acoustic sources; PTS would permanently reduce sea turtle perception of sound within a limited frequency range. This long-term consequence could impact a turtle's ability to sense biologically important sounds, such as predators or prey, reducing that animal's fitness. A larger number of sea turtles are predicted to experience TTS, which would reduce their perception of sound within a limited frequency range, for a period of minutes to days, depending on the exposure. The predicted impacts do not account for avoidance behavior at close range or for high sound levels approaching those that could cause PTS. Furthermore, cues preceding the event (e.g., vessel presence and movement, aircraft overflight) may cause some animals to leave the area before active sound sources begin transmitting. Avoidance behavior could reduce the sound exposure level experienced by a sea turtle, and therefore reduce the likelihood and degree of PTS and TTS predicted near sound sources. In addition, PTS and TTS threshold criteria for sea turtles are conservatively based on criteria developed for mid-frequency marine mammals. Therefore, actual PTS and TTS impacts are expected to be substantially less than the predicted quantities.

Pursuant to the ESA, the use of sonar and other active acoustic sources during testing activities under the No Action Alternative may affect, and is likely to adversely affect, green, hawksbill, leatherback, loggerhead, and olive ridley sea turtles.

3.5.3.1.7.3 Alternative 1

Training Activities

The number of annual training activities that produce in-water noise from sonar or other active acoustic sources that falls within the hearing range of sea turtles would increase under Alternative 1 relative to the No Action Alternative. Use of sonar and other active acoustic sources during training activities is discussed in Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources).

Model-predicted acoustic impacts of exposure to sonar and other active acoustic sources on sea turtles for annually recurring training activities under Alternative 1 are shown in Table 3.5-7. The results shown are the impacts on sea turtles predicted for one year of training. The impacts are predicted to increase compared to the No Action Alternative. The increase in proposed activities under Alternative 1 over the No Action Alternative would increase predicted impacts on sea turtles (TTS only) by approximately 10 percent. Most of the increase in predicted impacts over the No Action Alternative would result from additional anti-submarine warfare training during major training activities. These events would occur a few times per year, but each event would last for several days. Therefore, some animals may be exposed several times.

The increase in predicted impacts on sea turtles could increase the number of individual animals exposed per year or increase the number of times per year some animals are exposed, when compared to the No Action Alternative. However, the expected impacts on any individual sea turtle remain the same. Similarly, the model may over-predict acoustic impacts because it does not consider avoidance and the criteria for predicting impacts are conservative. For the same reasons provided in Section 3.5.3.1.7.2 (No Action Alternative), potential impacts are not expected to result in substantial changes in behavior, growth, survival, annual reproductive success, or lifetime reproductive success (fitness) for most individuals. Although some individuals may experience long-term impacts, population-level impacts are not expected.

Pursuant to the ESA, the use of sonar and other active acoustic sources during training activities under Alternative 1 may affect, and is likely to adversely affect, green, hawksbill, leatherback, loggerhead, and olive ridley sea turtles.

Testing Activities

Testing activities under Alternative 1 include activities that produce in-water noise from sonar or other active non-impulsive acoustic sources that fall within the hearing range of sea turtles. These activities, the number of events, and their proposed locations are described in Tables 2.8-2 to 2.8-5 of Chapter 2.

Model-predicted acoustic impacts of exposure to sonar and other active acoustic sources on sea turtles under Alternative 1 are shown in Table 3.5-7 for annually recurring testing activities. The results shown in Table 3.5-7 are predicted impacts for one year of testing activities. Model-predicted acoustic impacts resulting in temporary threshold shift increased; however, impacts resulting in permanent threshold shift decreased under Alternative 1 when compared to the No Action Alternative.

Although impacts could occur across all of the range complexes and training ranges because of various types of testing involving active acoustic sources, the portion of total predicted impacts are greater for certain activities, either because of the types of sources or because of the hours of use. Testing events using sonar and other active acoustic sources are often multi-day events during which active sources are used intermittently; therefore, some animals may be exposed several times over a few days. While most testing using anti-submarine warfare sonar would occur beyond 12 nm from shore, other testing activities using active acoustic sources may occur closer to shore, specifically within nearshore SOCAL testing locations.

The increase in predicted impacts on sea turtles could increase the number of individual animals exposed per year or increase the number of times per year some animals are exposed, when compared to the No Action Alternative. Relative to the No Action Alternative, sea turtles experiencing TTS are expected to increase by approximately 10 percent under Alternative 1, and the number of green sea turtles experiencing PTS are expected to decrease by approximately 10 percent (the model did not predict PTS in other sea turtle species). Despite the overall increase in the number of exposures relative to the No Action Alternative, the expected impacts on any individual sea turtle would remain the same. Similarly, the model may over-predict acoustic impacts because it does not consider avoidance and the criteria for predicting impacts are conservative. For the same reasons provided in Section 3.5.3.1.7.2 (No Action Alternative), potential impacts are not expected to substantially change behavior, growth, survival, annual reproductive success, or lifetime reproductive success (fitness) in most individuals. Although some individuals may experience long-term impacts, population-level impacts are not expected.

Pursuant to the ESA, the use of sonar and other active acoustic sources during testing activities under Alternative 1 may affect, and is likely to adversely affect, green, hawksbill, leatherback, loggerhead, and olive ridley sea turtles.

3.5.3.1.7.4 Alternative 2

Training Activities

The number and location of training activities under Alternative 2 would be identical to those of training activities under Alternative 1. Therefore, impacts on and comparisons to the No Action Alternative would also be identical, as described in Section 3.5.3.1.7.2 (No Action Alternative).

Pursuant to the ESA, the use of sonar and other active acoustic sources during training activities as described under Alternative 2 may affect, and is likely to adversely affect, green, hawksbill, leatherback, loggerhead, and olive ridley sea turtles.

Testing Activities

Alternative 2 testing activities would increase the number of hours of active acoustic sonar use within the Study Area. As shown in Table 3.0-8, the largest increases in the number of hours would be within the low-frequency active range (producing signals under 1 kHz). Despite the increases in the number of hours of active acoustic sonar use, there is no difference in the Navy's acoustic modeling for Alternative 2 impacts to sea turtles, relative to Alternative 1 (see Table 3.5-7). Therefore, impacts on and comparisons to the No Action Alternative would also be identical, as described in Section 3.5.3.1.7.2 (No Action Alternative).

Pursuant to the ESA, the use of sonar and other active acoustic sources during testing activities as described under Alternative 2 may affect, and is likely to adversely affect, green, hawksbill, leatherback, loggerhead, and olive ridley sea turtles.

3.5.3.1.8 Impacts from Explosives

Explosions in the water or near the water's surface can introduce loud, impulsive, broadband sounds into the marine environment. These sounds are likely to be within the audible range of most sea turtles, but the duration of individual sounds is very short. Energy from explosives is capable of causing mortalities, injuries to the lungs or gastrointestinal tract (Section 3.5.3.1.2.1, Direct Injury), TTS or PTS (Section 3.5.3.1.2.2, Hearing Loss), or behavioral responses (Section 3.5.3.1.2.5, Behavioral Reactions). The impacts on sea turtles of at-sea explosions depend on the net explosive weight of the charge, the depth of the charge, the properties of detonations underwater, the animal's distance from the charge, the animal's location in the water column, and environmental factors such as water depth, water temperature, and bottom type. The net explosive weight accounts for the weight and the type of explosive material. Criteria for determining physiological impacts of impulsive sound on sea turtles are discussed in Section 3.5.3.1.3 (Acoustic and Explosive Thresholds and Criteria). The limited information on sea turtle behavioral responses to sounds is discussed in Section 3.5.3.1.2.5 (Behavioral Reactions).

Exposures that result in injuries such as non-lethal trauma and PTS may limit an animal's ability to find or obtain food, communicate with other animals, avoid predators, or interpret the environment around them. Impairment of these abilities can decrease an individual's chance of survival or impact its ability to successfully reproduce. Mortality of an animal will remove the animal entirely from the population as well as eliminate its future reproductive potential.

There is some limited information on sea turtle behavioral responses to impulsive noise from airgun studies (Section 3.5.3.1.3.12, Behavioral Responses), that can be used as a surrogate for explosive impact analysis. Any behavioral response to a single detonation would likely be a short-term startle response, if the animal responds at all. Multiple detonations over a short period may cause an animal to exhibit other behavioral reactions, such as interruption of feeding or avoiding the area.

3.5.3.1.8.1 Model-Predicted Impacts

The average ranges of impacts from explosives of different charge weights for each of the specific criteria (onset mortality, onset slight lung injury, onset slight GI tract injury, PTS, and TTS) are shown in Table 3.5-8. Sea turtles within these ranges are predicted by the model to receive the associated impact. Information about the ranges of impacts is important, not only for predicting acoustic impacts, but also for verifying the accuracy of model results against real-world situations and determining adequate mitigation ranges to avoid higher level impacts, especially physiological impacts on sea turtles. Because propagation of the acoustic waves is affected by environmental factors at different locations and because some criteria are partially based on sea turtle mass, the range of impacts for particular criteria will vary.

Based on the estimate of sound exposure level that could induce a sea turtle to exhibit avoidance behavior when exposed to repeated impulsive sounds (see Section 3.5.3.1.3.12, Criteria for Behavioral Responses), the distance from an explosion at which a sea turtle may behaviorally react (e.g., avoid by moving farther away) can be estimated. These ranges are also shown in Table 3.5-8. If exposed to a single impulsive sound, a sea turtle is assumed to exhibit a brief startle reaction that would likely be biologically insignificant.

Table 3.5-9 through Table 3.5-13 present impacts of explosive detonations on sea turtles predicted by the Navy Acoustic Effects Model, applying the impact threshold criteria shown in Table 3.5-3.

The impact estimates for each alternative represent the total number of impacts and not necessarily the number of individuals exposed, because a single individual may be exposed several times over the course of a year.

Table 3.5-8: Ranges of Impacts from In-water Explosions on Sea Turtles for Representative Sources

Criteria Predicted Impact[1]	Impact Predicted to Occur When Sea Turtle is at this Range (m) or Closer to a Detonation			
	Source Class E2 (0.5 lb. NEW)	Source Class E5 (10 lb. NEW)	Source Class E9 (250 lb. NEW)	Source Class E12 (1,000 lb. NEW)
Onset Mortality (1% Mortality)	12	47	137	204
Onset Slight Lung Injury	25	87	240	352
Onset Slight GI Tract Injury	25	71	147	274
Permanent Threshold Shift[2]	79	222	587	1,602
Temporary Threshold Shift[2]	178	598	1,711	3,615
Avoidance Behavior (for multiple impulses)	344	1,125	2,971	6,709

[1] Criteria for impacts are discussed in Section 3.5.3.1.3, Acoustic and Explosive Thresholds and Criteria.
[2] Modeling for sound exposure level-based impulsive criteria assumed explosive event durations of one second. Actual durations may be less, resulting in smaller ranges to impact.
Notes: (1) NEW = net explosive weight, m = meters, lb. = pound, GI = gastrointestinal; (2) Ranges determined using REFMS, Navy's explosive propagation model

Some of the conservative assumptions made for the impact modeling and criteria may cause the impact predictions to be overestimated, as follows:

- Many explosions from ordnance such as bombs and missiles actually explode upon impact with above-water targets. For this analysis, sources such as these were modeled as exploding at depths of 1 m, overestimating the amount of explosive and acoustic energy entering the water.
- For predicting TTS and PTS based on sound exposure level, the duration of an explosion is assumed to be one second. Actual detonation durations may be much shorter, so the actual sound exposure level at a particular distance may be lower.
- Mortality and slight lung injury criteria are based on juvenile turtle masses, which substantially increases that range to which these impacts are predicted to occur compared to the ranges that would be predicted using adult turtle masses.
- Animats are assumed to receive the full impulse of the initial positive pressure wave due to an explosion, although the impulse-based thresholds (onset mortality and onset slight lung injury) assume an impulse delivery time adjusted for animal size and depth. Therefore, these impacts are overestimated at farther distances and increased depths.
- The predicted acoustic impacts do not take into account mitigation measures implemented during many training and testing activities, such as exclusion zones around detonations. Smaller hatchling and early juvenile hardshell turtles tend to be near the surface, which is subject to avoidance mitigation measures (Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring).

Most training and testing activities using explosives occur every year. Results for non-annual training events (such as shock trials) are considered separate in the modeling analysis from annual activities.

Table 3.5-9: Annual Model-Predicted Impacts from Explosives on Sea Turtles for Training Activities Under the No Action Alternative

Sea Turtle Species or Group	Temporary Threshold Shift	Permanent Threshold Shift	GI Tract Injury	Slight Lung Injury	Mortality
Green sea turtles	0	0	0	0	0
Pacific guild turtles[1]	152	18	0	10	4

[1] A Pacific guild of sea turtles was created for modeling purposes, due to the lack of density data for species other than green sea turtles. A similar approach was taken for marine mammal modeling.

Table 3.5-10: Annual Model-Predicted Impacts from Explosives on Sea Turtles for Training Activities Under Alternatives 1 and 2

Sea Turtle Species or Group	Temporary Threshold Shift	Permanent Threshold Shift	GI Tract Injury	Slight Lung Injury	Mortality
Green sea turtles	0	0	0	0	0
Pacific guild turtles[1]	182	21	0	13	4

[1] A Pacific guild of sea turtles was created for modeling purposes, due to the lack of density data for species other than green sea turtles. A similar approach was taken for marine mammal modeling.

Notes: The timing, locations, and numbers of these activities would not substantially differ from year to year under each alternative. Non-annual training activities are not included in this table; the model-predicted impacts for non-annual training activities are four TTS exposures.

Table 3.5-11: Annual Model-Predicted Impacts from Explosives on Sea Turtles for Testing Activities Under the No Action Alternative

Sea Turtle Species or Groups	Temporary Threshold Shift	Permanent Threshold Shift	GI Tract Injury	Slight Lung Injury	Mortality
Green sea turtles	0	0	0	0	0
Pacific guild turtles[1]	0	0	0	0	0

[1] A Pacific guild of sea turtles was created for modeling purposes, due to the lack of density data for species other than green sea turtles. A similar approach was taken for marine mammal modeling.

Table 3.5-12: Annual Model-Predicted Impacts from Explosives on Sea Turtles for Testing Activities Under Alternative 1

Sea Turtle Species or Groups	Temporary Threshold Shift	Permanent Threshold Shift	GI Tract Injury	Slight Lung Injury	Mortality
Green sea turtles	0	0	0	0	0
Pacific guild turtles[1]	0	3	0	0	0

[1] A Pacific guild of sea turtles was created for modeling purposes, due to the lack of density data for species other than green sea turtles. A similar approach was taken for marine mammal modeling.

Table 3.5-13: Annual Model-Predicted Impacts from Explosives on Sea Turtles for Testing Activities Under Alternative 2

Sea Turtle Species	Temporary Threshold Shift	Permanent Threshold Shift	GI Tract Injury	Slight Lung Injury	Mortality
Green sea turtles	0	0	0	0	0
Pacific guild turtles[1]	1	5	0	0	0

[1] A Pacific guild of sea turtles was created for modeling purposes, due to the lack of density data for species other than green sea turtles. A similar approach was taken for marine mammal modeling.

3.5.3.1.8.2 No Action Alternative

Training Activities

Training activities under the No Action Alternative using explosives at or beneath the water surface would expose sea turtles to underwater impulsive sound. The largest source class used during training under the No Action Alternative would be E13 (1,000 to 1,740 lb. net explosive weight). Explosives would be used at or beneath the water surface in all training range complexes. Some areas within training ranges are not used for explosives, such as San Diego Bay. The number of training events using explosives and their proposed locations are presented in Table 2.8-1 of Chapter 2. Use of explosives and the number of detonations in each source class are provided in Section 3.0.5.3.1.2 (Explosives).

Model-predicted impacts on sea turtles of explosives used in annually recurring training activities under the No Action Alternative are shown in Table 3.5-9. The results shown are the impacts on sea turtles predicted for one year of training. Under the No Action Alternative, the majority of predicted impacts are from Bombing Exercises (Air-to-Surface) using source class E12 (651 to 1,000 lb. net explosive weight), Missile Exercises (Air-to-Surface) using source class E6 (11 to 20 lb. net explosive weight) and E10 (251 to 500 lb. net explosive weight), tracking and torpedo exercise – Maritime Patrol Aircraft-sonobuoys using source class E4 (2.6 to 5 lb. net explosive weight), Naval Surface Fire Support – At Sea using source class E5 (6 to 10 lb. net explosive weight), and Gunnery Exercise (Air-to-Surface) – Rocket using source class E5 (6 to 10 lb. net explosive weight).

Detonations would typically occur beyond approximately 3 nm from shore, minimizing impacts near nesting beaches within the HRC or coastal habitats of green sea turtles in SOCAL. A few near-shore (within 3 nm) training events could occur within SOCAL and HRC, however, potentially exposing some sea turtles approaching nesting beaches to impulsive sounds over a short duration, if the training occurred during nesting season, or to sea turtles in SOCAL nearshore habitats. Modeling predicted no PTS, TTS, gastrointestinal, lung injury, or mortality for sea turtles in coastal habitats.

A small number of sea turtles within the Pacific Guild group are predicted to be exposed to impulse levels associated with the onset of mortality (four sea turtles) and slight lung injury (10 sea turtles) over any training year for explosives use in open ocean habitats. Temporary threshold shift is predicted to occur in 152 sea turtles and permanent threshold shift in 18 sea turtles. Any injured sea turtles could suffer reduced fitness and long-term survival. Sea turtles that experience PTS would have permanently reduced perception of sound within a limited frequency range. It is uncertain whether some permanent hearing loss over a part of a sea turtle’s hearing range would have long-term consequences for that individual, because the sea turtle hearing range is already limited. Because detonations impact only a small portion of the frequency range and most sounds are broadband, sea turtles may be able to compensate for the loss of sensitivity because they can still hear the stimulus over the broader audible hearing range. A long-term consequence could be an impact on an individual turtle’s ability to sense biologically important sounds, such as predators or prey, reducing that animal’s fitness. A larger number of sea turtles are predicted to experience TTS, which would reduce their perception of sound within a limited frequency range for a period of minutes to days, depending on the exposure. PTS and TTS threshold criteria for sea turtles are conservatively based on criteria developed for mid-frequency marine mammals, so actual PTS and TTS impacts may be less than the predicted quantities.

Some sea turtles beyond the ranges of the above impacts may behaviorally react if they hear a detonation. Events with single detonations, such as a bombing and missile exercise, are expected to only elicit short-term startle reactions. If a sea turtle hears several detonations in a short period, such as during gunnery, firing, or sonobuoy exercises, it may react by avoiding the area. Any significant behavioral reactions could lead to a sea turtle expending energy and missing opportunities to secure resources. However, because most events would consist of a limited number of detonations and exposures would not occur over long periods, the sea turtle would have an opportunity to recover from an incurred energetic cost.

Because model-predicted impacts are conservative and most impacts would be short-term, potential impacts are not expected to result in substantial changes in behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment. Although a few individuals (green sea turtles) may experience long-term impacts such as potential injury and mortality, population-level impacts are not expected.

Pursuant to the ESA, the use of underwater explosives during training activities under the No Action Alternative may affect, and is likely to adversely affect, green, hawksbill, leatherback, loggerhead, and olive ridley sea turtles.

Testing Activities

Testing activities under the No Action Alternative using explosives at or beneath the water surface would expose sea turtles to underwater impulsive sound. The largest source class used during training under the No Action Alternative would be E11 (501 to 650 lb. net explosive weight). Explosives would be used at or beneath the water surface in all training range complexes. Some areas within training ranges are not used for explosives, such as San Diego Bay. The number of training events using explosives and their proposed locations are presented in Tables 2.8-2 through 2.8-5 in Chapter 2. Use of explosives and the number of detonations in each source class are provided in Section 3.0.5.3.1.2 (Explosives).

Detonations would typically occur beyond approximately 3 nm (5.6 km) from shore, minimizing impacts near nesting beaches within the HRC or coastal habitats of green sea turtles in SOCAL. A few near-shore (within 3 nm) training events, however, could occur within SOCAL and HRC, potentially exposing some sea turtles approaching nesting beaches to impulsive sounds over a short period, if the training occurred during nesting season, or to sea turtles in SOCAL nearshore habitats. Modeling predicted no TTS, gastrointestinal, lung injury, or mortality for sea turtles in coastal habitats.

For Pacific Guild species that occur in open ocean habitats, no sea turtles are predicted to be exposed to impulse levels associated with the onset of mortality, gastrointestinal injury, slight lung injury, TTS, or PTS over any training year. Any injured sea turtles could suffer reduced fitness and long-term survival. Some sea turtles beyond the ranges of the above impacts may behaviorally react if they hear a detonation. Events with single detonations, such as a bombing and missile exercise, are expected to only elicit short-term startle reactions. If a sea turtle hears several detonations in a short period, such as during gunnery, firing, or sonobuoy exercises, it may react by avoiding the area. Any significant behavioral reactions could lead to a sea turtle expending energy and missing opportunities to secure resources. However, because most events would consist of a limited number of detonations and exposures would not occur over long periods, the sea turtle would have an opportunity to recover from an incurred energetic cost.

Because model-predicted impacts are conservative and most impacts would be short-term, potential impacts are not expected to result in substantial changes in behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment. Although a few individuals may experience long-term impacts and potential mortality, population-level impacts are not expected.

Pursuant to the ESA, the use of underwater explosives during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, and olive ridley sea turtles.

3.5.3.1.8.3 Alternative 1

Training Activities

Training activities under Alternative 1 using explosives at or beneath the water surface would expose sea turtles to underwater impulsive sound. The largest source class used during training under Alternative 1 would be E13 (1,000 to 1,740 lb. net explosive weight). Explosives would be used at or beneath the water surface in all training range complexes. Some areas within training ranges are not used for explosives, such as San Diego Bay. The number of training events using explosives and their proposed locations are presented in Table 2.8-1 of Chapter 2. Use of explosives and the number of detonations in each source class are provided in Section 3.0.5.3.1.2 (Explosives).

Model-predicted impacts on sea turtles from explosives used in annually recurring training activities under Alternative 1 are shown in Table 3.5-10. The results shown are the impacts on sea turtles predicted for one year of training. Under Alternative 1, the majority of predicted impacts are from Bombing Exercises (Air-to-Surface) using source class E12 (651 to 1,000 lb. net explosive weight), Missile Exercises (Air-to-Surface) using source class E6 (11 to 20 lb. net explosive weight) and E10 (251 to 500 lb. net explosive weight), tracking and torpedo exercises with Maritime Patrol Aircraft-sonobuoys using source class E4 (2.6 to 5 lb. net explosive weight), Naval Surface Fire Support – At Sea using source class E5 (6 to 10 lb. net explosive weight), and Gunnery Exercise (Air-to-Surface) – rocket using source class E5 (6 to 10 lb. net explosive weight).

Detonations would typically occur beyond approximately 3 nm from shore, minimizing impacts near nesting beaches within the HRC or coastal habitats of green sea turtles in SOCAL. A few near-shore (within 3 nm) training events could occur within SOCAL and HRC, however, potentially exposing some sea turtles approaching nesting beaches to impulsive sounds over a short period, if the training occurred during nesting season, or to sea turtles in SOCAL nearshore habitats. Modeling predicted no PTS, TTS, gastrointestinal, lung injury, or mortality for sea turtles in coastal habitats.

As with the No Action Alternative, a small number of sea turtles within the Pacific Guild group are predicted to be exposed to impulse levels associated with the onset of mortality and slight lung injury over any training year for explosives use in open ocean habitats. Exposures modeled under Alternative 1 are expected to increase by approximately 17 percent, relative to the No Action Alternative. Model-predicted results for non-annual training activities under Alternative 1 amount to four TTS exposures in open ocean areas (Pacific Guild modeling group). Any injured sea turtles could suffer reduced fitness and long-term survival. Sea turtles that experience PTS would have permanently reduced perception of sound within a limited frequency range. It is uncertain whether some permanent hearing loss over a part of a sea turtle's hearing range would have long-term consequences for that individual, because the sea turtle hearing range is already limited. A long-term consequence could be an impact on an individual turtle's ability to sense biologically important sounds, such as predators or prey, reducing that animal's fitness. A larger number of sea turtles are predicted to experience TTS, which would reduce their perception of sound within a limited frequency range for a period of minutes to days, depending on the exposure. PTS and TTS threshold criteria for sea turtles are conservatively based on criteria developed for mid-frequency marine mammals, so actual PTS and TTS impacts may be less than the predicted quantities.

Some sea turtles beyond the ranges of the above impacts may behaviorally react if they hear a detonation. Events with single detonations, such as a bombing and missile exercise, are expected to only elicit short-term startle reactions. If a sea turtle hears several detonations in a short period, such as during gunnery, firing, or sonobuoy exercises, it may react by avoiding the area. Any significant behavioral reactions could lead to a sea turtle expending energy and missing opportunities to secure resources. However, because most events would consist of a limited number of detonations and exposures would not occur over long periods, the sea turtle would have an opportunity to recover from an incurred energetic cost.

Because model-predicted impacts are conservative and most impacts would be short-term, potential impacts are not expected to result in substantial changes in behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment. Although a few individuals (green sea turtles) may experience long-term impacts such as potential injury and mortality, population-level impacts are not expected.

Pursuant to the ESA, the use of underwater explosives during training activities under Alternative 1 may affect, and is likely to adversely affect, green, hawksbill, leatherback, loggerhead, and olive ridley sea turtles.

Testing Activities

Testing activities under Alternative 1 using explosives at or beneath the water surface would expose sea turtles to underwater impulsive sound. The largest source class used during testing under Alternative 1 is E11 (500 to 650 lb. net explosive weight). Explosives at or beneath the water surface would be used in all training range complexes. Some areas within training ranges are not used for explosives, such as San Diego Bay. The number of testing activities using explosives and their proposed locations are presented in Tables 2.8-2 and 2.8-3 of Chapter 2. Use of explosives and the number of detonations in each source class are provided in Section 3.0.5.3.1.2 (Explosives).

Model-predicted acoustic impacts from explosives on sea turtles during annually recurring testing activities under Alternative 1 are shown in Table 3.5-12. The results shown are the impacts on sea turtles predicted for one year of testing. Model-predicted results for testing activities under Alternative 1 amount to three PTS exposures in the open ocean portions of the Study Area (zero exposures were predicted under the No Action Alternative for testing activities). Because model-predicted impacts are conservative and most impacts would be short-term, potential impacts are not expected to result in substantial changes in behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment. Although a few individuals may experience long-term impacts and potential mortality, population-level impacts are not expected.

Pursuant to the ESA, the use of underwater explosives during testing activities under Alternative 1 may affect, and is likely to adversely affect green, hawksbill, leatherback, loggerhead, and olive ridley sea turtles.

3.5.3.1.8.4 Alternative 2

Training Activities

Training activities under Alternative 2 using explosives at or beneath the water surface would expose sea turtles to underwater impulsive sound. The largest source class used during training under Alternative 2 would be E13 (1,001 to 1,740 lb. net explosive weight). Explosives would be used at or beneath the water surface in all training range complexes. Some areas within training ranges are not used for explosives, such as San Diego Bay. The number of training events using explosives and their proposed locations are presented in Table 2.8-1 of Chapter 2. Use of explosives and the number of detonations in each source class are provided in Section 3.0.5.3.1.2 (Explosives).

Model-predicted impacts on sea turtles of explosives used in annually recurring training activities under Alternative 2 are shown in Table 3.5-10. The results shown are the impacts on sea turtles predicted for one year of training. Under Alternative 2, the model-predicted results are the same as for annual and non-annual training activities as Alternative 1; therefore, the impacts under Alternative 2 are expected to be the same as Alternative 1.

Pursuant to the ESA, the use of underwater explosions during training activities under Alternative 2 may affect, and is likely to adversely affect, green, hawksbill, leatherback, loggerhead, and olive ridley sea turtles.

Testing Activities

Testing activities under Alternative 2 using explosives at or beneath the water surface would expose sea turtles to underwater impulsive sound. The largest source class used during testing under the No Action Alternative would be E11 (500 to 650 lb. net explosive weight). Explosives would be used at or beneath the water surface in all training range complexes. Some areas within training ranges are not used for explosives, such as San Diego Bay. The number of testing events using explosives and their proposed locations are presented in Table 2.8-2 and Table 2.8-3 of Chapter 2. Use of explosives and the number of detonations in each source class are provided in Section 3.0.5.3.1.2 (Explosives).

Model-predicted results for testing activities under Alternative 2 amount to five PTS exposures and one TTS exposure in the open ocean portions of the Study Area (zero exposures were predicted under the No Action Alternative for testing activities). Because model-predicted impacts are conservative and most impacts would be short-term, potential impacts are not expected to result in substantial changes in behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment. Although a few individuals may experience long-term impacts and potential mortality, population-level impacts are not expected.

Pursuant to the ESA, the use of underwater explosives during testing activities under Alternative 2 may affect, and is likely to adversely affect, green, hawksbill, leatherback, loggerhead, and olive ridley sea turtles.

3.5.3.1.9 Impacts from Pile-Driving

Pile-driving activities could include impact or vibratory pile driving and vibratory pile removal, which would produce impulsive and continuous sounds underwater. This activity would involve intermittent impact pile driving of 24 in. (60.9 cm), uncapped, steel pipe piles over approximately two weeks at a rate of approximately eight piles per day. Each pile takes about 10 minutes to drive. When training events that use the elevated causeway system are complete, the structure would be removed. The piles would be removed using vibratory methods over approximately six days. Crews can remove about 14 piles per day, each taking about six minutes to remove.

Impulses from an impact hammer are broadband, and emit most of their energy in the lower frequencies. The impulses are within the hearing range of most sea turtles, and can produce a shock wave that is transmitted to the sediment and water column (Reinhall and Dahl 2011). The impulses produced would be less than a second each, occur at a rate of 30 to50 impulses per minute, and have a source level of around 194 dB re 1 µPa root mean square and 207 dB re 1 µPa peak at 10 m (32.8 ft.) from the pile (California Department of Transportation 2009). Assuming that sound propagates in accordance with the practical spreading loss (see Section 3.0.4, Acoustic and Explosive Primer), sound pressure levels from impact pile driving would be above the injury criteria threshold value (190 dB re 1 µPa root mean square) only a short distance from the pile. Sound pressure levels that could injure sea turtles would only occur within a radius of 19 m (62.3 ft.) from the pile. Because of the small size of the potential injury zone and the densities of sea turtle in the proposed project locations, no injurious exposures are predicted to occur from impact pile driving activities associated with Navy training.

Sound from a vibratory hammer is similar in its frequency range to that of an impact hammer, except that the source levels are much lower than for the impact hammer. The vibrations typically oscillate at a rate of about 1,700 cycles per minute, so the sound source is treated as a continuous sound source. The source level for vibratory removal of the size and type of piles that would be used during Navy training, assuming vibratory removal source levels are similar to vibratory driving source levels, would be around 164 dB re 1 µPa root mean square at 10 m (32.8 ft.) from the pile, less than the criteria threshold value for injury.

Despite the short duration of driving and removing a single pile, there is the potential for auditory masking in sea turtles and some temporary physiological stress. In addition, sea turtles may exhibit behavioral responses to impact or vibratory pile driving, including short-term startle responses or avoidance of the area around the pile driving. Because of the presence of vessels and shore construction activity, sea turtles may avoid the areas around proposed construction before pile driving activities begin, decreasing any potential impacts.

Pile driving would occur under all alternatives. Each alternative proposes four training events per year that involve pile driving, all occurring within Silver Strand Training Complex (SSTC). Because the numbers and locations do not vary among the alternatives, impacts are assessed together in one section and apply to all alternatives. Pile driving also occurs at Camp Pendleton as part of Joint Logistics Over the Shore training activities, and is discussed in Chapter 4 (Cumulative Impacts).

3.5.3.1.9.1 No Action Alternative, Alternative 1, and Alternative 2

Training Activities

Under the No Action Alternative, Alternative 1, and Alternative 2, four Elevated Causeway System training events would occur every year in SSTC Boat Lanes 1 to 10 and in the bayside Bravo Beach training lane. Based on the sound fields produced during the impact installation and vibratory removal of 24 in. (60.1 cm) steel pipe piles, no injuries to sea turtles are predicted from sound exposures during pile-driving and removal activities associated with Navy training. However, sea turtles may behaviorally respond to pile-driving and removal. As part of previous consultations between the Navy and the NMFS on elevated causeway training activities, mitigation measures have been developed so that the Navy does not drive piles when sea turtles are observed within waters ensonified (an area filled with sound) by 180 dB 1 µPa, which is approximately 50 m (164.04 ft.) from the pile. To accomplish this, the Navy will continue with mitigation measures agreed to as part of previous Elevated Causeway training activities. These measures include the monitoring of a 150 ft. (45.7 m) safety buffer zone for the presence of sea turtles before, during, and after pile removal activities. If sea turtles are found in the area, pile removal activities would be halted until the sea turtles have voluntarily left the safety buffer.

The anticipated effects on sea turtles are avoidance of waters that are ensonified by the pile driving. Impacts on sea turtles on the bayside can be more precisely defined based on the temporary ensonfication of important eelgrass habitats (foraging areas for green sea turtles) within San Diego Bay during pile driving activities. Only a small percentage of piles would be driven within eelgrass habitat and eelgrass. The Bravo lane eelgrass habitat is an area of only 17.5 ac. (0.1 km^2). Furthermore, piles would be driven within a 1.13 acres (ac.) (0.004 km^2) defined training lane within Bravo.

Piles would be driven infrequently. Given the extent of adjacent habitat and the population of turtles known to exist in adjacent habitat, effects on turtles of driving piles are expected to be temporary and local. Based on the limited occurrence (four events per year) and constrained nature of pile driving within turtle foraging areas (low intensity of the activity), the probability of impacts on turtles is low. Disturbance of sea turtles by Elevated Causeway System activities would include startle responses, avoidance behaviors, and removal of available eelgrass foraging habitats within San Diego Bay during Elevated Causeway System training events.

Pursuant to the ESA, pile driving as part of training activities for the No Action Alternative, Alternative 1, and Alternative 2 may affect, but is not likely to adversely affect, green sea turtles within SSTC (where this training type occurs). Pile driving during training activities would have no effect on hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Testing activities under the No Action Alternative, Alternative 1, and Alternative 2 do not include pile driving activities.

3.5.3.1.10 Impacts from Swimmer Defense Airguns

Airguns can introduce brief impulsive, broadband sounds into the marine environment. These sounds are probably within the audible range of most sea turtles. Sounds from airguns are capable of causing PTS or TTS (see Section 3.5.3.1.2.2) or behavioral responses (see Section 3.5.3.1.2.5). Single, small swimmer defense airguns would not cause direct trauma to sea turtles. Impulses from these small airguns lack the strong shock wave and rapid pressure increases from explosives that can cause primary blast injury or barotraumas (criteria for determining impacts to sea turtles from impulsive sound are discussed in Section 3.5.3.1.3.2). The limited information on assessing sea turtle behavioral responses to impulsive sounds is discussed in Section 3.5.3.1.2.5.

The behavioral response of sea turtles to the repeated firing of airguns has been studied for seismic survey airguns (e.g., oil and gas exploration) (Section 3.5.3.1.2.5). Sea turtles were shown to avoid higher-level exposures or to agitate when exposed to higher-level sources. However, the airguns proposed for use in Navy testing are smaller, and fire a limited number of times, so reactions would likely be lesser than those observed in studies.

Activities that use swimmer defense airguns as part of Navy testing activities would only occur at pierside locations in San Diego Bay; therefore, sea turtles outside of these areas would not be affected. Only the green sea turtles in San Diego Bay are carried forward for analysis.

3.5.3.1.10.1 Model-Predicted Impacts

For the analysis of hearing loss, airguns are treated as any other impulsive sound source. Estimates of the number of sea turtles exposed to levels capable of causing these impacts were calculated using the Navy Acoustic Effects Model. For all testing activities using airguns, no PTS or TTS impacts were predicted.

3.5.3.1.10.2 No Action Alternative

Training Activities

Training activities under the No Action Alternative do not use airguns.

Testing Activities

Testing activities that impart underwater impulsive noise from airguns under the No Action Alternative include pierside integrated swimmer defense testing activities at pierside locations, as described in Table 2.8-3. Small airguns (60 $in.^3$) would release a limited number of impulses into waters around Navy piers in San Diego Bay. These areas are industrial, and the waterways carry a high volume of vessel traffic in addition to Navy vessels. These areas tend to have high ambient noise levels and limited numbers of sea turtles present because of the high levels of human activity. Green sea turtles, the only species of sea turtle expected to occur in San Diego Bay, are not expected to occur around Navy piers in San Diego Bay. If sea turtles are present, they may alert, startle, avoid the immediate area, or not respond at all while the airgun is firing. Substantial behavioral impacts in these areas from the proposed use of the swimmer defense airgun are unlikely. Impulses from swimmer defense airguns are not predicted to cause any PTS or TTS impacts on sea turtles. The increase in the number of sea turtles that may experience behavioral effects between the alternatives is small compared to the size of sea turtle populations, and would not result in long-term consequences to the species.

Pursuant to the ESA, the use of swimmer defense airguns during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, green sea turtles. The use of swimmer defense airguns would have no effect on hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.1.10.3 Alternative 1

Training Activities

Training activities under Alternative 1 do not use airguns.

Testing Activities

Testing activities that impart underwater impulsive noise from airguns under Alternative 1 include a small decrease in pierside integrated swimmer defense testing activities over the No Action Alternative, as described in Table 2.8-3. Despite the decrease, the types of impacts on sea turtles from exposures to airguns under Alternative 1 are the same as those described under the No Action Alternative. As with the No Action Alternative, green sea turtles are not expected to occur around Navy piers in San Diego Bay. If sea turtles are present, they may alert, startle, avoid the immediate area, or not respond at all while the airgun is firing. Substantial behavioral impacts in these areas from the proposed use of the swimmer defense airgun are unlikely. Impulses from swimmer defense airguns are not predicted to cause any PTS or TTS impacts on sea turtles.

Pursuant to the ESA, the use of swimmer defense airguns during testing activities under Alternative 1 may affect, but is not likely to adversely affect, green sea turtles. The use of swimmer defense airguns would have no effect on hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.1.10.4 Alternative 2

Training Activities

Training activities under Alternative 2 do not use airguns.

Testing Activities

Testing activities that impart underwater impulsive noise from airguns under Alternative 2 result in only five PTS exposures in pierside integrated swimmer defense testing activities over the No Action Alternative, as described in Table 2.8-3. The number of activities that use swimmer defense airguns proposed under Alternative 2 is the same as the No Action Alternative. Therefore, the types of impacts on sea turtles from exposures to airguns under Alternative 2 are the same as those described under the No Action Alternative.

Pursuant to the ESA, the use of swimmer defense airguns during testing activities under Alternative 2 may affect, and is likely to adversely affect, green sea turtles. The use of swimmer defense airguns would have no effect on hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.1.11 Impacts from Weapons Firing, Launch, and Impact Noise

Sea turtles may be exposed to weapons firing and launch noise and sound from the impact of non-explosive ordnance on the water's surface. The sounds produced by these activities are described in Section 3.0.5.3.1.5 (Weapons Firing, Launch, and Impact Noise). Reactions by sea turtles to these specific stressors have not been recorded; however, sea turtles may be expected to react to weapons firing, launch, and non-explosive impact noise as they would other transient sounds (see Section 3.5.3.1.2.5, Behavioral Reactions).

Sea turtles exposed to firing, launch, and non-explosive impact noise may exhibit brief startle reactions, avoidance, diving, or no reaction at all. Gunfire noise would typically consist of a series of impulsive sounds. Because of the short term, transient nature of gunfire noise, animals may be exposed to multiple sounds over a short period. Launch noise would be transient and of short duration, lasting no more than a few seconds at any given location as a projectile travels. Many missiles and targets are launched from aircraft, which produces minimal noise in the water because of the altitude of the aircraft at launch. Any launch noise transmitted into the water would likely be due only to launches from vessels. Most events would consist of single launches. Non-explosive bombs, missiles, and targets could impact the water with great force and produce a short duration impulsive sound underwater that would depend on the size, weight, and speed of the object at impact.

Sea turtles that are exposed to any of these sounds would likely alert, startle, dive, or avoid the immediate area. An animal near the surface directly beneath the firing of a large gun could experience sound exposure levels sufficient to cause a threshold shift: however, this potential impact may be unlikely if a sea turtle reacts to the presence of the vessel prior to a large gunfire event.

3.5.3.1.11.1 No Action Alternative

Training Activities

Training under the No Action Alternative includes activities that produce in-water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface. Activities could occur throughout the Study Area.

A sea turtle very near a launch or impact location could experience hearing impacts, although the potential for this effect has not been studied and a sea turtle may avoid vessel interactions prior to the firing of a gun. It is uncertain whether some permanent hearing loss over a part of a sea turtle's hearing range would have long-term consequences for that individual, as the sea turtle hearing range is already limited. A long-term consequence could be an impact on an individual turtle's ability to sense biologically important sounds, such as predators or prey, reducing that animal's fitness. TTS would reduce the sea turtle's perception of sound within a limited frequency range for a period of minutes to days, depending on the exposure.

Any behavioral reactions would likely be short-term, and consist of brief startle reactions, avoidance, or diving. Any significant behavioral reactions could lead to a sea turtle expending energy and missing opportunities to secure resources. However, because most events would consist of a limited number of firings or launches and would not occur over long periods, the sea turtle would have an opportunity to recover from an incurred energetic cost. Although some individuals may be impacted by activities that include weapons firing, launch, and non-explosive impact, population-level impacts are not expected.

Pursuant to the ESA, noise from weapons firing, launch, and non-explosive impact during training activities under the No Action Alternative may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, and olive ridley sea turtles.

Testing Activities

Testing activities under the No Action Alternative include activities that produce in water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface. Activities are spread throughout the Study Area, as described in Tables 2.8-2 to 2.8-5 of Chapter 2.

A sea turtle very near a launch or impact location could experience hearing impacts, although the potential for this effect has not been studied and a sea turtle may avoid vessel interactions prior to the firing of a gun. It is uncertain whether some permanent hearing loss over a part of a sea turtle's hearing range would have long-term consequences for that individual, as the sea turtle hearing range is already limited. A long-term consequence could be an impact on an individual turtle's ability to sense biologically important sounds, such as predators or prey, reducing that animal's fitness. TTS would reduce the sea turtle's perception of sound within a limited frequency range for a period of minutes to days, depending on the exposure.

Any behavioral reactions would likely be short-term, and consist of brief startle reactions, avoidance, or diving. Any significant behavioral reactions could lead to a sea turtle expending energy and missing opportunities to secure resources. However, because most events would consist of a limited number of firings or launches and would not occur over long durations, the sea turtle would have an opportunity to recover from an incurred energetic cost. Although some individuals may be impacted by activities that include weapons firing, launch, and non-explosive impact, population-level impacts are not expected.

Pursuant to the ESA, noise from weapons firing, launch, and non-explosive impact during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.1.11.2 Alternative 1

Training Activities

Training activities under Alternative 1 that produce in-water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface would increase compared to the No Action Alternative. The locations and types of activities would be similar to those under the No Action Alternative. The number of events and their proposed locations are described in Table 2.8-1 of Chapter 2.

Although impacts on sea turtles are expected to increase under Alternative 1 compared to the No Action Alternative, the expected impacts on any individual sea turtle would remain the same. For the same reasons provided in Section 3.5.3.1.11.1 (No Action Alternative), although some individuals may be impacted by activities that include weapons firing, launch, and non-explosive impact, population-level impacts are not expected.

Pursuant to the ESA, noise from weapons firing, launch, and non-explosive impact during training activities under Alternative 1 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Testing activities under Alternative 1 that produce in-water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface would increase under Alternative 1 compared to the No Action Alternative. Activities involving weapons noise would increase from the No Action Alternative, including a large increase associated with aircraft carrier sea trials, mission package testing, combat system ship qualification trials, and anti-surface/anti-submarine warfare activities. Activities would be spread throughout the Study Area, as described in Tables 2.8-2 to 2.8-5 of Chapter 2.

Sea turtles exposed to noise from weapons firing, launch, or non-explosive ordnance impact with the water's surface could exhibit brief startle reactions, avoidance, diving, or no reaction at all. An animal very near a launch or impact location could experience hearing impacts. Because of the short-term, transient nature of weapons firing, launch, and non-explosive impact noise, animals would likely not be exposed several times within a short period. Behavioral reactions would likely be short-term, and would not lead to significant energy costs or long-term consequences for individuals or populations.

Although the impacts on sea turtles are expected to increase under Alternative 1 compared to the No Action Alternative, the expected impacts on any individual sea turtle would remain the same. For the same reasons provided in Section 3.5.3.1.11.1 (No Action Alternative), although some individuals may be impacted by activities that include weapons firing, launch, and non-explosive impact, population-level impacts are not expected.

Pursuant to the ESA, noise from weapons firing, launch, and non-explosive impact during testing activities under Alternative 1 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.1.11.3 Alternative 2

Training Activities

The number and location of training activities under Alternative 2 are identical to those of training activities under Alternative 1. Therefore, impacts and comparisons to the No Action Alternative would also be identical, as described in Section 3.5.3.1.11.1 (No Action Alternative).

Pursuant to the ESA, noise from weapons firing, launch, and non-explosive impact during training activities under Alternative 2 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Testing activities under Alternative 2 that produce in-water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface would increase from the No Action Alternative.

Locations and types of activities would be the same as those under Alternative 1, although the number of activities that produce in-water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface would increase by approximately 10 percent. The number of events and their proposed locations are described in Tables 2.8-2 and 2.8-3 of Chapter 2.

Although impacts on sea turtles are expected to increase under Alternative 2 compared to the No Action Alternative, the expected impacts on any individual sea turtle would remain the same. For the same reasons provided in Section 3.5.3.1.11.1 (No Action Alternative), although some individuals may be impacted by activities that include weapons firing, launch, and non-explosive impact, population-level impacts are not expected.

Pursuant to the ESA, noise from weapons firing, launch, and non-explosive impact during testing activities under Alternative 2 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.1.12 Impacts from Vessel and Aircraft Noise

Vessel Noise

Vessels could move throughout the Study Area, although some portions would have limited or no activity. Many ongoing and proposed training and testing activities within the Study Area involve maneuvers by various types of surface ships, boats, and submarines (collectively referred to as vessels). Operations involving vessel movements occur intermittently, and are variable in duration, ranging from a few hours up to two weeks. Additionally, a variety of smaller craft are operated within the Study Area. Small craft types, sizes, and speeds vary. During training, speeds generally range from 10 to 14 knots; however, ships and craft can and will, on occasion, operate within the entire spectrum of their specific operational capabilities. Vessel noise is described in Section 3.0.5.3.1.6 (Vessel Noise).

Vessel noise could disturb sea turtles, and potentially elicit an alerting, avoidance, or other behavioral reaction. Sea turtles are frequently exposed to research, ecotourism, commercial, government, and private vessel traffic. Some sea turtles may have habituated to vessel noise, and may be more likely to respond to the sight of a vessel rather than the sound of a vessel, although both may play a role in prompting reactions (Hazel et al. 2007). Any reactions are likely to be minor and short-term avoidance reactions, leading to no long-term consequences for the individual or population.

Auditory masking can occur from vessel noise, potentially masking biologically important sounds (e.g., sounds of prey or predators) upon which sea turtles may rely. Potential for masking can vary depending on the ambient noise level within the environment (Section 3.0.4.5, Ambient Noise); the received level and frequency of the vessel noise; and the received level and frequency of the sound of biological interest. Masking by ships or other sound sources transiting the Study Area would be short-term and intermittent, and therefore unlikely to result in any substantial energetic costs or consequences to individual animals or populations. Areas with increased levels of ambient noise from anthropogenic noise sources, such as busy shipping lanes and near harbors and ports, may have sustained levels of auditory masking for sea turtles, which could reduce an animal's ability to find prey, find mates, avoid predators, or navigate. However, Navy vessels make up a very small percentage of the overall vessel traffic, and the rise of ambient noise levels in these areas is a problem related to all ocean users, including commercial and recreational vessels and shoreline development and industrialization.

Surface combatant ships (e.g., guided missile destroyer, guided missile cruiser, and Littoral Combat Ship) and submarines are designed to be very quiet to evade enemy detection. While surface combatants and submarines may be detectable by sea turtles over ambient noise levels at distances of up to a few kilometers, any auditory masking would be minor and temporary. Other Navy ships and small craft have higher source levels, similar to equivalently sized commercial ships and private vessels. Ship noise tends to be low-frequency and broadband; therefore, it may have the largest potential to mask all sea turtle hearing. Noise from large vessels and outboard motors on small craft can produce source levels of 160 to over 200 dB re 1 µPa at 1 m for some large commercial vessels and outboard engines. Therefore, in the open ocean, noise from non-combatant Navy vessels may be detectable over ambient levels for tens of kilometers, and some auditory masking is possible. In noisier inshore areas around Navy ports and ranges, vessel noise may be detectable above ambient for only several hundred meters. Some auditory masking to sea turtles is likely from non-combatant Navy vessels, especially in quieter, open-ocean environments.

An approaching vessel may produce a sound shadow when the propulsion system is located at the rear of the vessel. The vessels that pose the greatest risk to sea turtles are small, fast-moving vessels typically used in coastal waters where sea turtle abundance is the greatest (Chaloupka et al. 2008a). These boats typically have propeller configurations above the depth of the keel, shielding sound waves from projecting forward of the vessel (Gerstein et al. 2009). Sound levels in front of the approaching vessel are lower because the ship's hull blocks the sound produced by the propulsion system (Gerstein et al. 2009). Low-frequency sounds are refracted around the ship's hull, as shown by Gerstein et al. (2009), while mid-frequency and high frequency sounds are refracted outward from the vessel trajectory. In response, marine animals that hear in the middle and high frequencies may move to a position closer to the approaching vessel's bow trajectory, increasing the potential for a strike. Low-frequency specialists, such as sea turtles, are less likely to be confused by a sound shadow produced by an approaching vessel because the sound shadow contains low-frequency sounds. The potential for vessel strikes is discussed in more detail in Section 3.5.3.3. (Physical Disturbance and Strike Stressors).

Navy ports such as San Diego and Pearl Harbor are heavily trafficked by private and commercial vessels, in addition to naval vessels. Because Navy ships make up a small portion of the total ship traffic, even in the most concentrated port and inshore areas, proposed Navy vessel transits are unlikely to cause long-term abandonment of habitat by sea turtles.

Aircraft Noise

Fixed and rotary-wing aircraft are used for a variety of training and testing activities throughout the Study Area. Sea turtles may be exposed to aircraft noise wherever aircraft overfly the Study Area. Most of these sounds would be centered around airbases and fixed ranges within each range complex. Aircraft produce extensive airborne noise from either turbofan or turbojet engines. Rotary-wing aircraft (helicopters) produce low-frequency sound and vibration (Pepper et al. 2003). A severe but infrequent type of aircraft noise is the sonic boom, produced when the aircraft exceeds the speed of sound. Aircraft noise as a stressor is described in Section 3.0.4.4.2 (Air-Water Interface).

Transmission of sound from a moving airborne source to a receptor underwater is influenced by numerous factors, but significant acoustic energy is primarily transmitted into the water directly below the craft in a narrow cone area, as discussed in greater detail in Section 3.0.3.2 (Acoustic and Explosives Primer). Underwater sounds from aircraft are strongest just below the surface and directly under the aircraft. The maximum sound levels in water from aircraft overflights are approximately 150 dB re 1 µPa for an F/A-18 aircraft at 980 ft. altitude; approximately 125 dB re 1 µPa for an H-60 helicopter hovering at 50 ft.; and under ideal conditions, sonic booms from aircraft at 3,280 ft. (999.7 m) could reach up to

178 dB re 1 µPa at the water's surface (see Section 3.0.4.4.3 for additional information on aircraft sonic booms).

Sea turtles may respond to both the physical presence and to the noise generated by aircraft, making causation by one or the other stimulus difficult to determine. In addition to noise, all low-flying aircraft create shadows, to which animals at the surface may react. Helicopters may also produce strong downdrafts, a vertical flow of air that becomes a surface wind, which can also affect an animal's behavior at or near the surface.

In most cases, exposure of a sea turtle to fixed-wing or rotary-wing aircraft would last for only seconds as the aircraft quickly passes overhead. Animals would have to be at or near the surface at the time of an overflight to be exposed to appreciable sound levels. Take-offs and landings occur at established airfields as well as on vessels at sea across the Study Area. Take-offs and landings from Navy vessels could startle sea turtles; however, these events only produce in-water noise at any given location for a brief period as the aircraft climbs to cruising altitude. Some sonic booms from aircraft could startle sea turtles, but these events are transient and happen infrequently at any given location within the Study Area. Repeated exposure to most individuals over short periods (days) is unlikely, except for animals that reside in inshore areas around Navy ports, or on Navy fixed-ranges, or during major training exercises.

Low flight altitudes of helicopters during some activities, which often occur under 100 ft. (30.5 m) altitude, may elicit a somewhat stronger behavioral response because of the proximity to the water; the slower airspeed and therefore longer exposure duration; and the downdraft created by the helicopter's rotor. Sea turtles would likely avoid the area under the helicopter. An individual likely would not be exposed repeatedly for long periods because these events typically transit open ocean areas within the Study Area.

3.5.3.1.12.1 No Action Alternative

Training Activities

Training activities under the No Action Alternative include noise from vessel movements and fixed- and rotary-wing aircraft overflights. Navy vessel and aircraft traffic could be associated with training in all of the range complexes, and throughout the Study Area while in transit.

Within HRC, vessel traffic would be concentrated in waters near Naval port facilities (e.g., Pearl Harbor) and other installations (e.g., Pacific Missile Range Facility), as well as smaller craft concentrations near training areas on Oahu (e.g., Marine Corps Training Area Bellows). Within SOCAL, most vessel traffic would be concentrated in San Diego Bay, as well as in oceanside training areas within SSTC (e.g., Boat Lanes and oceanside training beaches), and waters off San Clemente Island within Navy training areas. Therefore, the majority of sound introduced into the water by vessel movements would be concentrated in these areas.

Helicopters typically train closer to shore and at lower altitudes than fixed-wing aircraft. Within SOCAL, sea turtles foraging in shallow waters may be exposed to in-water noise from helicopter overflights near SSTC and San Clemente Island training locations. Within HRC, sea turtles foraging in shallow waters or approaching nesting beaches may be exposed to in-water noise from helicopter overflights near Pearl Harbor, Marine Corps Base Hawaii Kaneohe, Marine Corps Base Hawaii Bellows, and training areas off Kauai.

Sea turtles exposed to a passing Navy vessel or aircraft may not respond at all, or they may exhibit a short-term behavioral response such as avoidance or changing dive behavior. Short-term reactions to aircraft or vessels are not likely to disrupt major behavioral patterns or to result in serious injury to any sea turtles. Acoustic masking may result from vessel sounds, especially from non-combatant ships. Acoustic masking may prevent an animal from perceiving biologically relevant sounds during the period of exposure, potentially resulting in missed opportunities to obtain resources.

Long-term impacts from training activities are unlikely because the density of Navy ships in the Study Area is low overall and Navy combatant vessels are designed to be quiet. Abandonment of habitat because of proposed Navy activities is unlikely because of the low overall density of Navy vessel and aircraft in the Study Area. No long-term consequences for individuals or the population are expected.

Pursuant to the ESA, noise from vessels and aircraft during training activities under the No Action Alternative may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Testing activities under the No Action Alternative include noise from vessel movements and fixed- and rotor-wing aircraft overflights. Navy vessel and aircraft traffic could be associated with testing within HRC near Naval port facilities (e.g., Pearl Harbor) and other installations used for testing (e.g., Pacific Missile Range Facility, Shallow Water Training Range, and areas used for Hawaii Area Tracking System testing, test areas north of Maui). Within SOCAL, vessel and aircraft activities would be concentrated in areas used for testing, such as SSTC training areas, Southern California Anti-Submarine Warfare Range, waters off the Shore Bombardment Area, and other areas off San Clemente Island.

Sea turtles exposed to a passing Navy vessel or aircraft may not respond at all, or they may exhibit a short-term behavioral response such as avoidance or changing dive behavior. Short-term reactions to aircraft or vessels are not likely to disrupt major behavioral patterns or to result in serious injury to any sea turtles. Acoustic masking may occur due to vessel sounds, especially from non-combatant ships. Acoustic masking may prevent an animal from perceiving biologically relevant sounds during the period of exposure, potentially resulting in missed opportunities to obtain resources.

Long-term impacts from the proposed activities are unlikely because the density of Navy ships in the Study Area is low overall and many Navy ships are designed to be as quiet as possible. Abandonment of habitat in response to proposed Navy activities is unlikely because of the low overall density of Navy vessel and aircraft in the Study Area. No long-term consequences for individuals or the population would be expected.

Pursuant to the ESA, noise from vessels and aircraft during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.1.12.2 Alternative 1

Training Activities

Training activities proposed under Alternative 1 would increase vessel traffic and aircraft flight hours compared to the No Action Alternative, increasing overall amounts of aircraft and vessel noise. Certain portions of the Study Area, such as areas near Navy ports and airfields, installations, and training ranges, are used more heavily by vessels and aircraft than other portions of the Study Area, as described in further detail in Table 2.8-1 of Chapter 2, Section 3.0.5.3.1.6 (Vessel Noise), and Section 3.0.5.3.1.7 (Aircraft Overflight Noise). The types and locations of noise from vessels and aircraft would be similar to those under the No Action Alternative.

Although more sea turtle exposures to noise from vessels and aircraft could occur, predicted impacts from vessel or aircraft noise would not differ substantially from those under the No Action Alternative. Significant behavioral reactions by sea turtles in response to passing vessel or aircraft noise are not expected. For the same reasons stated in Section 3.5.3.1.12.1 (No Action Alternative), even though vessel noise may cause short-term impacts, no long-term consequences for individuals or populations would be expected.

Pursuant to the ESA, noise from vessels and aircraft during training activities under Alternative 1 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Testing Activities proposed under Alternative 1 would increase Navy vessel traffic and aircraft overflights compared to the No Action Alternative, increasing overall amounts of vessel and aircraft noise. Within HRC, vessel traffic would be concentrated in waters that are used for testing by various Navy systems commands. These areas within HRC are located near naval port facilities (e.g., Pearl Harbor) and other installations used for testing (e.g., Pacific Missile Range Facility, Shallow Water Training Range, areas used for Hawaii Area Tracking System testing, and test areas north of Maui). Within SOCAL, vessel traffic would be concentrated in areas used for testing, such as SSTC training areas, Southern California Anti-Submarine Warfare Range, waters off the Shore Bombardment Area, and other areas off San Clemente Island. New vessels proposed for testing under Alternative 1, such as the Littoral Combat Ship, the Joint High Speed Vessel, and the Expeditionary Fighting Vehicle, are all fast-moving and designed to operate in nearshore waters. Overall noise levels may increase in these environments. The number of events and proposed locations are discussed in further detail in Tables 2.8-2 through 2.8-5 of Chapter 2; Section 3.0.5.3.1.6 (Vessel Noise); and Section 3.0.5.3.1.7 (Aircraft Overflight Noise).

Although sea turtle exposures to noise from vessels and aircraft could increase under Alternative 1, predicted impacts from vessel or aircraft noise would not differ substantially from those under the No Action Alternative. Significant behavioral reactions by sea turtles in response to passing vessel or aircraft noise are not expected. For the same reasons stated in Section 3.5.3.1.12.1 (No Action Alternative), even though vessel noise may cause short-term impacts, no long-term consequences for individuals or populations would be expected.

Pursuant to the ESA, noise from vessels and aircraft during testing activities under Alternative 1 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.1.12.3 Alternative 2

Training Activities

The number and location of training activities under Alternative 2 are identical to those of training activities under Alternative 1. Therefore, impacts and comparisons to the No Action Alternative would also be identical, as described in Section 3.5.3.1.12.1 (No Action Alternative).

Pursuant to the ESA, noise from vessels and aircraft during training activities under Alternative 2 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Testing Activities proposed under Alternative 2 would increase Navy vessel traffic and aircraft overflights compared to the No Action Alternative, increasing overall amounts of vessel and aircraft noise. The types of activities and their locations would similar to those under Alternative 1, although overall activities would increase by approximately 10 percent over Alternative 1. The number of events and proposed locations are discussed in further detail in Tables 2.8-2 through 2.8-4 of Chapter 2; Section 3.0.5.3.1.6 (Vessel Noise); and Section 3.0.5.3.1.7 (Aircraft Overflight Noise).

Although sea turtle exposures to noise from vessels and aircraft could increase under Alternative 2, predicted impacts from vessel or aircraft noise would not differ substantially from those under the No Action Alternative. Significant behavioral reactions by sea turtles in response to passing vessel or aircraft noise are not expected. For the same reasons stated in Section 3.5.3.1.12.1 (No Action Alternative), even though vessel noise may cause short-term impacts, no long-term consequences for individuals or populations would be expected.

Pursuant to the ESA, noise from vessels and aircraft during testing activities under Alternative 2 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.2 Energy Stressors

This section evaluates the potential for sea turtles to be impacted by electromagnetic devices used during training and testing activities in the Study Area. Lasers used as part of proposed training and testing activities would be low-energy lasers used for mine detection and targeting. These laser devices are described in Chapter 2. While all points on a sea turtle's body would have roughly the same probability of laser exposure, only eye exposure is of concern for low-energy lasers. Any heat that the laser generates would rapidly dissipate due to the large heat capacity of water and the large volume of water in which the laser is used. There is no suspected effect due to heat from the laser beam. Eye damage to sea turtles is unlikely because eye damage depends on wavelength with exposures of greater than 10 seconds. With pulse durations less than 10 seconds, combined with the laser platform movement and animal motion, exposures of more than 10 seconds would not be possible. Furthermore, 96 percent of a laser beam projected into the ocean is absorbed, scattered, or otherwise lost (Guenther et al. 1996). Therefore, the use of low-energy lasers is discounted from the analysis of potential impacts on sea turtles.

3.5.3.2.1 Impacts from Electromagnetic Devices

Several different types of electromagnetic devices are used during training and testing activities. For a discussion of the types of activities that use electromagnetic devices, where they are used, and how many activities would occur under each alternative, please see Section 3.0.5.3.2.1 (Electromagnetic Devices). Aspects of electromagnetic stressors that are applicable to marine organisms in general are presented in Section 3.0.5.7.2 (Conceptual Framework for Assessing Effects from Energy-Producing Activities).

Well over a century ago, electromagnetic fields were introduced into the marine environment within the Study Area from a wide variety of sources (e.g., power transmission cables), yet little is known about the potential impacts of these sources. Studies on behavioral responses to magnetic fields have been conducted on green and loggerhead sea turtles. Loggerheads were found to be sensitive to field intensities ranging from 0.0047 to 4000 microteslas, and green sea turtles were found to be sensitive to field intensities from 29.3 to 200 microteslas (Normandeau et al. 2011). Because these data are the best available information, this analysis assumes that the responses would be similar for other sea turtle species.

Sea turtles use geomagnetic fields to navigate at sea, and therefore changes in those fields could impact their movement patterns (Lohmann and Lohmann 1996; Lohmann et al. 1997). Turtles in all life stages orient to the earth's magnetic field to position themselves in oceanic currents; this helps them locate seasonal feeding and breeding grounds and to return to their nesting sites (Lohmann and Lohmann 1996; Lohmann et al. 1997). Experiments show that sea turtles can detect changes in magnetic fields, which may cause them to deviate from their original direction (Lohmann and Lohmann 1996; Lohmann et al. 1997). For example, Lohmann and Lohmann (1996) found that loggerhead hatchlings tested in a magnetic field of 52,000 nanoteslas swam eastward, and when the field was decreased to 43,000 nanoteslas, the hatchlings swam westward. Sea turtles also use nonmagnetic cues for navigation and migration, and these additional cues may compensate for variations in magnetic fields.

3.5.3.2.1.1 No Action Alternative

Training Activities

Table 3.0-18 lists the number and location of training activities that generate electromagnetic fields. As indicated in Section 3.0.5.3.2.1 (Electromagnetic Devices), under the No Action Alternative, training activities involving electromagnetic devices occur in open ocean areas of HRC and SOCAL. All sea turtle species in the Study Area could occur in these locations, and could be exposed to the electromagnetic fields.

If located in the immediate area (within about 650 ft. [200 m]) where electromagnetic devices are being used, sea turtles could deviate from their original movements, but the extent of this disturbance is likely to be inconsequential. The electromagnetic devices used in training activities are not expected to cause more than a short-term behavioral disturbance to sea turtles because of the: (1) relatively low intensity of the magnetic fields generated (0.2 microtesla at 200 m [656.2 ft.] from the source), (2) very local potential impact area, and (3) temporary duration of the activities (hours). Potential impacts of exposure to electromagnetic stressors are not expected to result in substantial changes in an individual's behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment, and are not expected to result in population-level impacts.

Pursuant to the ESA, the use of electromagnetic devices during training activities under the No Action Alternative may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Table 3.0-18 lists the number and location of testing activities that generate electromagnetic fields. As indicated in Section 3.0.5.3.2.1 (Electromagnetic Devices), under the No Action Alternative, training activities involving electromagnetic devices occur in open ocean areas of HRC and SOCAL. All sea turtle species in the Study Area could occur in these locations, and could be exposed to the electromagnetic fields.

If located in the immediate area (within about 650 ft. [200 m]) where electromagnetic devices are being used, sea turtles could deviate from their original movements, but the extent of this disturbance is likely to be inconsequential. The electromagnetic devices used in training activities are not expected to cause more than a short-term behavioral disturbance to sea turtles because of the: (1) relatively low intensity of the magnetic fields generated (0.2 microtesla at 200 m [656.2 ft.] from the source), (2) very localized potential impact area, and (3) temporary duration of the activities (hours). Potential impacts of exposure to electromagnetic stressors are not expected to result in substantial changes to an individual's behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment, and are not expected to result in population-level impacts.

Pursuant to the ESA, the use of electromagnetic devices during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.2.1.2 Alternative 1

Training Activities

Table 3.0-18 lists the number and location of training activities under Alternative 1 that generate electromagnetic fields. As indicated in Section 3.0.5.3.2.1 (Electromagnetic Devices), under Alternative 1, testing activities involving electromagnetic devices occur in open ocean areas of HRC and SOCAL. All sea turtle species in the Study Area could occur in these locations, and could be exposed to the electromagnetic fields.

In comparison to the No Action Alternative, the increase in activities under Alternative 1 may increase the risk of sea turtle exposures to electromagnetic energy. However, the impact on sea turtles would remain the same. For the same reasons as stated in Section 3.5.3.2.1.1 (No Action Alternative), the use of electromagnetic devices is not expected to cause more than a short-term behavioral disturbance to sea turtles, or have any lasting effects on their survival, growth, recruitment, or reproduction.

Pursuant to the ESA, the use of electromagnetic devices during training activities under Alternative 1 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Table 3.0-18 lists the number and location of testing activities that generate electromagnetic fields. As indicated in Section 3.0.5.3.2.1 (Electromagnetic Devices), under Alternative 1, testing activities involving electromagnetic devices occur in open ocean areas of HRC and SOCAL. All sea turtle species in the Study Area could occur in these locations, and could be exposed to the electromagnetic fields.

In comparison to the No Action Alternative, the approximately 30 percent increase in activities under Alternative 1 may increase the risk of sea turtles being exposed to electromagnetic energy. However, the expected impact on sea turtles remains the same. For the same reasons as stated in Section 3.5.3.2.1.1 (No Action Alternative), the use of electromagnetic devices is not expected to cause more than a short-term behavioral disturbance to sea turtles or have lasting effects on their survival, growth, recruitment, or reproduction.

Pursuant to the ESA, the use of electromagnetic devices during testing activities under Alternative 1 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.2.1.3 Alternative 2

Training Activities

The number and location of training activities under Alternative 2 are identical to those of training activities under Alternative 1. Therefore, impacts on and comparisons to the No Action Alternative would be identical to those described in Section 3.5.3.3.2.1.2 (Alternative 1).

Pursuant to the ESA, the use of electromagnetic devices used during training activities under Alternative 2 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Table 3.0-18 lists the number and location of electromagnetic energy activities. As indicated in Section 3.0.5.3.2.1 (Electromagnetic Devices), under Alternative 2, electromagnetic device use would increase by approximately 40 percent in the Study Area, compared to the No Action Alternative, and would be approximately 10 percent more than under Alternative 1. The location of testing activities and species potentially impacted under Alternative 2 are identical to those specified under Alternative 1.

Pursuant to the ESA, the use of electromagnetic devices during testing activities under Alternative 2 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.3 Physical Disturbance and Strike Stressors

This section analyzes the potential impacts of the various types of physical disturbance and strike stressors used by Navy during training and testing activities within the Study Area. For a list of Navy activities that involve this stressor, refer to Table 3.0-7. The physical disturbance and strike stressors that may impact sea turtles include: (1) vessels, (2) in-water devices, (3) military expended materials, and (4) seafloor devices. Sections 3.5.3.1.1 (Impulse and Non-Impulse Sound Sources) through 3.5.3.1.11 (Impacts from Weapons Firing, Launch, and Impact Noise) contain the analysis of the potential for disturbance visual or acoustic cues. For a list of Navy activities that involve this stressor, refer to Table 3.0-7 (Stressors by Warfare and Testing Area).

The way a physical disturbance may affect a sea turtle would depend in part on the relative size of the object, the speed of the object, the location of the sea turtle in the water column, and the behavioral reaction of the sea turtle. It is not known at what point or through what combination of stimuli (visual, acoustic, or through detection in pressure changes) a sea turtle becomes aware of a vessel or other potential physical disturbances prior to reacting or being struck. Like marine mammals, if a sea turtle reacts to physical disturbance, the individual must stop its activity and divert its attention in response to the stressor. The energetic costs of reacting to a stressor depend on the specific situation, but one can assume that the caloric requirements of a response may reduce the amount of energy available for other biological functions. Given that the presentation of a physical disturbance should be very rare and brief, the cost of the response is likely to be within the normal variation experienced by a sea turtle during its daily routine unless the animal is struck. If a strike does occur, the cost to the individual could range from slight injury to death.

3.5.3.3.1 Impacts from Vessels

The majority of the training and testing activities under all alternatives involve some level of vessel activity. For a discussion of the types of activities that include the use of vessels, where they are used, and the speed and size characteristics of vessels used, see Section 3.0.5.3.3.1 (Vessels). Vessels include ships, submarines, and boats ranging in size from small, 22 ft. (6.7 m) rigid hull inflatable boats to aircraft carriers with lengths up to 1,092 ft. (332.8 m). Large Navy ships generally operate at speeds in the range of 10 to 15 knots, and submarines generally operate at speeds in the range of 8 to 13 knots. Small craft (for purposes of this discussion less than 40 ft. [12.2 m] in length) have much more variable speeds (dependent on the mission). While these speeds are representative of most activities, some vessels need to operate outside of these parameters. For example, to produce the required relative wind speed over the flight deck, an aircraft carrier vessel group engaged in flight operations must adjust its speed accordingly. Conversely, there are other instances, such as launch and recovery of a small rigid hull inflatable boat, vessel boarding, search, and seizure training activities or retrieval of a target, when vessels will be stopped or moving slowly ahead to maintain steerage. There are a few specific activities, including high speed tests of newly constructed vessels such as aircraft carriers, amphibious assault ships and the Joint High Speed Vessel (which will operate at an average speed of 35 knots), where vessels will operate at higher speeds.

The number of Navy vessels in the Study Area at any given time varies, and depends on local training or testing requirements. Most activities include either one or two vessels, and may last from a few hours up to two weeks. Vessel movement under the Proposed Action would be widely dispersed throughout the Study Area, but more concentrated in portions of the Study Area near ports, naval installations, range complexes, and testing ranges.

A study of sea turtle stranding events in the Hawaiian Archipelago from 1982 to 2003 showed that 97 percent of the 3,861 sea turtles stranded were green sea turtles. Over half (54.4 percent) of the strandings could not be attributed to any known or single cause. However, of the known causes, boat strikes (generally by small craft) contributed the fewest (2.5 percent), compared to shark attacks (2.7 percent), fishing gear (12 percent), and the tumor-forming disease, fibropapillomatosis (28 percent) (Chaloupka et al. 2008a).

Since green sea turtles were first documented in 1970 in San Diego Bay, little mortality has been attributed to vessel strikes through anecdotal observations (U.S. Department of the Navy 2011). Quantitative and consistent reporting of vessel strikes on turtles within San Diego Bay is lacking; however, vessel strike data for San Diego County indicates that nine vessel strikes occurred between 1986 and 2008 (National Marine Fisheries Service 2008). It is unknown if the mortalities related to vessel strikes occurred in San Diego Bay or at sea; currents and tides and winds bring debris into San Diego Bay. Navy vessel traffic within San Diego Bay is concentrated near navigational channels and berthing areas, and primarily occurs in daylight. Between 2009 and 2011, MacDonald et al. (2012) used acoustic telemetry to track 25 green sea turtles in San Diego Bay. Based on recent acoustic telemetry analyses of green sea turtle ranges in San Diego Bay, resident green sea turtles do not likely spend much, if any, time foraging in the central or northern portions of San Diego Bay (MacDonald et al. 2012). Most commercial and military vessel traffic is concentrated in the central and northern portions of San Diego Bay. A few sea turtles have been observed in northern San Diego Bay, but these are likely transient green sea turtles that enter the bay in warmer months (MacDonald et al. 2012). The majority of marine training and testing activities occur in the offshore training lanes, and small-boat training and testing events are a small portion of the total activities within SSTC. Navy vessels taking part in training and testing activities within San Diego Bay transit through a small portion of documented turtle resting and foraging habitat in the southern and south-central portions of San Diego Bay.

Minor strikes may cause temporary reversible impacts, such as diverting the turtle from its previous activity or causing minor injury. Major strikes are those that can cause permanent injury or death from bleeding or other trauma, paralysis and subsequent drowning, infection, or inability to feed. Apart from the severity of the physical strike, the likelihood and rate of a turtle's recovery from a strike may be influenced by its age, reproductive state, and general condition. Much of what is written about recovery from vessel strikes is inferred from observing individuals some time after a strike. Numerous sea turtles bear scars that appear to have been caused by propeller cuts or collisions with vessel hulls (Hazel et al. 2007; Lutcavage et al. 1997), suggesting that not all vessel strikes are lethal. Conversely, fresh wounds on some stranded animals may strongly suggest a vessel strike as the cause of death. The actual incidence of recovery versus death is not known, given available data.

Any of the sea turtle species found in the Study Area can occur at or near the surface in open ocean and coastal areas, whether feeding or periodically surfacing to breathe. Sea turtles spend a majority of their time submerged (Renaud and Carpenter 1994; Sasso and Witzell 2006). Leatherback turtles are more likely to feed at or near the surface in open ocean areas. Green, hawksbill, olive ridley, and loggerhead turtles are more likely to forage nearshore, and although they may feed along the seafloor, they surface periodically to breathe while feeding and moving between nearshore habitats. These species are distributed widely in all offshore portions of the Study Area.

To assess the risk or probability of a physical strike, the number, size, and speed of Navy vessels were considered, as well as the sensory capability of sea turtles to identify an approaching vessel. Because of the wide dispersal of large vessels in open ocean areas and the widespread, scattered distribution of turtles at sea, strikes during open-ocean transits of Navy vessels are unlikely. For very large vessels, the bow wave may even preclude a sea turtle strike. The probability of a strike is further reduced by Navy mitigation measures and standard operating procedures to avoid sea turtles (see Chapter 5). Smaller, faster vessels that operate in nearshore waters, where green, hawksbill, olive ridley, and loggerhead sea turtles can be more densely concentrated, pose a greater risk (Chaloupka et al. 2008). Some vessels associated with training and testing can travel at high speeds, which increase the strike risk to sea turtles (Table 3.0-19) (Hazel et al. 2007). Vessels transiting in shallow waters to and from ports travel at slower speed and pose less risk of strikes to sea turtles (see Section 3.0.5.3.3.1, Vessels).

3.5.3.3.1.1 No Action Alternative, Alternative 1, and Alternative 2

<u>Training Activities</u>

As indicated in Section 3.0.5.3.3.1 (Vessels), the majority of the training activities under all alternatives involve vessels. See Table 3.0-19 for a representative list of Navy vessel sizes and speeds. These activities could be widely dispersed throughout the Study Area, but would be more concentrated near naval ports, piers, and range areas. There is no seasonal differentiation in Navy vessel use. Large vessel movement primarily occurs within the U.S. Exclusive Economic Zone. Vessel strikes are more likely in nearshore areas than in the open ocean portions of the Study Area because of the concentration of vessel movements in those areas. Any of the sea turtle species found in the Study Area can occur at or near the surface in open-ocean and coastal areas, whether feeding or periodically surfacing to breathe. These species are distributed widely in all offshore portions of the Study Area. Given the concentration of Navy vessel movements near naval ports, piers and range areas, this training activity could overlap with sea turtles occupying these waters.

Under the No Action Alternative, Alternative 1, and Alternative 2, exposure to vessels used in training activities may cause short-term disturbance to an individual turtle; however, these short-term disturbances may cause injury or mortality due to strikes. As demonstrated by scars on all species of sea turtles, they are not always able to avoid being struck; therefore, vessel strikes are a potential cause of mortality for these species. Although the likelihood of being struck is minimal, sea turtles that overlap with Navy exercises are more likely to encounter vessels. This overlap is expected to be infrequent and rare, with the highest risk to transient turtles entering San Diego Bay during warm months of the year. Exposure to vessels may change an individual's behavior, growth, survival, annual reproductive success, or lifetime reproductive success (fitness). Exposure to vessels is not expected to result in population-level impacts. The stressor does not overlap with any designated sea turtle critical habitat.

Pursuant to the ESA, the use of vessels during training activities as described in the No Action Alternative, Alternative 1, and Alternative 2 may affect, and is likely to adversely affect, green, hawksbill, olive ridley, leatherback or loggerhead turtles.

Testing Activities

As indicated in Section 3.0.5.3.3.1 (Vessels), most testing activities involve the use of vessels. However, the number of vessels used for testing activities is comparatively lower than the number of vessels used for training (less than 10 percent). In addition, testing often occurs jointly with training, so the testing activity would probably occur on a training vessel. Vessel movement in conjunction with testing activities could be widely dispersed throughout the Study Area, but would be concentrated near naval ports, piers, and range complexes. The likelihood of vessel strikes would be higher in the nearshore portions of the Study Area because of the concentration of vessel movement in those areas.

Propulsion testing activities, also referred to as high-speed vessel trials, occur infrequently, but pose a higher strike risk because of the high-speeds at which the vessels need to transit to complete the testing activity. However, just a few of these activities are proposed per year, so the increased risk is nominal compared to all vessel use in the Proposed Action. Any of the sea turtle species found in the Study Area can occur at or near the surface in open-ocean and coastal areas, whether feeding or periodically surfacing to breathe. These species are distributed widely in all offshore portions of the Study Area.

Under the No Action Alternative, Alternative 1 and Alternative 2, exposure to vessels used in testing activities may cause short-term disturbance to an individual turtle; however, these short-term disturbances may cause injury or mortality due to strikes. As demonstrated by scars on all species of sea turtles, they are not always able to avoid being struck; therefore, vessel strikes are a potential cause of mortality for these species. Although the likelihood of being struck is minimal, sea turtles that overlap with Navy exercises are more likely to encounter vessels. Exposure to vessels may change an individual's behavior, growth, survival, annual reproductive success, or lifetime reproductive success (fitness). Exposure to vessels is not expected to have population-level impacts. The stressor would not overlap with any designated sea turtle critical habitat.

Pursuant to the ESA, the use of vessels during testing activities as described in the No Action Alternative, Alternative 1, and Alternative 2 may affect, and is likely to adversely affect, green, hawksbill, olive ridley, leatherback and loggerhead turtles.

3.5.3.3.2 Impacts from In-Water Devices

In-water devices are generally smaller (several inches to 111 ft. [34 m]) than most Navy vessels. For a discussion of the types of activities that use in-water devices, where they are used, and how many activities would occur under each alternative, see Section 3.0.5.3.3.2 (In-Water Devices). See Table 3.0-31 for the types, sizes, and speeds of Navy in-water devices used in the Study Area.

Devices that pose the greatest collision risk to sea turtles are those that are towed or operated at high speeds and include: remotely operated high-speed targets and mine warfare systems. Devices that move slowly through the water column have a very limited potential to strike a sea turtle because sea turtles in the water could avoid a slow-moving object.

3.5.3.3.2.1 No Action Alternative, Alternative 1, and Alternative 2

Training Activities

Use of in-water devices is concentrated within the SOCAL Range Complex. The number of in-water device activities increases by less than 2 percent under Alternative 1 and Alternative 2 compared to the No Action Alternative. Any of the sea turtle species found in the Study Area can occur at or near the surface in open-ocean and coastal areas, whether feeding or periodically surfacing to breathe. These species are distributed widely in all offshore portions of the Study Area.

Under the No Action Alternative, Alternative 1, and Alternative 2, exposure to in-water devices used in training activities may cause short-term disturbance to an individual turtle; however, these short-term disturbances may cause injury or mortality due to strikes. These devices move slowly through the water column and have a very limited potential to strike a sea turtle because sea turtles in the water could avoid a slow moving object. Exposure to in-water devices may change an individual’s behavior, growth, survival, annual reproductive success, or lifetime reproductive success (fitness). Exposure to vessels is not expected to result in population-level impacts.

Pursuant to the ESA, the use of in-water devices during training activities as described in the No Action Alternative, Alternative 1, and Alternative 2 may affect, but is not likely to adversely affect, green, hawksbill, olive ridley, leatherback, and loggerhead turtles.

Testing Activities

Under the No Action Alternative, Alternative 1, and Alternative 2, exposure to in-water devices used in testing activities may cause short-term disturbance to an individual turtle; however, these short-term disturbances may cause injury or mortality due to strikes. These devices move slowly through the water column and have a very limited potential to strike a sea turtle because sea turtles in the water could avoid a slow moving object. Exposure to in-water devices may affect an individual’s behavior, growth, survival, annual reproductive success, or lifetime reproductive success (fitness). Exposure to vessels is not expected to result in population-level impacts. The stressor would not overlap with any designated sea turtle critical habitat.

Pursuant to the ESA, the use of in-water devices during testing activities as described in the No Action Alternative, Alternative 1, and Alternative 2 may affect, but is not likely to adversely affect, green, hawksbill, olive ridley, leatherback, and loggerhead turtles.

3.5.3.3.3 Impacts from Military Expended Materials

This section analyzes the strike potential to sea turtles from the following categories of military expended materials: (1) non-explosive practice munitions, (2) fragments from high-explosive munitions and (3) expended materials other than ordnance, such as sonobuoys, vessel hulks, and expendable targets. For a discussion of the types of activities that use military expended materials, where they are used, and how many activities would occur under each alternative, see Section 3.0.5.3.3.3 (Military Expended Materials Strikes).

While disturbance or strike from an item as it falls through the water column is possible, it is not likely because the objects generally sink through the water slowly and can be avoided by most sea turtles. Therefore, the discussion of military expended materials strikes will focus on the potential of a strike at the surface of the water.

There is a possibility that an individual turtle at or near the surface may be struck if they are in the target area at the point of physical impact at the time of non explosive ordnance delivery. Expended munitions may strike the water surface with sufficient force to cause injury or mortality. While any species of sea turtle may move through the open ocean, most sea turtles will only surface occasionally. Sea turtles are generally at the surface for short periods, and spend most of their time submerged (Renaud and Carpenter 1994; Sasso and Witzell 2006). The leatherback turtle is more likely to be foraging at or near the surface in the open ocean than other species, but the likelihood of being struck by a projectile remains very low. Furthermore, projectiles are aimed at targets, which will absorb the impact of the projectile. The probability of a strike is further reduced by Navy mitigation measures and standard operating procedures to avoid sea turtles (see Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring).

3.5.3.3.3.1 No Action Alternative, Alternative 1, and Alternative 2

Training Activities

Tables 3.0-63 and 3.0-64 list the number and location of military expended materials, most of which are small- and medium-caliber projectiles. Activities using military expended materials are concentrated within the SOCAL Range Complex. Any of the sea turtle species found in the Study Area can occur at or near the surface in open-ocean and coastal areas, whether feeding or periodically surfacing to breathe. These species are distributed widely in all offshore portions of the Study Area.

Under the No Action Alternative, Alternative 1, and Alternative 2, exposures to military-expended materials used in training activities may cause short-term disturbance to an individual turtle; however, these short-term disturbances may cause injury or mortality due to strikes. Sea turtles are generally at the surface only for short periods and spend most of their time submerged, so the likelihood of being struck by a projectile is very low. Projectiles are aimed at targets, which will absorb the impact of the projectile. Exposure to military-expended materials may change an individual's behavior, growth, survival, annual reproductive success, or lifetime reproductive success (fitness). Exposure to military-expended materials is not expected to result in population-level impacts.

Pursuant to the ESA, the use military expended materials during training activities as described in the No Action Alternative, Alternative 1, and Alternative 2 may affect, but is not likely to adversely affect, green, hawksbill, olive ridley, leatherback, and loggerhead turtles.

Testing Activities

Tables 3.0-63 and 3.0-64 list the number and location of military expended materials, most of which are small- and medium-caliber projectiles. Any of the sea turtle species found in the Study Area can occur at or near the surface in open-ocean and coastal areas, whether feeding or periodically surfacing to breathe. These species are distributed widely in all offshore portions of the Study Area.

Under the No Action Alternative, Alternative 1, and Alternative 2, exposures to military-expended materials used in testing activities may cause short-term disturbance to an individual turtle; however, these short-term disturbances may cause injury or mortality due to strikes. Sea turtles are generally at the surface only for short periods and spend most of their time submerged, so the likelihood of being struck by a projectile is very low. Projectiles are aimed at targets, which will absorb the impact of the projectile. The model results indicate a high level of certainty that sea turtles would not be struck by military expended materials during testing activities. Exposure to military-expended materials could change an individual's behavior, growth, survival, annual reproductive success, or lifetime reproductive success (fitness). Exposure to military-expended materials is not expected to result in population-level impacts.

Pursuant to the ESA, the use military expended materials during testing activities as described in the No Action Alternative, Alternative 1, and Alternative 2 may affect, but is not likely to adversely affect, green, hawksbill, olive ridley, leatherback, and loggerhead turtles.

3.5.3.3.4 Impacts from Seafloor Devices

For a discussion of the types of activities that use seafloor devices, where they are used, and how many activities would occur under each alternative, see Section 3.0.5.3.3.4 (Seafloor Devices). These include items that are placed on, dropped on, or moved along the seafloor such as mine shapes, anchor blocks, anchors, bottom-placed instruments, bottom-crawling unmanned undersea vehicles, and bottom-placed targets that are recovered (not expended). As discussed in the Section 3.5.3.3 (Physical Disturbance and Strike Stressors), objects falling through the water column will slow in velocity as they sink toward the bottom and could be avoided by most sea turtles.

3.5.3.3.4.1 No Action Alternative

Training Activities

Tables 3.0-66 and 3.0-67 list the number and location where seafloor devices are used. Any of the sea turtle species found in the Study Area can occur at or near the surface in open-ocean and coastal areas, whether feeding or periodically surfacing to breathe. These species are distributed widely in all offshore portions of the Study Area.

Under the No Action Alternative, exposure to seafloor devices used in training activities may cause short-term disturbance to an individual turtle; however, these short-term disturbances may cause injury or mortality due to strikes. Objects falling through the water column will slow in velocity as they sink toward the bottom and could be avoided by most sea turtles. Further, the potential for a sea turtle to be close to a seafloor device, and therefore be exposed, is very low, because of the relative position of sea turtles within the water column and the wide distribution of habitats. Exposure to seafloor devices is not expected to change an individual's behavior, growth, survival, annual reproductive success, or lifetime reproductive success (fitness). Exposure to seafloor devices is not expected to result in population-level impacts.

Pursuant to the ESA, the use of seafloor devices during training activities as described under the No Action Alternative may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Tables 3.0-66 and 3.0-67 list the number and location where seafloor devices are used. Any of the sea turtle species found in the Study Area can occur at or near the surface in open-ocean and coastal areas, whether feeding or periodically surfacing to breathe. These species are distributed widely in all offshore portions of the Study Area.

Under the No Action Alternative, exposure to seafloor devices used in testing activities may cause short-term disturbance to an individual turtle or, if struck, could lead to injury or death. Objects falling through the water column will slow in velocity as they sink toward the bottom and could be avoided by most sea turtles. Furthermore, the potential for a sea turtle to be close to a seafloor device, and therefore to be exposed, is very low, because of the relative position of sea turtles within the water column and the wide distribution of habitats. Exposure to seafloor devices is not expected to change an individual's behavior, growth, survival, annual reproductive success, or lifetime reproductive success (fitness). Exposure to seafloor devices is not expected to result in population-level impacts.

Pursuant to the ESA, the use of seafloor devices during testing activities as described under the No Action Alternative may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.3.4.2 Alternative 1

Training Activities

Tables 3.0-66 and 3.0-67 list the number and location where seafloor devices are used. As indicated in Section 3.0.5.3.3.4 (Seafloor Devices), under Alternative 1, the number of activities using seafloor devices is more than twice that of the No Action Alternative. Any of the sea turtle species found in the Study Area can occur at or near the surface in open-ocean and coastal areas, whether feeding or periodically surfacing to breathe. These species are distributed widely in all offshore portions of the Study Area.

Under Alternative 1, exposure to seafloor devices used in training activities may cause short-term disturbance to an individual turtle; however, these short-term disturbances may cause injury or mortality due to strikes. Objects falling through the water column will slow in velocity as they sink toward the bottom and could be avoided by most sea turtles. Furthermore, the potential for a sea turtle to be close to a seafloor device, and therefore to be exposed, is very low, because of the relative position of sea turtles within the water column and the wide distribution of habitats. Exposure to seafloor devices is not expected to change an individual's behavior, growth, survival, annual reproductive success, or lifetime reproductive success (fitness). Exposure to seafloor devices is not expected to result in population-level impacts.

Pursuant to the ESA, the use of seafloor devices during training activities as described under Alternative 1 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Tables 3.0-66 and 3.0-67 list the number and location where seafloor devices are used. As indicated in Section 3.0.5.3.3.4 (Seafloor Devices), under Alternative 1, the number of activities using seafloor devices is approximately twice that of the No Action Alternative. The activities using seafloor devices under Alternative 1 would be expended in the same geographic locations as the No Action Alternative. Any of the sea turtle species found in the Study Area can occur at or near the surface in open-ocean and coastal areas, whether feeding or periodically surfacing to breathe. These species are distributed widely in all offshore portions of the Study Area.

Under Alternative 1, exposure to seafloor devices used in testing activities may cause short-term disturbance to an individual turtle or, if struck, could lead to injury or death. Objects falling through the water column will slow in velocity as they sink toward the bottom and could be avoided by most sea turtles. Furthermore, the potential for a sea turtle to be close to a seafloor device, and therefore to be exposed, is very low, because of the relative position of sea turtles within the water column and the wide distribution of habitats. Exposure to seafloor devices is not expected to change an individual's behavior, growth, survival, annual reproductive success, or lifetime reproductive success (fitness). Exposure to seafloor devices is not expected to result in population-level impacts.

Pursuant to the ESA, the use of seafloor devices during testing activities as described under Alternative 1 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.3.4.3 Alternative 2

Training Activities

The number and location of training activities under Alternative 2 are identical to those of the training activities under Alternative 1. Therefore, impacts and comparisons to the No Action Alternative would also be identical, as described in Section 3.5.3.3.4.2 (Alternative 1).

Pursuant to the ESA, the use seafloor devices used in training activities as described under Alternative 2 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Tables 3.0-66 and 3.0-67 list the number and location where seafloor devices are used. As indicated in Section 3.0.5.3.3.4 (Seafloor Devices), under Alternative 2, the number of activities using seafloor devices is approximately twice that of the No Action Alternative and Alternative 1. Any of the sea turtle species found in the Study Area can occur at or near the surface in open-ocean and coastal areas, whether feeding or periodically surfacing to breathe. These species are distributed widely in all offshore portions of the Study Area.

Pursuant to the ESA, the use of seafloor devices during testing activities as described under Alternative 2 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.4 Entanglement Stressors

This section analyzes the potential entanglement impacts of the various types of expended materials used by the Navy during training and testing activities within the Study Area. This analysis includes the potential impacts of two types of military expended materials, including: (1) fiber optic cables and guidance wires, and (2) parachutes. Aspects of entanglement stressors that are applicable to marine organisms in general are presented in Section 3.0.5.7.4 (Conceptual Framework for Assessing Effects from Entanglement).

3.5.3.4.1 Impacts from Fiber Optic Cables and Guidance Wires

Fiber optic cables and guidance wires are used in several different training and testing activities. For a list of Navy activities that involve the use of fiber optic cables and wires, refer to Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires).. A sea turtle that becomes entangled in nets, lines, ropes, or other foreign objects under water may suffer only a temporary hindrance to movement before it frees itself. The turtle may suffer minor injuries but recover fully, or it may die as a result of the entanglement. Because of the physical characteristics of guidance wires and fiber optic cables, detailed in Section 3.0.5.3.4 (Entanglement Stressors), these items pose a potential, although unlikely, entanglement risk to sea turtles. The Navy analyzed the potential for entanglement of sea turtles by guidance wires and concluded that the potential for entanglement is low (U.S. Department of the Navy 1996). Except for a chance encounter with the guidance wire at the surface or in the water column while the cable or wire is sinking to the seafloor, a sea turtle would be vulnerable to entanglement only if its diving and feeding patterns place it in direct contact with the bottom. Bottom-feeding sea turtles tend to forage in nearshore areas, and these guidance wires are expended in deeper waters.

The likelihood of a sea turtle encountering and becoming entangled in a fiber-optic cable or guidance wire depends on several factors. The length of time that the fiber-optic cable or guidance wire is near a sea turtle can affect the likelihood of it posing an entanglement risk. Because these items would only be in the water column during the activity and while it sinks, the likelihood of a sea turtle encountering a fiber optic cable in the water column and becoming entangled is extremely low. Guidance wires sink to the sea floor at a rate of 0.7 ft. (0.2 m) per second; therefore, it is most likely that a sea turtle would encounter a guidance wire once it had settled to the sea floor. The length of the cable or wire may influence the potential for a sea turtle to encounter or become entangled in these items. The lengths of fiber-optic cables and guidance wires vary. Fiber-optic cables can range in size up to about 900 ft. (300 m). Greater lengths of these items may increase the likelihood that a sea turtle could become entangled. The behavior and feeding strategy of a species can also determine whether they may encounter items on the seafloor, where fiber-optic cables and guidance wires will most likely be available. There is a potential for those species that feed on the seafloor to encounter these items and become entangled; however, the relatively few fiber-optic cables and guidance wires being expended within the Study Area limits the potential for encounters. Lastly, the properties of the items themselves may limit the risk of entanglement. The physical characteristics of guidance wires and fiber-optic cables are detailed in Section 3.0.5.3.4 (Entanglement Stressors). This analysis indicates that these items pose a potential, although unlikely, entanglement risk to sea turtles. For instance, the physical characteristics of the fiber-optic material render the cable brittle and easily broken when kinked, twisted, or bent sharply (i.e., to a radius greater than 360 degrees). Thus, the fiber-optic cable would not loop, greatly reducing or eliminating any potential issues of entanglement with regard to marine life. In addition, based on degradation times, the guidance wires would break down within 1 to 2 years and therefore no longer pose an entanglement risk.

The Navy previously analyzed the potential for entanglement of sea turtles by guidance wires and concluded that the potential for entanglement is low (U.S. Department of the Navy 1996). Except for a chance encounter with the guidance wire at the surface or in the water column while the cable or wire is sinking to the seafloor, a sea turtle would be vulnerable to entanglement only if its diving and feeding patterns place it in direct contact with the bottom. Bottom-feeding sea turtles tend to forage in nearshore areas, and these wires are expended in deeper waters.

3.5.3.4.1.1 No Action Alternative

Training Activities

Tables 3.0-78 and 3.0-81 list the number and locations of activities that expend fiber optic cables and guidance wires. As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), under the No Action Alternative, no Airborne mine neutralization activities (with High Explosives neutralizers) expend fiber optic cables.

Any species of sea turtle that occurs in the Study Area could at some point encounter expended fiber optic cables and guidance wires. The sink rates of cables and wires would rule out the possibility of them drifting great distances into nearshore and coastal areas where green, hawksbill, olive ridley, and loggerhead turtles are more likely to occur and feed on the bottom. The leatherback is more likely to co-occur with these activities, given its preference for open ocean habitats, but this species is known to forage on jellyfish at or near the surface.

Under the No Action Alternative, exposure to cables and wires used in training activities may cause short-term or long-term disturbance to an individual turtle because if a sea turtle were to become entangled in a cable or wire, it could free itself or it could lead to injury or death. Exposure to cable or wire may change an individual's behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment. However, cables and wires are generally not expected to cause disturbance to sea turtles because: (1) the number of cables and wires expended is relatively low, decreasing the likelihood of encounter; (2) the physical characteristics of the cables and wires; and (3) the behavior of the species, as sea turtles are unlikely to become entangled in an object that is resting on the seafloor. Exposure to cables and wires is not expected to result in population-level impacts.

Pursuant to the ESA, the use of fiber optic cables and guidance wires during training activities as proposed under the No Action Alternative may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Tables 3.0-78 and 3.0-81 list the number and locations of activities that expend fiber optic cables and guidance wires. As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), under the No Action Alternative, Airborne mine neutralization activities (with High Explosives neutralizers) would expend fiber optic cables and guidance wires in SOCAL and HRC.

Sea turtle species in the Study Area could at some point encounter expended fiber optic cables and guidance wires. The sink rates of cables and wires rule out the possibility of them drifting great distances into nearshore and coastal areas where green, hawksbill, olive ridley, and loggerhead turtles are more likely to occur and feed on the bottom. The leatherback is more likely to co-occur with these activities, given its preference for open ocean habitats, but this species is known to forage on jellyfish at or near the surface.

Under the No Action Alternative, exposure to cables and wires used in testing activities may cause short-term or long-term disturbance to an individual turtle because if a sea turtle were to become entangled in a cable or wire, it could free itself or it could lead to injury or death. Exposure to munitions may change an individual's behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment. However, cables and wires are generally not expected to cause disturbance to sea turtles because: (1) the number of cables and wires expended is relatively low, decreasing the likelihood of encounter; (2) the physical characteristics of the cables and wires; and (3) the behavior of the species, as sea turtles are unlikely to become entangled in an object that is resting on the seafloor. Exposure to cables and wires is not expected to result in population-level impacts.

Pursuant to the ESA, the use of fiber optic cables and guidance wires during testing activities as proposed under the No Action Alternative may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.4.1.2 Alternative 1

Training Activities

Tables 3.0-78 and 3.0-81 list the number and locations of activities that expend fiber optic cables and guidance wires. As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), under Alternative 1, the number of activities that expend fiber optic cables is more than two-times higher than that of the No Action Alternative.

As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), under Alternative 1, the number of torpedo activities that expend guidance wire is approximately two-times higher than that of the No Action Alternative. The torpedo activities using guidance wire under Alternative 1 would occur in the same geographic locations as the No Action Alternative.

Species of sea turtles that occur in the Study Area could encounter expended fiber-optic cables and guidance wires. The sink rates of cables and wires rule out the possibility of them drifting great distances into nearshore and coastal areas where green, hawksbill, olive ridley, and loggerhead turtles are more likely to occur and to feed on the bottom. The leatherback is more likely to co-occur with these activities, given its preference for open ocean habitats, but this species is known to forage on jellyfish at or near the surface.

In comparison to the No Action Alternative, the increase in activities presented in Alternative 1 may increase the risk of exposing sea turtles to cables and wires. However, the expected impact on any exposed sea turtle remains the same. For the same reasons as stated in Section 3.5.3.4.1.1 (No Action Alternative), the use of cables and wires in training activities may cause short-term or long-term disturbance to an individual turtle, because if a sea turtle were to become entangled in a cable or wire, it could free itself or it could lead to injury or death. Exposure to cable or wire may change an individual's behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment. Exposure to cables and wires is not expected to result in population-level impacts.

Pursuant to the ESA, the use of fiber optic cables and guidance wires during training activities as proposed under Alternative 1 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Tables 3.0-78 and 3.0-81 list the number and locations of activities that expend fiber optic cables and guidance wires. As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), under Alternative 1, the number of Airborne mine neutralization activities (with High Explosive neutralizers) that expend fiber optic cables is almost two times higher than that of the No Action Alternative. The activities using fiber optic cables and guidance wires under Alternative 1 would occur in the same geographic locations as the No Action Alternative.

Any species of sea turtle that occurs in the Study Area could encounter expended fiber-optic cables and guidance wires. The sink rates of cables and wires rule out the possibility of them drifting great distances into nearshore and coastal areas where green, hawksbill, olive ridley, and loggerhead turtles are more likely to occur and to feed on the bottom. The leatherback is more likely to co-occur with these activities, given its preference for open ocean habitats, but this species is known to forage on jellyfish at or near the surface.

In comparison to the No Action Alternative, the increase in activities presented in Alternative 1 may increase the risk of sea turtles being exposed to cables and wires; however, the expected impact to any exposed sea turtle remains the same. For the same reasons as stated in Section 3.5.3.4.1.1 (No Action Alternative), the use of cables and wires in testing activities may cause short-term or long-term disturbance to an individual turtle, because if a sea turtle were to become entangled in a cable or wire, it could free itself or it could lead to injury or death. Exposure to cable or wire may change an individual's behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment. Exposure to cables and wires is not expected to result in population-level impacts.

Pursuant to the ESA, the use of fiber optic cables and guidance wires during testing activities as proposed under Alternative 1 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.4.1.3 Alternative 2

Training Activities

Activities proposed under Alternative 2 are the same as those proposed under Alternative 1. Therefore, the impact conclusion for Alternative 2 training events is the same as for Alternative 1.

The entanglement of sea turtles by fiber optic cables is considered to be highly unlikely. If a sea turtle became entangled in a cable, however, the sea turtle could suffer a temporary or permanent impairment of normal activities. Impairment of some activities (e.g., foraging) could indirectly result in mortality while impairment of other activities (e.g., migration) could affect reproduction.

Pursuant to the ESA, the use of fiber optic cables and guidance wires during training activities as proposed under Alternative 2 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Tables 3.0-78 and 3.0-81 list the number and locations of activities that expend fiber optic cables and guidance wires. As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), under Alternative 2, the number of Airborne mine neutralization activities (with High Explosive neutralizers) that expend fiber optic cables is nearly two-times higher than that of the No Action Alternative, and is approximately 10 percent higher than under Alternative 1. The activities using fiber optic cables under Alternative 2 would occur in the same geographic locations as the No Action Alternative.

As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), under Alternative 2, the number of torpedo activities that expend guidance wire is nearly four-times that of the No Action Alternative. The torpedo activities using guidance wire under Alternative 2 would occur in the same geographic locations as the No Action Alternative.

Any species of sea turtle that occurs in the Study Area could encounter expended fiber optic cables and guidance wires. The sink rates of cables and wires rule out the possibility of them drifting great distances into nearshore and coastal areas where green, hawksbill, olive ridley, and loggerhead turtles are more likely to occur and to feed on the bottom. The leatherback is more likely to co-occur with these activities, given its preference for open ocean habitats, but this species is known to forage on jellyfish at or near the surface.

In comparison to the No Action Alternative and Alternative 1, the increase in activities presented in Alternative 2 may increase the risk of sea turtles being exposed to cables and wires; however, the expected impact to any exposed sea turtle remains the same. For the same reasons as stated in Section 3.5.3.4.1.1 (No Action Alternative), the use of cables and wires in testing activities may cause short-term or long-term disturbance to an individual turtle, because if a sea turtle were to become entangled in a cable or wire, it could free itself or it could lead to injury or death. Exposure to cable or wire may change an individual's behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment. Exposure to cables and wires is not expected to result in population-level impacts.

Pursuant to the ESA, the use of fiber-optic cables and guidance wires during testing activities as proposed under Alternative 2 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.4.2 Impacts from Parachutes

Sonobuoys, lightweight torpedoes, targets, and other devices deployed by aircraft use nylon parachutes of various sizes. For example, a typical sonobuoy parachute is about 8 ft. (2.4 m) in diameter, with nylon suspension lines about 20 ft. (6 m) long. These parachutes are not typically recovered after the activity (Appendix A). Once a sonobuoy hits the water surface, its parachute is designed to produce drag at the surface for 5 to 15 seconds, allowing for deployment of the sonobuoy, then the parachute separates and sinks. The parachute assembly contains metallic components, and could be at the surface for a short period before sinking to the seafloor. Sonobuoy parachutes are designed to sink within 15 minutes, but the rate of sinking depends upon sea conditions and the shape of the parachute, and the duration of the descent would depend on the water depth. Prior to reaching the seafloor, it could be carried along in a current, or snagged on a hard structure near the bottom. Conversely, it could settle to the bottom, where it would be buried by sediment in most softbottom areas. Parachutes or parachute lines may be a risk for sea turtles to become entangled, particularly while at the surface. A sea turtle would have to surface to breathe or grab prey from under the parachute, and swim into the parachute or its lines.

While in the water column, a sea turtle is less likely to become entangled because the parachute would have to land directly on the turtle, or the turtle would have to swim into the parachute before it sank. If the parachute and its lines sink to the seafloor in an area where the bottom is calm, it would remain there undisturbed. Over time, it may become covered by sediment in most areas or colonized by attaching and encrusting organisms, which would further stabilize the material and reduce the potential for reintroduction as an entanglement risk.

If bottom currents are present, the canopy may billow and pose an entanglement threat to sea turtles that feed in benthic habitats (e.g., loggerhead sea turtles). Bottom-feeding sea turtles tend to forage in nearshore areas rather than offshore, where these parachutes are used; therefore, sea turtles are not likely to encounter parachutes once they reach the seafloor. The potential for a sea turtle to encounter an expended parachute at the surface or in the water column is extremely low, and is even less probable at the seafloor, given the general improbability of a sea turtle being near the deployed parachute, as well as the general behavior of sea turtles.

3.5.3.4.2.1 No Action Alternative

Training Activities

Under the No Action Alternative, activities that involve air-dropped sonobuoys, torpedoes, or targets (and therefore the expending of unrecoverable parachutes) include tracking and torpedo exercises involving helicopter platforms and fixed-wing aircraft. As detailed in Table 3.0-84, under the No Action Alternative, up to 44,500 parachutes would be expended in the Study Area during training activities.

The entanglement of sea turtles in parachute assemblies is considered to be highly unlikely. If a sea turtle became entangled in a parachute assembly, however, the sea turtle may suffer a temporary or permanent impairment of normal activities. Impairment of some activities (e.g., foraging) may indirectly result in mortality while impairment of other activities (e.g., migration) may impair reproduction.

Pursuant to the ESA, the use of parachutes during training activities as proposed under the No Action Alternative may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

As detailed in Table 3.0-84, under the No Action Alternative, up to 7,230 parachutes would be expended in the Study Area during testing activities.

As stated above, the entanglement of sea turtles in parachute assemblies is considered to be highly unlikely. If a sea turtle became entangled in a parachute assembly, however, the sea turtle could suffer a temporary or permanent impairment of normal activities. Impairment of some activities (e.g., foraging) could indirectly result in mortality while impairment of other activities (e.g., migration) could impair reproduction.

Pursuant to the ESA, the use of parachutes during testing activities as proposed under the No Action Alternative may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.4.2.2 Alternative 1

Training Activities

Under Alternative 1, 54,200 parachutes would be expended in the Study Area during training activities. This represents an approximate 20 percent increase under Alternative 1, relative to the No Action Alternative.

The increase in expended parachutes would increase the risk of entangling sea turtles. These exercises are widely dispersed in open ocean habitats, however, where sea turtles are lower in abundance than in nearshore habitats. Furthermore, entanglement of a sea turtle in a parachute assembly is unlikely because the parachute would have to land directly on a sea turtle, or a sea turtle would have to swim into it before it settles to the ocean floor, or the sea turtle would have to encounter the parachute on the ocean floor. The potential for sea turtles to encounter an expended parachute assembly is extremely low, given the generally low probability of a sea turtle being at the exact point where the parachute lands, and the negative buoyancy of parachute constituents (reducing the probability of contact with sea turtles near the surface). If bottom currents are present, the canopy could billow and pose an entanglement threat to bottom-feeding sea turtles. However, the probability of a sea turtle encountering a parachute assembly on the sea floor and the potential for accidental entanglement in the canopy or suspension lines are both considered low.

The entanglement of sea turtles in parachute assemblies is considered to be highly unlikely. If a sea turtle became entangled in a parachute assembly, however, the sea turtle would suffer a temporary or permanent impairment of normal activities. Impairment of some activities (e.g., foraging) could indirectly result in mortality while impairment of other activities (e.g., migration) could impair reproduction.

Pursuant to the ESA, the use of parachutes during training activities as proposed under Alternative 1 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Under Alternative 1, up to 12,578 parachutes would be expended in the Study Area during testing activities. This represents nearly a 54 percent increase in the use of parachutes under Alternative 1 testing activities, relative to the No Action Alternative.

The increase in expended parachutes would increase the risk of entangling sea turtles. These exercises are widely dispersed in open ocean habitats, however, where sea turtles are lower in abundance than in nearshore habitats. Furthermore, entanglement of a sea turtle in a parachute assembly is unlikely because the parachute would have to land directly on a sea turtle, or a sea turtle would have to swim into it before it settles to the ocean floor, or the sea turtle would have to encounter the parachute on the ocean floor. The potential for sea turtles to encounter an expended parachute assembly is extremely low, given the generally low probability of a sea turtle being at the exact point where the parachute lands, and the negative buoyancy of parachute constituents (reducing the probability of contact with sea turtles near the surface). If bottom currents are present, the canopy could billow and pose an entanglement threat to bottom-feeding sea turtles. However, the probability of a sea turtle encountering a parachute assembly on the sea floor and the potential for accidental entanglement in the canopy or suspension lines are both considered low.

The entanglement of sea turtles in parachute assemblies is considered to be highly unlikely. If a sea turtle became entangled in a parachute assembly, however, the sea turtle would suffer a temporary or permanent impairment of normal activities. Impairment of some activities (e.g., foraging) could indirectly result in mortality while impairment of other activities (e.g., migration) could impair reproduction.

Pursuant to the ESA, the use of parachutes during testing activities as proposed under Alternative 1 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.4.2.3 Alternative 2

Training Activities

Alternative 2 training events would use the same number of parachutes as are proposed under Alternative 1, therefore, the conclusions for parachute use under Alternative 2 are the same as under Alternative 1.

The entanglement of sea turtles in parachute assemblies is considered to be highly unlikely. If a sea turtle became entangled in a parachute assembly, however, the sea turtle would suffer a temporary or permanent impairment of normal activities. Impairment of some activities (e.g., foraging) could indirectly result in mortality while impairment of other activities (e.g., migration) could impair reproduction.

Pursuant to the ESA, the use of parachutes during training activities as proposed under Alternative 2 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

Testing Activities

Under Alternative 2, up to 13,776 parachutes would be expended in the Study Area during testing activities. This represents a 62 percent increase in the use of parachutes under Alternative 2 testing activities, relative to the No Action Alternative.

The entanglement of sea turtles in parachute assemblies is considered to be highly unlikely. If a sea turtle became entangled in a parachute assembly, however, the sea turtle may suffer a temporary or permanent impairment of normal activities. Impairment of some activities (e.g., foraging) may indirectly result in mortality while impairment of other activities (e.g., migration) may impair reproduction.

Pursuant to the ESA, the use of parachutes during testing activities as proposed under Alternative 2 may affect, but is not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.3.5 Ingestion Stressors

This section analyzes the potential ingestion impacts of expended materials used by the Navy during training and testing activities within the Study Area. This analysis includes two categories of military expended materials: (1) munitions (both non-explosive practice munitions and fragments from high-explosive munitions), which are expected to sink to the seafloor; and (2) military expended materials other than munitions (including fragments from targets, chaff, flares, and parachutes), which may remain at the surface or in the water column for some time prior to sinking. Sea turtles could ingest expended materials in all Large Marine Ecosystems and Open Ocean Areas, and can ingest items at the surface, in the water column, or at the seafloor, depending on the size and buoyancy of the expended object and the feeding behavior of the turtle. Floating material could be eaten by turtles such as leatherbacks that feed at or near the water surface, while materials that sink to the seafloor pose a risk to bottom-feeding turtles such as loggerheads (see Sections 3.5.2.4 through 3.5.2.8 for descriptions of feeding behavior by species).

Leatherbacks feed primarily on jellyfish throughout the water column, and may mistake floating debris for prey. Items found in a sample of leatherbacks that had ingested plastic included plastic bags, fishing line, twine, mylar balloon fragments, and a plastic spoon (Mrosovsky et al. 2009). Kemp's ridleys, loggerheads, and green sea turtles in coastal Florida were found to ingest bits of plastic, tar, rubber, and aluminum foil (Bjorndal et al. 1994). Oceanic-stage loggerhead turtles in the North Atlantic Ocean were found to ingest "small pieces of hard plastic," corks, and white Styrofoam pieces (Frick et al. 2009). Juvenile loggerheads in the Mediterranean ingested plastic most frequently, followed by tar, Styrofoam, wood, feathers, lines, and net fragments (Tomás et al. 2002). Similar trends in types of items ingested were observed in Kemp's ridley, loggerhead, and green sea turtles off the Texas coast (Stanley et al. 1988). Conditions for marine pollution in the Pacific are similar to conditions in the Atlantic, Mediterranean, and the Gulf of Mexico; therefore, sea turtle ingestion rates of non-prey items in the Pacific is expected to be similar to other sea turtle habitats. The variety of items ingested by turtles suggests that feeding is nondiscriminatory, and they are prone to ingesting nonprey items. Ingestion of these items may not be directly lethal; however, ingestion of plastic and other fragments can restrict food intake and have sub-lethal impacts by reducing nutrient intake (McCauley and Bjorndal 1999). Poor nutrient uptake can lead to decreased growth rates, depleted energy, reduced reproduction, and decreased survivorship. These long-term sublethal effects may lead to population level impacts, but this is difficult to assess because the affected individuals remain at sea and the trends may only arise after several generations have passed.

Because bottom-feeding occurs in nearshore areas, materials that sink to the seafloor in the open ocean are less likely to be ingested due to their location, as depth in areas where ordnance is fired ranges from approximately 20 to 200 m (65.6 to 656.2 ft.) in areas far offshore. The consequences of ingestion could range from temporary and inconsequential to long-term physical stress, or even death. Aspects of ingestion stressors that are applicable to marine organisms in general are presented in Section 3.0.5.7.5 (Conceptual Framework for Assessing Effects from Ingestion).

3.5.3.5.1 Impacts from Munitions

Types of non-explosive practice munitions generally include projectiles, missiles, and bombs. Of these items, only small- or medium-caliber projectiles would be small enough for a sea turtle to ingest. Small- and medium-caliber projectiles include all sizes up to and including 2.25 in. (57 millimeters [mm]) in diameter. These solid metal materials would quickly move through the water column and settle to the seafloor. Ingestion of non-explosive practice munitions is not expected to occur in the water column because the ordnance sinks quickly. Instead, they are most likely to be encountered by species that forage on the bottom. The types, numbers, and locations of activities using these devices under each alternative are discussed in Sections 3.0.5.3.5.1 (Non-explosive Practice Munitions) and 3.0.5.3.5.2 (Fragments from High-Explosive Munitions).

Because green, loggerhead, olive ridley, and hawksbill turtles feed along the seafloor, they are more likely to encounter munitions of ingestible size that settle on the bottom than leatherbacks that primarily feed at the surface. Furthermore, these four species typically use nearshore feeding areas, while leatherbacks are more likely to feed in the open ocean. Given the very low probability of a leatherback encountering and ingesting materials on the seafloor, this analysis will focus on green, loggerhead, olive ridley, and hawksbill turtles and ingestible materials expended nearshore, within range complexes and testing ranges.

3.5.3.5.1.1 No Action Alternative

Training Activities

Tables 3.0-63 and 3.0-64 list the number and location of small- and medium-caliber projectiles. As indicated in Section 3.0.5.3.5.1 (Non-explosive Practice Munitions), under the No Action Alternative, the areas with the greatest amount of small- and medium-caliber projectiles would occur SOCAL. For a discussion of the types of activities that use small- and medium-caliber projectiles, where they are used, and how many events will occur under each alternative, see Section 3.0.5.3.3.3 (Military Expended Materials Strikes). Any bottom-feeding sea turtle may occur in these range complexes.

Table 3.0-66 lists the number and location of activities that expend fragments of high-explosive ordnance and munitions (e.g., demolition charges, grenades, bombs, missiles, and rockets). As indicated in Section 3.0.5.3.5.2 (Fragments from High-Explosive Munitions), under the No Action Alternative, the areas with the greatest amounts of high-explosive ordnance and munitions would be open ocean portions of SOCAL. For a discussion of the types of activities that use high-explosive ordnance and munitions, where they are used, and how many events would occur under each alternative, see Section 3.0.5.3.3.3 (Military Expended Materials Strikes). Any bottom-feeding sea turtle may occur in these range complexes.

Sublethal effects from ingestion of munitions used in training activities may cause short-term or long-term disturbance to an individual turtle because: (1) if a sea turtle were to incidentally ingest and swallow a projectile or solid metal high-explosive fragment, it could disrupt its feeding behavior or digestive processes; and (2) if the item is particularly large in proportion to the turtle ingesting it, the projectile could become permanently encapsulated by the stomach lining, with a rare chance that this could impede the turtle's ability to feed or take in nutrients. Exposure to munitions may change an individual's behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment. However, munitions used in training activities are generally not expected to cause disturbance to sea turtles because: (1) sea turtles are not expected to encounter most small- and medium-caliber projectiles or high-explosive fragments on the seafloor because of the depth at which these would be expended; and (2) in some cases, a turtle would likely pass the projectile through their digestive tract and expel the item without impacting the individual. Exposure to munitions is not expected to result in population-level impacts.

Pursuant to the ESA, the use of munitions of ingestible size during training activities under the No Action Alternative would have no effect on leatherback sea turtles. The use of materials of ingestible size may affect, but is not likely to adversely affect, green, hawksbill, loggerhead, or olive ridley sea turtles.

Testing

Tables 3.0-63 and 3.0-64 list the number and location of small- and medium-caliber projectiles. For a discussion of the types of activities that use small- and medium-caliber projectiles, where they are used, and how many events would occur under each alternative, see Section 3.0.5.3.3.3 (Military Expended Materials Strikes). Any bottom-feeding turtle may occur in these range complexes, but the most likely are green, olive ridley, and loggerhead sea turtles.

Table 3.0-66 lists the number and location of activities that expend fragments of high-explosive ordnance and munitions (e.g., demolition charges, grenades, bombs, missiles, and rockets). The types of activities that use high-explosive ordnance and munitions, where they are used, and how many events would occur under each alternative are discussed in Section 3.0.5.3.3.3 (Military Expended Materials Strikes). Any bottom-feeding turtle may occur in these range complexes, but the most likely are green, olive ridley, and loggerhead sea turtles.

Sublethal effects from ingestion of munitions used in testing activities may cause short-term or long-term disturbance to an individual turtle because: (1) if a sea turtle were to incidentally ingest and swallow a projectile or solid metal high-explosive fragment, it could disrupt its feeding behavior or digestive processes; and (2) if the item is particularly large in proportion to the turtle ingesting it, the item could become permanently encapsulated by the stomach lining, with a rare chance that this could impede the turtle's ability to feed or take in nutrients. Exposure to munitions may change an individual's behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment. However, munitions used in training activities are generally not expected to cause disturbance to sea turtles because: (1) sea turtles are not expected to encounter most small- and medium-caliber projectiles or high-explosive fragments on the seafloor because of the depth at which these would be expended; and (2) in some cases a turtle would likely pass the projectile through their digestive tract and expel the item without impacting the individual. Exposure to munitions is not expected to result in population-level impacts.

Pursuant to the ESA, the use of munitions of ingestible size during testing activities under the No Action Alternative would have no effect on leatherback sea turtles. The use of materials of ingestible size may affect, but is not likely to adversely affect, green, hawksbill, loggerhead, or olive ridley sea turtles.

3.5.3.5.1.2 Alternative 1

Training

Tables 3.0-63 and 3.0-64 list the number and location of small- and medium-caliber projectiles. As indicated in Section 3.0.5.3.5.1 (Non-explosive Practice Munitions), under Alternative 1, the amount of small- and medium-caliber projectiles is almost three-times that of the No Action Alternative. The types of activities that use small- and medium-caliber projectiles, where they are used, and the number of events under each alternative are discussed in Section 3.0.5.3.3.3 (Military Expended Materials Strikes). Any bottom-feeding sea turtle may occur in these range complexes.

Table 3.0-66 lists the number and location of activities that expend fragments of high-explosive ordnance and munitions (e.g., demolition charges, grenades, bombs, missiles, and rockets). As indicated in Section 3.0.5.3.5.2 (Fragments from High Explosive Munitions), under Alternative 1, the number of events that use high-explosive ordnance and munitions is more than four-times that of the No Action Alternative. The types of activities that use high-explosive ordnance and munitions, where they are used, and the number of events under each alternative are discussed in Section 3.0.5.3.3.3 (Military Expended Materials Strikes). Any bottom-feeding sea turtle may occur in these range complexes.

In comparison to the No Action Alternative, the increase in training activities under Alternative 1 increases the risk of sea turtles being exposed to munitions; however, the expected impact on any exposed sea turtle remains the same. For the same reasons stated in Section 3.5.3.5.1.1 (No Action Alternative), sub-lethal effects from ingestion of munitions used in training activities may cause short-term or long-term disturbance to an individual turtle. Exposure to munitions is not expected to result in population-level impacts.

Pursuant to the ESA, the use of munitions of ingestible size during testing activities under Alternative 1 would have no effect on leatherback sea turtles. The use of materials of ingestible size may affect, but is not likely to adversely affect, green, hawksbill, loggerhead, or olive ridley sea turtles.

Testing

Tables 3.0-63 and 3.0-64 list the number and location of small- and medium-caliber projectiles. As indicated in Section 3.0.5.3.5.1 (Non-explosive Practice Munitions), under Alternative 1, the amount of small- and medium-caliber projectiles is more than four-times that of the No Action Alternative. The types of activities that use small- and medium-caliber projectiles, where they are used, and the number of events under each alternative are discussed in Section 3.0.5.3.3.3 (Military Expended Materials Strikes). Any bottom-feeding sea turtle may occur in these range complexes.

Table 3.0-66 lists the number and location of activities that expend fragments of high-explosive ordnance and munitions (e.g., demolition charges, grenades, bombs, missiles, and rockets). As indicated in Section 3.0.5.3.5.2 (Fragments from High Explosive Munitions), under Alternative 1, the number of events that use high-explosive ordnance and munitions is more than 13-times that of the No Action Alternative. The activities using high-explosive ordnance and munitions under Alternative 1 would occur in the same geographic locations as the No Action Alternative. The types of activities that use high-explosive ordnance and munitions, where they are used, and how many events would occur under each alternative are discussed in Section 3.0.5.3.3.3 (Military Expended Materials Strikes). Any bottom-feeding sea turtle may occur in these range complexes.

In comparison to the No Action Alternative, the increase in testing activities under Alternative 1 increases the risk of sea turtles being exposed to munitions. However, the expected impact on any exposed sea turtle remains the same. For the same reasons stated in Section 3.5.3.5.1.1 (No Action Alternative), sub-lethal effects from ingestion of munitions used in testing activities may cause short-term or long-term disturbance to an individual turtle. Exposure to munitions is not expected to result in population-level impacts.

Pursuant to the ESA, the use of munitions of ingestible size during testing activities under Alternative 1 would have no effect on leatherback sea turtles. The use of materials of ingestible size may affect, but is not likely to adversely affect green, hawksbill, loggerhead, or olive ridley sea turtles.

3.5.3.5.1.3 Alternative 2

Training

The number and location of training activities under Alternative 2 are identical to training activities under Alternative 1. Therefore, impacts of and comparisons to the No Action Alternative would also be identical, as described in Section 3.5.3.5.1.1 (No Action Alternative).

Pursuant to the ESA, the use of munitions of ingestible size during training activities under Alternative 2 would have no effect on leatherback sea turtles. The use of materials of ingestible size may affect, but is not likely to adversely affect, green, hawksbill, loggerhead, or olive ridley sea turtles.

Testing Activities

Tables 3.0-63 and 3.0-64 list the number and location of small- and medium-caliber projectiles. As indicated in Section 3.0.5.3.5.1 (Non-explosive Practice Munitions), under Alternative 2, the amount of small- and medium-caliber projectiles is nearly five-times that of the No Action Alternative. The activities using small- and medium-caliber projectiles under Alternative 2 would occur in the same geographic locations as the No Action Alternative. The types of activities that use small- and medium-caliber projectiles, where they are used, and how many events would occur under each alternative are discussed in Section 3.0.5.3.3.3 (Military Expended Materials Strikes). Any bottom-feeding sea turtle may occur in these range complexes.

Table 3.0-66 lists the number and location of activities that expend fragments of high-explosive ordnance and munitions (e.g., demolition charges, grenades, bombs, missiles, and rockets). As indicated in Section 3.0.5.3.5.2 (Fragments from High Explosive Munitions), under Alternative 2, the number of events that use high-explosive ordnance and munitions is more than 14-times that of the No Action Alternative, but is only approximately 10 percent more than under Alternative 1. The activities using high-explosive ordnance and munitions under Alternative 2 would occur in the same geographic locations as the No Action Alternative. The types of activities that use high-explosive ordnance and munitions, where they are used, and how many events would occur under each alternative are discussed in Section 3.0.5.3.3.3 (Military Expended Materials Strikes). Any bottom-feeding sea turtle may occur in these range complexes.

The increase in testing activities over the No Action Alternative increases the risk of sea turtles being exposed to munitions. However, the expected impact on any exposed sea turtle remains the same. For the same reasons stated in Section 3.5.3.5.1.1 (No Action Alternative), sub-lethal effects from ingestion of munitions used in testing activities may cause short-term or long-term disturbance to an individual turtle. Exposure to munitions is not expected to result in population-level impacts.

Pursuant to the ESA, the use of munitions of ingestible size during testing activities under Alternative 2 would have no effect on leatherback sea turtles. The use of materials of ingestible size may affect, but is not likely to adversely affect, green, hawksbill, loggerhead, or olive ridley sea turtles.

3.5.3.5.2 Impacts from Military Expended Materials Other than Munitions

Fragments of targets, chaff, flare casings, and parachutes are ingestion stressors introduced during training and testing activities, and are being analyzed for sea turtles. The types, numbers, and locations of activities using these devices under each alternative are discussed in Sections 3.0.5.3.4.2 (Parachutes), 3.0.5.3.5.1 (Non-explosive Practice Munitions), 3.0.5.3.5.2 (Fragments from High-Explosive Munitions), and 3.0.5.3.5.3 (Military Expended Materials Other than Munitions).

Leatherbacks are more likely to feed at or near the surface, so they are more likely to encounter materials at the surface than other species of turtles that primarily feed on the seafloor. Furthermore, leatherbacks typically feed in the open ocean, while other species are more likely to feed in nearshore areas. Though they are bottom-feeding species that generally feed nearshore, green, hawksbill, olive ridley, and loggerhead sea turtles may occur in the open ocean during migrations. Given the very low probability of nearshore, bottom-feeding species encountering and ingesting materials at the surface, leatherback sea turtles are more likely to be exposed.

3.5.3.5.2.1 No Action Alternative

Training Activities

Under the No Action Alternative, some training activities deploy sonobuoys that use parachutes of ingestible size. Under the No Action Alternative, 42,250 sonobuoys would be expended in the Study Area during training activities. The sonobuoy parachutes sink, so they are not expected to drift into another portion of the Study Area. Because of the low number of sonobuoys expended in the open ocean and the rapid sink rate of the parachute, the likelihood of a leatherback encountering and ingesting a parachute is extremely low. Because of the water depth over which these parachutes are deployed, other sea turtle species are not likely to encounter a parachute after it sinks through the water column.

Under the No Action Alternative, 10,050 flares would be expended annually in the Study Area during training activities, most of them (8,300) in SOCAL Range Complex. The flare consists of a cylindrical cartridge 1.4 in. in diameter and 5.8 in. long. Flare components that may be ingested include plastic end caps and pistons, which may float in the water column for some period. For estimation purposes, the SOCAL Range Complex is approximately 120,000 square nautical miles (nm^2), which equates to less than one cartridge per nm^2. The likelihood of a leatherback encountering and ingesting an end cap anywhere is very low.

Under the No Action Alternative, 20,950 chaff cartridges would be expended by ships and aircraft during training activities. Although these fibers are too small for sea turtles to confuse with prey and forage, there is some potential for chaff to be incidentally ingested along with other prey items. If ingested, chaff is not expected to impact sea turtles, due to the low concentration that would be ingested and the small size of the fibers. For instance, 20,000 chaff cartridges expended within the sea space of HRC and SOCAL would equate to one cartridge per two square nm within the Study Area.

Sublethal effects from ingestion of military expended materials other than munitions used in training activities may cause short-term or long-term disturbance to an individual turtle because: (1) if a sea turtle were to incidentally ingest and swallow any of these materials, it could disrupt its feeding behavior or digestive processes; and (2) if the item is particularly large in proportion to the turtle ingesting it, the material could become permanently encapsulated by the stomach lining, with a rare chance that this could impede the turtle's ability to feed or take in nutrients. Exposure to these materials may change an individual's behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment. However, military expended materials other than munitions used in training activities are generally not expected to cause disturbance to sea turtles because: (1) sea turtles are not expected to encounter these materials on the seafloor because of the depth at which these would be expended; (2) sea turtles are not expected to encounter these materials in the water column because of the brief time that any of these materials would be suspended; and (3) in some cases, a turtle would likely pass any military expended materials through its digestive tract and expel the item without impacting the individual. Exposure to military expended materials other than munitions is not expected to result in population-level impacts.

Pursuant to the ESA, the ingestion of military expended materials other than munitions during training activities under the No Action Alternative may affect, but is not likely to adversely affect leatherback, green, hawksbill, loggerhead, or olive ridley sea turtles.

Testing Activities

Under the No Action Alternative, 7,139 sonobuoys would be expended in the Study Area during testing activities. The risk of ingestion by sea turtles is described under training activities above, but the risk to sea turtles during testing activities is lower due to the lower number of sonobuoys expended.

Under the No Action Alternative, no flares would be expended annually in the Study Area during testing activities.

Under the No Action Alternative, no chaff cartridges would be expended during testing activities.

Sublethal effects from ingestion of military expended materials other than munitions used in testing activities may cause short-term or long-term disturbance to an individual turtle because: (1) if a sea turtle were to incidentally ingest and swallow any of these materials, it could disrupt its feeding behavior or digestive processes; and (2) if the item is particularly large in proportion to the turtle ingesting it, the material could become permanently encapsulated by the stomach lining, with a rare chance that this could impede the turtle's ability to feed or take in nutrients. Exposure to these materials may change an individual's behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment. However, military expended materials other than munitions used in testing activities are generally not expected to cause disturbance to sea turtles because: (1) sea turtles are not expected to encounter these materials on the seafloor because of the depth at which these would be expended; (2) sea turtles are not expected to encounter these materials in the water column because of the brief time that any of these materials would be suspended; and (3) in some cases a turtle would likely pass any military expended materials through its digestive tract and expel the item without impacting the individual. Exposure to military expended materials other than munitions is not expected to result in population-level impacts.

Pursuant to the ESA, the ingestion of military expended materials other than munitions during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, leatherback, green, hawksbill, loggerhead, or olive ridley sea turtles.

3.5.3.5.2.2 Alternative 1

Training Activities

Tables 3.0-65, 3.0-82, 3.0-84, and 3.0-85 list the number and locations of activities that expend target materials, parachutes, chaff, and flares, respectively.

As indicated in Section 3.0.5.3.4.2 (Parachutes), the number of parachutes expended under Alternative 1 would be approximately 22 percent higher than under the No Action Alternative.

As indicated in Section 3.0.5.3.5.3 (Military Expended Materials Other Than Munitions), the number of activities that expend target-related materials under Alternative 1, would be about four-times that of the No Action Alternative.

As indicated in Section 3.0.5.3.5.3 (Military Expended Materials Other Than Munitions), the number of activities that expend chaff under Alternative 1 would be approximately 11 percent more than under the No Action Alternative, while the number of flares would not change relative to the No Action Alternative. The activities using chaff under Alternative 1 would occur in the same geographic locations as under the No Action Alternative.

All sea turtle species could be exposed to parachutes, target materials, chaff, or flares in the areas listed above, but given the very low probability of nearshore, bottom-feeding species encountering and ingesting materials at the surface, leatherback sea turtles are more likely to be exposed.

In comparison to the No Action Alternative, the increase in training activities under Alternative 1 would increase the risk of sea turtles being exposed to parachutes, target materials, and flares; however, the expected impact on any exposed sea turtle would remain the same. For the same reasons stated in Section 3.5.3.5.2.1 (No Action Alternative), sub-lethal effects from ingestion of military expended materials other than munitions used in training activities may cause short-term or long-term disturbance to an individual turtle.

Pursuant to the ESA, the ingestion of military expended materials other than munitions during training activities under Alternative 1 may affect, but is not likely to adversely affect, leatherback, green, hawksbill, loggerhead, or olive ridley sea turtles.

Testing Activities

Tables 3.0-65, 3.0-82, 3.0-84, and 3.0-85 list the number and locations of activities that expend target materials, parachutes, chaff, and flares, respectively.

As indicated in Section 3.0.5.3.4.2 (Parachutes), the number of parachutes expended under Alternative 1 would be approximately 74 percent more than under the No Action Alternative. The activities using parachutes under Alternative 1 would occur in the same geographic locations as the No Action Alternative, with the exception of introducing flares into SOCAL training areas as part of Alternative 1 testing activities. As indicated in Section 3.0.5.3.5.3 (Military Expended Materials Other Than Munitions), the number of testing activities that would expend target-related materials under Alternative 1 is about 10 times that of the No Action Alternative.

As indicated in Section 3.0.5.3.5.3 (Military Expended Materials Other Than Munitions), approximately 600 chaff cartridges and flares would be expended under Alternative 1.

Any sea turtle species could be exposed to parachutes, target materials, chaff, or flares in the areas listed above, but given the very low probability of nearshore, bottom-feeding species encountering and ingesting materials at the surface, leatherback sea turtles are more likely to be exposed.

In comparison to the No Action Alternative, the increase in testing activities under Alternative 1 would increase the risk of sea turtles being exposed to parachutes, target materials, chaff, and flares; however, the expected impact on any exposed sea turtle would remain the same. For the same reasons stated in Section 3.5.3.5.2.1 (No Action Alternative), sub-lethal effects from ingestion of military expended materials other than munitions used in testing activities may cause short-term or long-term disturbance to an individual turtle. Exposure to munitions is not expected to result in population-level impacts.

Pursuant to the ESA, the ingestion of military expended materials other than munitions during testing activities under Alternative 1 may affect, but is not likely to adversely affect, leatherback, green, hawksbill, loggerhead, or olive ridley sea turtles.

3.5.3.5.2.3 Alternative 2

Training Activities

Tables 3.0-65, 3.0-82, 3.0-84, and 3.0-85 list the number and locations of activities that expend target materials, parachutes, chaff, and flares, respectively. As indicated in Section 3.0.5.3.4.2 (Parachutes), under Alternative 2 the number of parachutes expended is approximately 22 percent higher than under the No Action Alternative. As indicated in Section 3.0.5.3.5.3 (Military Expended Materials Other Than Munitions), under Alternative 2, the number of activities that expend target-related materials would be about four-times that under the No Action Alternative. As indicated in Section 3.0.5.3.5.3 (Military Expended Materials Other Than Munitions), under Alternative 2, the number of activities that expend chaff would increase by approximately 10 percent from the No Action Alternative, while the number of flares would not change relative to the No Action Alternative. The activities using chaff under Alternative 2 would occur in the same geographic locations as the No Action Alternative.

Any sea turtle species could be exposed to parachutes, target materials, chaff, or flares in the areas listed above, but given the very low probability of nearshore, bottom-feeding species encountering and ingesting materials at the surface, leatherback sea turtles are more likely to be exposed.

In comparison to the No Action Alternative, the increase in training activities under Alternative 2 would increase the risk of sea turtles being exposed to parachutes, target materials, and flares; however, the expected impact on any exposed sea turtle would remain the same. For the same reasons stated in Section 3.5.3.5.2.1 (No Action Alternative), sub-lethal effects from ingestion of military expended materials other than munitions used in training activities may cause short-term or long-term disturbance to an individual turtle.

Pursuant to the ESA, the ingestion of military expended materials other than munitions during training activities under Alternative 2 may affect, but is not likely to adversely affect, leatherback, green, hawksbill, loggerhead, or olive ridley sea turtles.

Testing Activities

Tables 3.0-65, 3.0-82, 3.0-84, and 3.0-85 list the number and locations of activities that expend target materials, parachutes, chaff, and flares, respectively.

As indicated in Section 3.0.5.3.4.2 (Parachutes), the number of parachutes expended under Alternative 1 would be approximately 90 percent more than under the No Action Alternative. The activities using parachutes under Alternative 2 would occur in the same geographic locations as the No Action Alternative, with the exception of introducing flares into SOCAL training areas as part of Alternative 2 testing activities. As indicated in Section 3.0.5.3.5.3 (Military Expended Materials Other Than Munitions), under Alternative 2, the number of testing activities that expend target materials would be about 10-times that of the No Action Alternative.

As indicated in Section 3.0.5.3.5.3 (Military Expended Materials Other Than Munitions), approximately 660 chaff cartridges and flares would be expended under Alternative 2.

Any sea turtle species could be exposed to parachutes, target materials, chaff, or flares in the areas listed above, but given the very low probability of nearshore, bottom-feeding species encountering and ingesting materials at the surface, leatherback sea turtles are more likely to be exposed.

In comparison to the No Action Alternative, the increase in testing activities under Alternative 1 would increase the risk of sea turtles being exposed to parachutes, target materials, chaff, and flares; however, the expected impact on any exposed sea turtle remains the same. For the same reasons stated in Section 3.5.3.5.2.1 (No Action Alternative), sub-lethal effects from ingestion of military expended materials other than munitions used in testing activities may cause short-term or long-term disturbance to an individual turtle. Exposure to munitions is not expected to result in population-level impacts.

Pursuant to the ESA, the ingestion of military expended materials other than munitions during testing activities under Alternative 2 may affect, but is not likely to adversely affect, leatherback, green, hawksbill, loggerhead, or olive ridley sea turtles.

3.5.3.6 Secondary Stressors

This section analyzes potential impacts on sea turtles exposed to stressors indirectly through effects on habitat, sediment, or water quality. Secondary effects on sea turtles via sediment or water (not by trophic transfer, e.g., bioaccumulation) are considered here. The terms "indirect" and "secondary" do not imply reduced severity of environmental consequences, but instead describe *how* the impact may occur to an organism. Bioaccumulation is considered in the Ecosystem Report.

Stressors from Navy training and testing activities could have secondary or indirect impacts on turtles via changes in habitat, sediment, or water quality. These stressors include: (1) explosives, (2) explosive byproducts and unexploded ordnance, (3) metals, and (4) chemicals. Activities associated with these stressors are detailed in Tables 2.8-1 to 2.8-5, and their potential impacts are discussed in Section 3.1 (Sediments and Water Quality) and Section 3.3 (Marine Habitats).

3.5.3.6.1 Explosives

In addition to directly affecting turtle and turtle habitat, underwater explosions could affect other species in the food web, including prey species upon which sea turtles feed. The impacts of underwater explosions would differ, depending on the type of prey species in the area of the blast.

In addition to the physical effects of an underwater blast, prey might have behavioral reactions to underwater sound. For instance, prey species might exhibit a strong startle reaction to detonations that might include swimming to the surface or scattering away from the source. This startle and flight response is the most common secondary defense among animals (Mather 2004). The abundance of prey species near the detonation point could be diminished for a short period before being repopulated by animals from adjacent waters. Many sea turtle prey items, such as jellyfish and sponges, have limited mobility and ability to react to pressure waves. Any of these scenarios would be temporary, only occurring during activities involving explosives, and no lasting effect on prey availability or the pelagic food web would be expected. The Navy avoids conducting training and testing activities in ESA-listed coral habitats, which would minimize secondary effects on sea turtle species that rely on these habitats. Furthermore, most explosions occur in depths exceeding that which normally support seagrass beds, again protecting these habitats.

3.5.3.6.2 Explosion By-Products and Unexploded Ordnance

Any explosive material not completely consumed during ordnance disposal and mine clearance detonations is collected after training is complete; therefore, potential impacts are assumed to be inconsequential and not detectable for these training and testing activities. Sea turtles may be exposed by contact with the explosive material, contact with contaminants in the sediment or water, and ingestion of contaminated sediments.

High-order explosions consume most of the explosive material, creating typical combustion products. In the case of Royal Demolition Explosive, 98 percent of the products are common seawater constituents and the remainder is rapidly diluted below threshold effect level (Table 3.1-9). Explosive byproducts from high-order detonations present no secondary stressors to turtles through sediment or water. However, low-order detonations and unexploded ordnance could have an impact on sea turtles.

Secondary effects of explosives and unexploded ordnance on turtles via sediment are possible near the ordnance. Degradation of explosives proceeds via several pathways discussed in Section 3.1.3.1.5 (Fates of Military Munitons in the Marine Environment). Degradation products of Royal Demolition Explosive are not toxic to marine organisms at realistic exposure levels (Rosen and Lotufo 2010). Relatively low solubility of most explosives and their degradation products means that concentrations of these contaminants in the marine environment are relatively low and readily diluted. Furthermore, while explosives and their degradation products were detectable in marine sediment approximately 6 to 12 in. (15.2 to 30.5 cm) away from degrading ordnance, concentrations of these compounds were not statistically distinguishable from background beyond 3 to 6 ft. (0.9 to 1.8 m) from the degrading ordnance (Section 3.1.3.1.5, Fates of Military Munitons in the Marine Environment). Various lifestages of turtles could be impacted by the indirect effects of degrading explosives within a small radius of the explosive (1 to 6 ft. [0.3 to 1.8 m]).

3.5.3.6.3 Metals

Metals are introduced into seawater and sediments by training and testing activities involving vessel hulks, targets, ordnance, munitions, and other military expended materials (Section 3.1.3.2, Metals). Some metals bioaccumulate, and physiological impacts begin to occur only after several trophic transfers concentrate the toxic metals (see Section 3.3, Marine Habitats, and Section 4.0, Cumulative Impacts). Indirect impacts of metals on sea turtles via sediment and water involve concentrations several orders of magnitude lower than concentrations achieved via bioaccumulation. Sea turtles may be exposed by contact with the metal, contact with contaminants in the sediment or water, or ingestion of contaminated sediments. Concentrations of metals in seawater are orders of magnitude lower than concentrations in marine sediments. It is extremely unlikely that sea turtles would be indirectly impacted by toxic metals via water.

3.5.3.6.4 Chemicals

Several Navy training and testing activities introduce potentially harmful chemicals into the marine environment; principally, flares and propellants for rockets, missiles, and torpedoes. Polychlorinated biphenyls (PCBs) are discussed in Section 3.1.3.3 (Chemicals Other Than Explosives). PCBs have a variety of effects on aquatic organisms. The chemicals persist in the tissues of animals at the bottom of the food chain. Thereafter, consumers of those species tend to accumulate PCBs at levels that may be many times higher than in water. In the past, PCBs have been raised as an issue because they have been found in certain solid materials on vessels used as targets during vessel-sinking exercises (e.g., insulation, wires, felts, and rubber gaskets). Currently, vessels used for sinking exercises are selected from a list of U.S. Navy-approved vessels that have been cleaned in accordance with USEPA guidelines. Properly functioning flares, missiles, rockets, and torpedoes combust most of their propellants, leaving benign or readily diluted soluble combustion byproducts (e.g., hydrogen cyanide). Operational failures allow propellants and their degradation products to be released into the marine environment. Sea turtles may be exposed by contact with contaminated water or ingestion of contaminated sediments.

Missile and rocket fuel pose no risk of secondary impacts on sea turtles via sediment. In contrast, the principal toxic components of torpedo fuel, propylene glycol dinitrate, and nitrodiphenylamine adsorb to sediments, have relatively low toxicity, and are readily degraded by biological processes. Various lifestages of sea turtles could be indirectly impacted by propellants via sediment near the object (e.g., within a few inches), but these potential effects would diminish rapidly as the propellant degrades.

Pursuant to the ESA, secondary stressors associated with testing activities under the No Action Alternative, Alternative 1, or Alternative 2 may affect, but are not likely to adversely affect, green, hawksbill, leatherback, loggerhead, or olive ridley sea turtles.

3.5.4 Summary of Potential Impacts (Combined Impacts of All Stressors) on Sea Turtles

As described in Section 3.0.5.5 (Resource-Specific Impacts Analysis for Multiple Stressors), this section evaluates the combined potential impacts of all the stressors from the Proposed Action. The analysis of and conclusions for the potential impacts of each of the individual stressors are discussed in the analyses of each stressor in the sections above and summarized in Section 3.5.5 (Endangered Species Act Determinations).

There are generally two ways that a sea turtle could be exposed to multiple stressors. The first would be if the animal were exposed to multiple sources of stress from a single activity (e.g., a mine warfare activity may involve explosives and vessels that could introduce potential acoustic and physical strike stressors). The potential for a combination of these impacts from a single activity would depend on the range of effects on each of the stressors and the response or lack of response to that stressor. Most of the activities included in the Proposed Action involve multiple stressors; therefore, it is likely that if a sea turtle were within the potential impact range of those activities, they may be impacted by multiple stressors simultaneously. This would be more likely to occur during large-scale exercises or activities that span a period of days or weeks (such as a sinking exercise or composite training unit exercise).

Secondly, an individual sea turtle could be exposed to a combination of stressors from multiple activities over the course of its life. This is most likely to occur in areas where training and testing activities are more concentrated (e.g., near naval ports, testing ranges, and routine activity locations outlined in Table 3.0-2) and in areas that individual sea turtles frequently visit because it is within the animal's home range, migratory route, breeding area, or foraging area. Except for in the few concentrated areas mentioned above, combinations are unlikely to occur because training and testing activities are generally separated in space and time in such a way that it would be very unlikely that any individual sea turtles would be exposed to stressors from multiple activities. However, animals with a small home range intersecting an area of concentrated Navy activity have elevated exposure risks relative to animals that simply transit the area through a migratory route. Also, the majority of the proposed training and testing activities occur over a small spatial scale relative to the entire Study Area, have few participants, and are of a short duration (on the order of a few hours or less).

Multiple stressors may also have synergistic effects. For example, sea turtles that experience temporary hearing loss or injury from acoustic stressors could be more susceptible to physical strike and disturbance stressors via a decreased ability to detect and avoid threats. Sea turtles that experience behavioral and physiological consequences of ingestion stressors could be more susceptible to physical strike stressors via malnourishment and disorientation. These interactions are speculative, and without data on the combination of multiple Navy stressors, the synergistic impacts from the combination of Navy stressors on sea turtles are difficult to predict.

Although potential impacts on certain sea turtle species from the Proposed Action could include injury or mortality, impacts are not expected to decrease the overall fitness or result in long-term population-level impacts on any given population. In cases where potential impacts rise to a level that warrants mitigation, mitigation measures designed to reduce the potential impacts are discussed in Chapter 5. The potential impacts of the Proposed Action are summarized in Section 3.5.5 (Endangered Species Act Determinations) with respect to the ESA.

3.5.5 ENDANGERED SPECIES ACT DETERMINATIONS

Administration of ESA obligations associated with sea turtles are shared between NMFS and U. S. Fish and Wildlife Service, depending on life stage and specific location of the sea turtle. NMFS has jurisdiction over sea turtles in the marine environment, and U. S. Fish and Wildlife Service has jurisdiction over sea turtles on land. The Navy is consulting with NMFS on its determination of effect on the potential impacts of the Proposed Action. Because no activities analyzed in this EIS/OEIS occur on land, consultation with U.S. Fish and Wildlife Service is not required for sea turtles. Table 3.5-14 summarizes the Navy’s determination of effect on ESA listed sea turtles for the Proposed Action.

Table 3.5-14: Summary of Effects and Impact Conclusions: Sea Turtles

Stressor		Sea Turtle Species				
		Green	Hawksbill	Olive Ridley	Loggerhead	Leatherback
Acoustic Stressors						
Sonar and Other Active Acoustic Sources	Training Activities	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
	Testing Activities	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Explosives	Training Activities	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
	Testing Activities	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Pile Driving	Training Activities	May affect, not likely to adversely affect	No Effect	No Effect	No Effect	No Effect
	Testing Activities	No Effect	No Effect	No Effect	No Effect	No Effect
Swimmer Defense Airguns	Training Activities	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Testing Activities	May affect, likely to adversely affect	No Effect	No Effect	No Effect	No Effect
Weapons Firing, Launch, and Impact Noise	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Vessel and Aircraft Noise	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Energy Stressors						
Electro-magnetic Devices	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Testing	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect

Table 3.5-14: Summary of Effects and Impact Conclusions: Sea Turtles (continued)

Stressor		Sea Turtle Species				
		Green	Hawksbill	Olive Ridley	Loggerhead	Leatherback
Physical Disturbance and Strike						
Vessels	Training Activities	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
	Testing Activities	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
In-Water Devices	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Military Expended Materials	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Seafloor Devices	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Entanglement Stressors						
Fiber Optic Cables and Guidance Wires	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Parachutes	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Ingestion						
Munitions	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	No effect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	No effect
Military Expended Materials other than Munitions	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect

Table 3.5-14: Summary of Effects and Impact Conclusions: Sea Turtles (continued)

Stressor		Sea Turtle Species				
		Green	Hawksbill	Olive Ridley	Loggerhead	Leatherback
Secondary Stressors						
Explosives	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Explosive ByProducts and Unexploded Ordnance	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Metals	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Chemicals	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect

REFERENCES

Aki, K., Brock, R., Miller, J., Mobley, J. R., Jr., Rappa, P. J., Tarnas, D. & Yuen, M. (1994). A Site Characterization Study for the Hawaiian Islands Humpback Whale National Marine Sanctuary. (pp. 119). Prepared by University of Hawaii Sea Grant College Program School of Ocean and Earth Science and Technology. Prepared for National Oceanic and Atmospheric Administration.

Alfaro-Shigueto, J., Dutton, P. H., Mangel, J. C. & Vega, D. (2004). First occurrence of loggerhead turtles in Peru. Marine Turtle Newsletter, 103, 7-11. Retrieved from http://www.seaturtle.org/mtn/archives/mtn103/mtn103p7.shtml

Arenas, P. & Hall, M. (1992). The association of sea turtles and other pelagic fauna with floating objects in the eastern tropical Pacific Ocean. In M. Salmon and J. Wyneken (Eds.), Proceedings of the Eleventh Annual Workshop on Sea Turtle Biology and Conservation. (NOAA Technical Memorandum NMFS-SEFSC-302, pp. 7-10) U.S. Department of Commerce, National Oceanic and Atmospheric Administration and Nationa Marine Fisheries Service.

Avens, L. & Lohmann, K.J. (2003). Use of multiple orientation cues by juvenile loggerhead sea turtles Caretta caretta. Journal of Experimental Biology. 206: 4317-4325.

Balazs, G. & Chaloupka, M. (2006). Recovery trend over 32 years at the Hawaiian Green sea turtle Rookery of French Frigate Shoals. Atoll Research Bulletin(543), 147-158.

Balazs, G. H. (1980). Synopsis of Biological Data on the Green sea turtle in the Hawaiian Islands. (NOAA-TM-NMFS-SWFC-7, pp. 141) U.S. Department of Commerce, Naitonal Oceanic and Atmospheric Administration and National Marine Fisheries Service.

Balazs, G. H. (1995). Status of sea turtles in the central Pacific Ocean. In K. A. Bjorndal (Ed.), Biology and Conservation of Sea Turtles (Revised ed., pp. 243-252). Washington, DC: Smithsonian Institution Press.

Balazs, G. H., Craig, P., Winton, B. R. & Miya, R. K. (1994). Satellite telemetry of green sea turtles nesting at French Frigate Shoals, Hawaii, and Rose Atoll, American Samoa. In K. A. Bjorndal, A. B. Bolten, D. A. Johnson and P. J. Eliazar (Eds.), Proceedings of the Fourteenth Annual Symposium on Sea Turtle Biology and Conservation. (NOAA Technical Memorandum NMFS-SEFSC-351, pp. 184-187) U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service.

Bartol S.M., Musick J.A., Lenhardt M.L. (1999). Auditory evoked potentials of the loggerhead sea turtule (Caretta caretta). Copeia:836-840.

Bartol S.M., & Musick J.A. (2003). Sensory Biology of Sea Turtles, in: P. L. Lutz, et al. (Eds.), The Biology of Sea Turtles. pp. 16.

Bartol, S. M. & Ketten, D. R. (2006). Turtle and tuna hearing. In Y. Swimmer and R. W. Brill (Eds.), Sea Turtle and Pelagic Fish Sensory Biology: Developing Techniques to Reduce Sea Turtle Bycatch in Longline Fisheries (NOAA Technical Memorandum NMFS-PIFSC-7, pp. 98-103) U.S. Department of Commerce, NOAA.

Benoit-Bird, K. J., Au, W. W. L., Brainard, R. E. & Lammers, M. O. (2001). Diel horizontal migration of the Hawaiian mesopelagic boundary community observed acoustically. Marine Ecology-Progress Series, 217, 1-14.

Benson, S. R., Forney, K. A., Harvey, J. T., Carretta, J. V. & Dutton, P. H. (2007). Abundance, distribution, and habitat of leatherback turtles (Dermochelys coriacea) off California, 1990-2003. Fishery Bulletin, 105(3), 337-347.

Beavers, S. C., & E. R. Cassano (1996). Movement and dive behavior of a male sea turtle (Lepidochelys olivacea) in the eastern tropical Pacific. J. Herpetol. 30(1):97-104.

Bjorndal, K. A. (1995). The consequences of herbivory for the life history pattern of the green sea turtle, Chelonia mydas. In K. A. Bjorndal (Ed.), Biology and Conservation of Sea Turtles (Revised ed., pp. 111-116). Washington, DC: Smithsonian Institution Press.

Bjorndal, K. A. (1997). Foraging ecology and nutrition of sea turtles. In P. L. Lutz and J. A. Musick (Eds.), The Biology of Sea Turtles (pp. 199-231). Boca Raton, FL: CRC Press.

Bjorndal, K. A. (2003). Roles of loggerhead sea turtles in marine ecosystems. In A. B. Bolten and B. E. Witherington (Eds.), Loggerhead Sea Turtles (pp. 235-254). Washington, DC: Smithsonian Institution Press.

Bjorndal, K. A. & Bolten, A. B. (1988). Growth rates of immature green sea turtles, Chelonia mydas, on feeding grounds in the southern Bahamas. Copeia, 1988(3), 555-564.

Bjorndal, K. A., Bolten, A. B. & Lagueux, C. J. (1994). Ingestion of marine debris by juvenile sea turtles in coastal Florida habitats. Marine Pollution Bulletin, 28(3), 154-158.

Blumenthal, J. M., Austin, T. J., Bothwell, J. B., Broderick, A. C., Ebanks-Petrie, G., Olynik, J. R., Godley, B. J. (2009). Diving behavior and movements of juvenile hawksbill turtles Eretmochelys imbricata on a Caribbean coral reef. Coral Reefs, 28(1), 55-65. doi: 10.1007/s00338-008-0416-1.

Bolten, A. B. (2003). Variation in sea turtle life history patterns: Neritic vs. oceanic developmental stages. In P. L. Lutz, J. A. Musick and J. Wyneken (Eds.), The Biology of Sea Turtles (Vol. II, pp. 243-258). Boca Raton, FL: CRC Press.

Bowen, B. W., Abreu-Grobois, F. A., Balazs, G. H., Kamezaki, N., Limpus, C. J. & Ferl, R. J. (1995). Trans-Pacific migrations of the loggerhead turtle (Caretta caretta) demonstrated with mitochondrial DNA markers. Proceedings of the National Academy of Sciences of the United States of America, 92, 3731-3734.

Bowen, B. W., Clark, A. M., Abreu-Grobois, A. F., Chaves, A., Reichart, H. A. & Ferl, R. J. (1998). Global phylogeography of the ridley sea turtles (Lepidochelys spp.) As inferred from mitochondrial DNA sequences. Genetica, 101, 179-189.

Bowen, B. W. & Karl, S. A. (1997). Population genetics, phylogeography, and molecular evolution. In P. L. Lutz and J. A. Musick (Eds.), The Biology of Sea Turtles (pp. 29-50). Boca Raton, FL: CRC Press.

Bradshaw, C. J. A., McMahon, C. R. & Hays, G. C. (2007). Behavioral inference of diving metabolic rate in free-ranging leatherback turtles. Physiological and Biochemical Zoology 80(2), 209-219.

Bresette, M., Gorham, J. C. & Peery, B. D. (1998). Site fidelity and size frequencies of juvenile green turtles (Chelonia mydas) utilizing near shore reefs in St. Lucie County, Florida. Marine Turtle Newsletter, 82, 5-7. Retrieved from http://www.seaturtle.org/mtn/archives/mtn82/mtn82p5.shtml

Bresette, M., Singewald, D. & De Maye, E. (2006). Recruitment of post-pelagic green sea turtles (Chelonia mydas) to nearshore reefs on Florida's east coast. In M. Frick, A. Panagopoulou, A. F. Rees and K. Williams (Eds.), Book of Abstracts: Twenty-sixth Annual Symposium on Sea Turtle Biology and Conservation (Abstract, pp. 288). Athens, Greece: International Sea Turtle Society.

Brill, R. W., Balazs, G. H., Holland, K. N., Chang, R. K. C., Sullivan, S. & George, J. C. (1995). Daily movements, habitat use, and submergence intervals of normal and tumor-bearing juvenile green sea turtles (Chelonia mydas L.) within a foraging area in the Hawaiian islands. Journal of Experimental Marine Biology and Ecology, 185(2), 203-218. doi: 10.1016/0022-0981(94)00146-5

Brown, C. H. & Brown, W. M. (1995). Status of sea turtles in the Southeastern Pacific: Emphasis on Peru. In K. A. Bjorndal (Ed.), Biology and Conservation of Sea Turtles (Revised ed., pp. 235-240). Washington DC: Smithsonian Institution Press.

Byles, R. A. (1988). Behavior and ecology of sea turtles from Chesapeake Bay, Virginia. (Ph.D. dissertation). College of William and Mary, Williamsburg, Virginia. Retrieved from http://www.sefsc.noaa.gov/PDFdocs/Byles_dissertation_1988.pdf

Caillouet, C. W., Fontaine, C.T., Manzella-Tirpak, S. A. & Shaver, D. J. (1995). Survival of head-started Kemp's ridley sea turtles (*Lepidochelys kempii*) released into the Gulf of Mexico or adjacent bays. *Chelonian Conservation and Biology 1*(4):285-292.

California Department of Transportation. (2009). Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. Prepared by ICF Jones and Stokes and Illingworth and Rodkin, Inc.

Carr, A. (1986). Rips, FADS, and little loggerheads. BioScience, 36(2), 92-100.

Carr, A. (1987). New perspectives on the pelagic stage of sea turtle development. Conservation Biology, 1(2), 103-121.

Carr, A., Carr, M. & Meylan, A. B. (1978). The ecology and migrations of sea turtles, 7. The west carribean green sea turtle colony. Bulletin of the American Museum of Natural History, 162(1), 1-46.

Carr, A. & Meylan, A. B. (1980). Evidence of passive migration of green sea turtle hatchlings in Sargassum. Copeia, 1980(2), 366-368.

Chaloupka, M., Dutton, P. & Nakano, H. (2004). Status of sea turtle stocks in the Pacific. In Papers Presented at the Expert Consultation on Interactions between Sea Turtles and Fisheries Within an Ecosystem Context. (FAO Fisheries Report No. 738, Supplement, pp. 135-164). Rome, Italy: Food and Agriculture Organization of the United Nations.

Chaloupka, M., Work, T. M., Balazs, G., Murakawa, S. K. & Morris, R. (2008a). Cause-specific temporal and spatial trends in green sea turtle strandings in the Hawaiian Archipelago (1982-2003). Marine Biology, 154, 887-898.

Chaloupka, M., Kamezaki, N. & Limpus, C. (2008b). Is climate change affecting the population dynamics of the endangered Pacific loggerhead sea turtle? Journal of Experimental Marine Biology and Ecology, 356(1-2), 136-143. doi: 10.1016/j.jembe.2007.12.009

Chaloupka, M. Y. & Musick, J. A. (1997). Age, growth, and population dynamics. In P. L. Lutz and J. A. Musick (Eds.), The Biology of Sea Turtles (pp. 233-276). Boca Raton, FL: CRC Press.

Chua, T. H. (1988). Nesting population and frequency of visits in Dermochelys coriacea in Malaysia. Journal of Herpetology, 22(2), 192-207.

Clark S.L., Ward J.W. (1943) The Effects of Rapid Compression Waves on Animals Submerged In Water. Surgery, Gynecology & Obstetrics 77:403-412.

Cliffton, K., Cornejo, D. O. & Felger, R. S. (1995). Sea turtles of the Pacific coast of Mexico. In K. A. Bjorndal (Ed.), Biology and Conservation of Sea Turtles (Revised ed., pp. 199-209). Washington, DC: Smithsonian Institution Press. Retrieved from Copyright protected.

Conant, T. A., Dutton, P. H., Eguchi, T., Epperly, S. P., Fahy, C. C., Godfrey, M. H., Witherington, B. E. (2009). Loggerhead Sea Turtle (*Caretta caretta*) 2009 Status Review under the U.S. Endangered Species Act. (pp. 222) Loggerhead Biological Review Team and National Marine Fisheries Service.

Craig J.C., Jr., Hearn C.W. (1998). Appendix D. Physical impacts of explosions on marine mammals and turtles, Final Environmental Impact Statement on Shock Testing of the Seawolf Submarine, U.S. Department of the Navy, North Charleston, South Carolina. pp. D1-D41.

Craig J.C., Jr., Rye K.W. (2008). Appendix D: Criteria and thresholds for injury, Shock Trial of the Mesa Verde (LPD 19), Chief of Naval Operations, U.S. Navy, Arlington, Virginia.

Davenport, J. (1988). Do diving leatherbacks pursue glowing jelly? British Herpetological Society Bulletin, 24, 20-21.

Davenport, J. & Balazs, G. H. (1991). 'Fiery bodies' Are pyrosomas an important component of the diet of leatherback turtles? British Herpetological Society Bulletin, 37, 33-38.

Dobbs, K. A., Miller, J. D., Limpus, C. J. & Landry, A. M., Jr. (1999). Hawksbill turtle, Eretmochelys imbricate, nesting at Milman Island, northern Great Barrier Reef, Australia. Chelonian Conservation and Biology, 3(2), 344-361.

Dodd, C. K., Jr. (1988). Synopsis of the Biological Data on the Loggerhead Sea Turtle Caretta caretta (Linnaeus 1758). (Biological Report 88(14), pp. 110). Washington, D.C.: U.S. Fish and Wildlife Service.

Dutton, D., Dutton, P., Leroux, R. & Seminoff, J. (2002). Ultrasonic Tracking of Green sea turtles (Chelonia mydas) in south San Diego Bay: 2001-2002 Report [Draft Report]. (pp. 13). San Diego, CA. Prepared for San Diego Bay Port Authority.

Dutton, P. (2006). Building our knowledge of the leatherback stock structure. SWoT Report-State of the World's Sea Turtles, I, 10-11. Retrieved from http://seaturtlestatus.org/report/swot-volume-1

Dutton, P. & McDonald, D. (1990). Status of Sea Turtles in San Diego Bay: 1989-1990. [Final Report]. (SWRI Technical Report 90-225). San Diego, CA: Sea World Research Institute.

Dutton, P. H. (unpublished data, 5 February). Sea turtle satellite data inquiry. K. Kelly, Tetra Tech, Inc, Honolulu, HI.

Dutton, P. H., Balazs, G. H. & Dizon, A. E. (1998). Genetic stock identification of sea turtles caught in the Hawaii-based pelagic longline fishery. In S. P. Epperly and J. Braun (Eds.), Proceedings of the Seventeenth Annual Sea Turtle Symposium [Abstract]. (NOAA Technical Memorandum NMFS-SEFSC-415, pp. 45-46). U. S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service. Available from http://www.nmfs.noaa.gov/pr/species/turtles/symposia.htm

Dutton, P. H., Balazs, G. H., LeRoux, R. A., Murakawa, S. K. K., Zarate, P. & Sarti Martinez, L. (2008). Composition of Hawaiian green sea turtle foraging aggregations: mtDNA evidence for a distinct regional population. Endangered Species Research, 5, 37-44. doi: 10.3354/esr00101

Dutton, P. H., Bowen, B. W., Owens, D. W., Barragan, A. & Davis, S. K. (1999). Global phylogeography of the leatherback turtle (Dermochelys coriacea). Journal of Zoology, London, 248, 397-409.

Eckert, K. L. (1987). Environmental unpredictability and leatherback sea turtle (Dermochelys coriacea) nest loss. Herpetologica, 43(3), 315-323.

Eckert, K. L. (1993). The Biology and Population Status of Marine Turtles in the North Pacific Ocean. (NOAA-TM-NMFS-SWFSC-186, pp. 166) U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service.

Eckert, K. L. (1995). Anthropogenic threats to sea turtles. In K. A. Bjorndal (Ed.), Biology and Conservation of Sea Turtles (Revised ed., pp. 611-612). Washington, DC: Smithsonian Institution Press.

Eckert, K. L., Bjorndal, K. A., Abreu-Grobois, F. A. & Donnelly, M. (Eds.) (1999). Research and Management Techniques for the Conservation of Sea Turtles. (IUCN/SSC Marine Turtle Specialist Group Publication No. 4, pp. 24).

Eckert, K. L. & Eckert, S. A. (1988). Pre-reproductive movements of leatherback sea turtles (Dermochelys coriacea) nesting in the Caribbean. Copeia, 1988(2), 400-406.

Eckert, K. L., Eckert, S. A., Adams, T. W. & Tucker, A. D. (1989). Inter-nesting migrations by leatherback sea turtles (Dermochelys coriacea) in the West Indies. Herpetologica, 45(2), 190-194.

Eckert, S. A. (2002). Distribution of juvenile leatherback sea turtle Dermochelys coriacea sightings. Marine Ecology Progress Series, 230, 289-293.

Eckert, S. A., Eckert, K. L., Ponganis, P. & Kooyman, G. L. (1989). Diving and foraging behavior of leatherback sea turtles (Dermochelys coriacea). Canadian Journal of Zoology, 67, 2834-2840.

Eckert, S. A., Liew, H. C., Eckert, K. L. & Chan, E. H. (1996). Shallow water diving by leatherback turtles in the South China Sea. Chelonian Conservation and Biology, 2(2), 237-243.

Eckert, S. A., Nellis, D. W., Eckert, K. L. & Kooyman, G. L. (1986). Diving patterns of two leatherback sea turtles (Dermochelys coriacea) during internesting intervals at Sandy Point, St. Croix, U.S. Virgin Islands. Herpetologica, 42(3), 381-388.

Eckert, S. A. & Sarti-Martinez, L. (1997). Distant fisheries implicated in the loss of the world's largest leatherback nesting population. Marine Turtle Newsletter, 78, 2-7. Retrieved from http://www.seaturtle.org/mtn/archives/mtn78/mtn78p2.shtml

Eguchi, T., Gerrodette, T., Pitman, R. L., Seminoff, J. A. & Dutton, P. H. (2007). At-sea density and abundance estimates of the olive ridley turtle Lepidochelys olivacea in the eastern tropical Pacific. Endangered Species Research, 3(2), 191-203. doi: 10.3354/esr003191

Eguchi, T., Seminoff, J., Leroux, R., Dutton, P. & Dutton, D. (2010). Abundance and survival rates of green sea turtles in an urban environment coexistence of humans and an endangered species. Marine Biology, 157, 1869-1877. doi: 10.1007/s00227-010-1458-9

Eisenberg, J. F. & Frazier, J. (1983). A leatherback turtle (Dermochelys coriacea) feeding in the wild. Journal of Herpetology, 17(1), 81-82.

Finneran J.J., Carder D.A., Schlundt C.E., Ridgway S.H. (2005). Temporary Threshold Shift in Bottlenose Dolphins (Tursiops truncatus) Exposed to Mid-frequency Tones. Journal of the Acoustical Society of America 118:2696-2705.

Finneran J.J., Schlundt C.E., Dear R., Carder D.A., Ridgway S.H. (2002). Temporary Shift in Masked Hearing Thresholds in Odontocetes After Exposure to Single Underwater Impulses from a Seismic Watergun. Journal of the Acoustical Society of America 111:2929-2940.

Finneran J.J., Schlundt C.E., Carder D.A., Clark J.A., Young J.A., Gaspin J.B., Ridgway S.H. (2000). Auditory and Behavioral Responses of Bottlenose Dolphins (Tursiops truncatus) and a Beluga Whale (Delphinapterus leucas) to Impulsive Sounds Resembling Distant Signatures of Underwater Explosions. Journal of the Acoustical Society of America 108:417-431.

Fossette, S., Ferraroli, S., Tanaka, H., Ropert-Coudert, Y., Arai, N., Sato, K., Georges, J. (2007). Dispersal and dive patterns in gravid leatherback turtles during the nesting season in French Guiana. Marine Ecology Progress Series 338, 233-247.

Frair, W., Ackman, R. G. & Mrosovsky, N. (1972). Body temperature of Dermochelys coriacea: Warm turtle from cold water. Science, 177, 791-793.

Frazier, J. G. (2001). General natural history of marine turtles. In K. L. Eckert and F. A. Abreu-Grobois (Eds.), Proceedings of the Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management. (pp. 3-17) WIDECAST, IUCN-MTSG, WWF and UNEP-CEP.

Fretey, J. (2001). Biogeography and Conservation of Marine Turtles of the Atlantic Coast of Africa. (CMS Technical Series Publication, no. 6, pp. 429). Bonn, Germany: UNEP/CMS Secretariat.

Frick, M. G., Williams, K. L., Bolten, A. B., Bjorndal, K. A. & Martins, H. R. (2009). Foraging ecology of oceanic-stage loggerhead turtles Caretta caretta. Endangered Species Research, 9, 91-97.

Fritts, T. H. (1981). Pelagic feeding habits of turtles in the eastern pacific. Marine Turtle Newsletter, 17(1), 4-5. Retrieved from http://www.seaturtle.org/mtn/archives/mtn17/mtn17p4.shtml

Fritts, T. H., Stinson, M. L. & Márquez, R. M. (1982). Status of sea turtle nesting in southern Baja California, México. Bulletin of the Southern California Academy of Sciences, 81(2), 51-60.

Gaos, A. R. & Yañez, I. L. (2008). Where have the Eastern Pacific Hawksbills Gone?! SWoT Report-State of the World's Sea Turtles, III, 18-19. Retrieved from http://seaturtlestatus.org/report/swot-volume-3

Gerstein, E.R, L.A. Gerstein, & S.E. Forsythe. (2009). Parametric projectors protecting marine mammals from vessel collisions. J. Acoust. Soc. Am. Volume 125, Issue 4, pp. 2689-2689.

Gilman, E. (2008). Pacific Leatherback Conservation and Research Activities, Financing and Priorities. (pp. 31). Honolulu, HI: The World Conservation Union and Western Pacific Fishery Management Council and IUCN.

Gilman, E., Clarke, S., Brothers, N., Alfaro-Shigueto, J., Mandelman, J., Mangel, J., Werner, T. (2007). Shark Depredation and Unwanted Bycatch in Pelagic Longline Fisheries: Industry Practices and Attitudes, and Shark Avoidance Strategies. (pp. 164). Honolulu, HI: Western Pacific Regional Fishery Management Council.

Godley, B. J., Broderick, A. C., Glen, F. & Hays, G. C. (2003). Post-nesting movements and submergence patterns of loggerhead marine turtles in the Mediterranean assessed by satellite tracking. Journal of Experimental Marine Biology and Ecology, 287, 119-134.

Godley, B. J., Thompson, D. R., Waldron, S. & Furness, R. W. (1998). The trophic status of marine turtles as determined by stable isotope analysis. Marine Ecology Progress Series, 166, 277-284.

Goertner J.F. (1982). Prediction of underwater explosion safe ranges for sea mammals, Naval Surface Weapons Center, Dahlgren Division, White Oak Detachment, Silver Spring, Maryland. pp. 38 pp.

Goertner, J. F., Wiley, M. L., Young, G. A. & McDonald, W. W. (1994). Effects of underwater explosions on fish without swimbladders. (NSWC TR 88-114). Silver Spring, Maryland: Naval Surface Warfare Center.

Goff, G. P. & Stenson, G. B. (1988). Brown adipose tissue in leatherback sea turtles: A thermogenic organ in an endothermic reptile? Copeia, 1988(4), 1071-1075.

Grant, G. S. & Ferrell, D. (1993). Leatherback turtle, Dermochelys coriacea (Reptilia: Dermochelidae): Notes on near-shore feeding behavior and association with cobia. Brimleyana, 19, 77-81.

Greaves F.C., Draeger R.H., Brines O.A., Shaver J.S., Corey E.L. (1943). An Experimental Study of Concussion. United States Naval Medical Bulletin 41:339-352.

Greer, A. E., Jr., Lazell, J. D., Jr. & Wright, R. M. (1973). Anatomical evidence for a counter-current heat exchanger in the leatherback turtle (Dermochelys coriacea). Nature, 244, 181.

Gregory, L. F. & Schmid, J. R. (2001). Stress response and sexing of wild Kemp's ridley sea turtles (Lepidochelys kempii) in the Northeastern Gulf of Mexico. General and Comparative Endocrinology, 124, 66-74 doi:10.1006/gcen.2001.7683

Guenther, G.C., T. J. Eisler, J.L. Riley, & S.W. Perez. (1996). Obstruction Detection and Data Decimation for Airborne Laser Hydrography. National Oceanic and Atmospheric Administration,National Ocean Service, Office of Coast Survey. Proceedings, 1996 Canadian Hydrographic Conference, Halifax, Canada.

Hailman, J. P. & Elowson, A. M. (1992). Ethogram of the nesting female loggerhead (Caretta caretta). Herpetologica, 48(1), 1-30.

Hatase, H., Matsuzawa, Y., Sakamoto, W., Baba, N. & Miyawaki, I. (2002). Pelagic habitat use of an adult Japanese male loggerhead turtle Caretta caretta examined by the Argos satellite system. Fisheries Science, 68, 945-947.

Hatase, H., Omuta, K. & Tsukamoto, K. (2007). Bottom or midwater: alternative foraging behaviours in adult female loggerhead sea turtles. Journal of Zoology, 273(1), 46-55. doi: 10.1111/j.1469-7998.2007.00298.x

Hatase, H., Sato, K., Yamaguchi, M., Takahashi, K. & Tsukamoto, K. (2006). Individual variation in feeding habitat use by adult female green sea turtles (Chelonia mydas): are they obligately neritic herbivores? Oecologia, 149(1), 52-64. doi: 10.1007/s00442-006-0431-2

Hawaii Department of Land and Natural Resources. (2002). Application for an Individual Incidental Take Permit Pursuant to the Endangered Species Act of 1973 for Listed Sea Turtles in Inshore Marine Fisheries in the Main Hawaiian Islands Managed by the State of Hawaii. (pp. 54). Honolulu, HI: State of Hawaii, Department of Land and Natural Resources, Division of Aquatic Resources.

Hawkes, L. A., Broderick, A. C., Coyne, M. S., Godfrey, M. H., Lopez-Jurado, L.-F., Lopez-Suarez, P., Godley, B. J. (2006). Phenotypically linked dichotomy in sea turtle foraging requires multiple conservation approaches. Current Biology, 16, 990-995.

Hays, G. C., Houghton, J. D. R., Isaacs, C., King, R. S., Lloyd, C. & Lovell, P. (2004). First records of oceanic dive profiles for leatherback turtles, Dermochelys coriacea, indicate behavioural plasticity associated with long-distance migration. Animal Behaviour, 67, 733-743.

Hays, G. C., Metcalfe, J. D. & Walne, A. W. (2004). The implications of lung-regulated buoyancy control for dive depth and duration. Ecology, 85(4), 1137-1145.

Hazel, J., Lawler, I. R., Marsh, H. & Robson, S. (2007). Vessel speed increases collision risk for the green sea turtle Chelonia mydas. Endangered Species Research, 3(2), 105-113. doi: 10.3354/esr003105

Heithaus, M. R., McLash, J. J., Frid, A., Dill, L. M. & Marshall, G. (2002). Novel insights into green sea turtle behaviour using animal-borne video cameras. Journal of the Marine Biological Association of the United Kingdom, 82(6), 1049-1050.

Hirth, H., Kasu, J. & Mala, T. (1993). Observations on a Leatherback Turtle Dermochelys coriacea Nesting Population near Piguwa, Papua New Guinea. Biological Conservation, 65, 77-82.

Hirth, H. F. (1997). Synopsis of the Biological Data on the Green sea turtle Chelonia mydas (Linnaeus 1758). (Biological Report 97(1)). Washington, DC: U.S. Fish and Wildlife Service.

Hirth, H. F. & Ogren, L. H. (1987). Some Aspects of the Ecology of the Leatherback Turtle Dermochelys coriacea at Laguna Jalova, Costa Rica. (NOAA Technical Report NMFS 56, pp. 14) U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service.

Hodge, R. P. & Wing, B. L. (2000). Occurrences of marine turtles in Alaska waters: 1960-1998. Herpetological Review, 31(3), 148-151.

Hughes, G. R., Luschi, P., Mencacci, R. & Papi, F. (1998). The 7000-km oceanic journey of a leatherback turtle tracked by satellite. Journal of Experimental Marine Biology and Ecology, 229, 209-217.

James, M. C. & Herman, T. B. (2001). Feeding of Dermochelys coriacea on medusae in the northwest Atlantic. Chelonian Conservation and Biology, 4(1), 202-205.

James, M. C. & Mrosovsky, N. (2004). Body temperatures of leatherback turtles (Dermochelys coriacea) in temperate waters off Nova Scotia, Canada. Canadian Journal of Zoology, 82, 1302-1306. doi: 10.1139/Z04-110

James, M. C., Myers, R. A. & Ottensmeyer, C. A. (2005a). Behaviour of leatherback sea turtles, Dermochelys coriacea, during the migratory cycle. Proceedings of the Royal Society B: Biological Sciences, 272, 1547-1555. doi: 10.1098/rspb.2005.3110

James, M. C., Ottensmeyer, C. A. & Myers, R. A. (2005b). Identification of high-use habitat and threats to leatherback sea turtles in northern waters: New directions for conservation. Ecology Letters, 2005(8), 195-201. doi: 10.1111/j.1461-0248.2004.00710.x

James, M. C., Sherrill-Mix, S. A., Martin, K. & Myers, R. A. (2006). Canadian waters provide critical foraging habitat for leatherback sea turtles. Biological Conservation, 133(3), 347-357.

Jones, T.T. (2009). Energetics of the leatherback turtle (Dermochelys coriacea). Thesis.

Jonsen, I. D., Myers, R. A. & James, M. C. (2007). Identifying leatherback turtle foraging behaviour from satellite telemetry using a switching state-space model. Marine Ecology Progress Series 337, 255-264.

Kalb, H. & Owens, D. (1994). Differences between solitary and arribada nesting olive ridley females during the internesting period. In K. A. Bjorndal, A. B. Bolten, D. A. Johnson and P. J. Eliazar (Eds.), Proceedings of the Fourteenth Annual Symposium on Sea Turtle Biology and Conservation. (NOAA Technical Memorandum NMFS-SEFSC-351, pp. 68) U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service.

Kamezaki, N., Matsuzawa, Y., Abe, O., Asakawa, H., Fujii, T., Goto, K., Wakabayashi, I. (2003). Loggerhead turtles nesting in Japan. In A. B. Bolten and B. E. Witherington (Eds.), Loggerhead Sea Turtles (pp. 210-217). Washington DC: Smithsonian Books.

Keinath, J. A. & Musick, J. A. (1993). Movements and diving behavior of a leatherback turtle, Dermochelys coriacea. Copeia, 1993(4), 1010-1017.

Ketten, D. R. (1995). Estimates of blast injury and acoustic trauma zones for marine mammals from underwater explosions R. A. Kastelein, J. A. Thomas and P. E. Nachtigall (Eds.), Sensory Systems of Aquatic Mammals (pp. 391-407). Woerden, The Netherlands: De Spil Publishers.

Ketten, D. R. (1998). Marine Mammal Auditory Systems: A Summary of Audiometric and Anatomical Data and Its Implications for Underwater Acoustic Impacts. Dolphin-Safe Research Program, Southwest Fisheries Science Center, La Jolla, California.

Ketten D.R., Lien J., Todd S. (1993). Blast injury in humpback whale ears: Evidence and implications (A). Journal of the Acoustical Society of America 94:1849-1850.

Klima, E. F., Gitschlag, G. R. & Renaud, M. L. (1988). Impacts of the explosive removal of offshore petroleum platforms on sea turtles and dolphins. Marine Fisheries Review, 50, 33-42.

Lazell, J. D., Jr. (1980). New England waters: Critical habitat for marine turtles. Copeia, 1980(2), 290-295.

Lenhardt M.L., Klinger R.C., Musick J.A. (1985). Marine Turtle Middle-Ear Anatomy. The Journal of Auditory Research 25:66-72.

Lenhardt, M. L., S. Bellmund, R. A. Byles, S. W. Harkins and J. A. Musick. (1983). Marine turtle reception of bone-conducted sound. *Journal of Auditory Research 23*: 119-125.

Lenhardt M.L. (1994). Seismic and very low frequency sound induced behaviors in captive loggerhead marine turtles (Caretta caretta), in: K. A. Bjorndal, et al. (Eds.), Fourteenth Annual Symposium on Sea Turtle Biology and Conservation, Hilton Head, South Carolina.

Lenhardt, M. L. (2002). "Sea turtle auditory behavior." *Journal of the Acoustical Society of America 112*(5, Part 2): 2314.

Levenson, D. H., S. A. Eckert, M. A. Crognale, J. I. Deegan and G. H. Jocobs. (2004). "Photopic spectral sensitivity of green and loggerhead sea turtles." *Copeia(4)*: 908–914.

Limpus, C., Bell, I. & Miller, J. (2009). Mixed stocks of green sea turtles foraging on Clack Reef, northern Great Barrier Reef identified from long term tagging studies. Marine Turtle Newsletter, 123, 3-5.

Limpus, C. J. (1992). The hawksbill turtle, Eretmochelys imbricata, in Queensland: population structure within a southern Great Barrier Reef ground. Wildlife Research 19, 489-506.

Lohmann, K. J. & Lohmann, C. M. F. (1992). Orientation to oceanic waves by green sea turtle hatchlings. Journal of Experimental Biology, 171, 1-13.

Lohmann, K. J. & Lohmann, C. M. F. (1996a). Detection of magnetic field intensity by sea turtles. Nature, 380, 59-61. doi:10.1038/380059a0

Lohmann, K. J. & Lohmann, C. M. F. (1996b). Orientation and open-sea navigation in sea turtles. Journal of Experimental Biology, 199(1), 73-81.

Lohmann, K. J., Witherington, B. E., Lohmann, C. M. F. & Salmon, M. (1997). Orientation, navigation, and natal beach homing in sea turtles. In P. L. Lutz and J. A. Musick (Eds.), The Biology of Sea Turtles (pp. 107-136). Boca Raton, FL: CRC Press.

Lopez-Castro, M. C. & Rocha-Olivares, A. (2005). The panmixia paradigm of eastern Pacific olive ridley turtles revised: consequences for their conservation and evolutionary biology. Molecular Ecology, 14(11), 3325-3334. doi: 10.1111/j.1365-294X.2005.02652.x

Lutcavage, M., Plotkin, P., Witherington, B. & Lutz, P. (1997). Human impacts on sea turtle survival. In P. Lutz and J. A. Musick (Eds.), The biology of sea turtles (Vol. 1, pp. 387-409). Boca Raton, FL: CRC Press.

Lutcavage, M. E. & Lutz, P. L. (1997). Diving Physiology. In P. L. Lutz and J. A. Musick (Eds.), The Biology of Sea Turtles (pp. 277-296). Boca Raton, FL: CRC Press.

MacDonald, B.D., R.L. Lewison, S.V. Madrak, J.A. Seminoff, T. Eguchi. (2012). Home ranges of East Pacific green turtles Chelonia mydas in a highly urbanized temperate foraging ground. *Marine Ecology Progress Series 461:*211-221.

Maison, K. A., Kelly, I. K. & Frutchey, K. P. (2010). Green sea turtle Nesting Sites and Sea Turtle Legislation throughout Oceania. (NOAA Technical Memorandum NMFS-F/SPO- 110, pp. 56) U.S. Department of Commerce, National Oceanic and Atmospheric Administration, and National Marine Fisheries Service.

Makowski, C., Seminoff, J. A. & Salmon, M. (2006). Home range and habitat use of juvenile Atlantic green sea turtles (Chelonia mydas L.) on shallow reef habitats in Palm Beach, Florida, USA. Marine Biology, 148, 1167-1179. doi: 10.1007/s00227-005-0150-y

Márquez M., R. (1990). FAO Species Catalogue: SeaTurtles of the World. An Annotated and Illustrated Catalogue of Sea Turtle Species known to date. (Vol. 11, FAO Fisheries Synopsis. No. 125, pp. 81). Rome, Italy: Food and Agriculture Organization of the United Nations.

Mather, J. (2004). Cephalopod Skin Displays: From Concealment to Communication. Chapter 11, Part IV, in: The Evolution of Communication Systems: A Comparitive Approach. Edited by: D. Kimbrough Oller and Ulrike Griebel. The Vienna Series in Theoretical Biology and the Massachusettes Institute of Technology. Cambridge, MA.

McCauley, S. J. & Bjorndal, K. A. (1999). Conservation implications of dietary dilution from debris ingestion: Sublethal effects in post-hatchling loggerhead sea turtles. Conservation Biology, 13(4), 925-929.

McCauley R.D., Fewtrell J., Duncan A.J., Jenner C., Jenner M.-N., Penrose J.D., Prince R.I.T., Adhitya A., Murdoch J., McCabe K.A. (2000). Marine Seismic Surveys: Analysis and Propagation of Air-gun Signals; and Effects of Air-gun Exposure on Humpback Whales, Sea Turtles, Fishes and Squid, Centre for Marine Science and Technology, Western Australia. pp. 198.

McClellan, C. M. & Read, A. J. (2007). Complexity and variation in loggerhead sea turtle life history. Biology Letters 3, 592-594. doi: 10.1098/rsbl.2007.0355

McCracken, M. L. (2000). Estimation of Sea Turtle Take and Mortality in the Hawaiian Longline Fisheries. (SWFSC Administrative Report H-00-06, pp. 29). Honolulu, HI: Southwest Fisheries Science Center.

McVey, J.P. & Wibbels, T. (1984). The growth and movements of captive-reared Kemp's ridley sea turtles, Lepidochelys kempi, following their release in the Gulf of Mexico. NOAA Technical Memorandum NMFS-SEFC-145, 25p.

Meylan, A. (1995). Sea turtle migration evidence from tag returns. In K. A. Bjorndal (Ed.), Biology and Conservation of Sea Turtles (Revised ed., pp. 91-100). Washington, DC: Smithsonian Institution Press.

Meylan, A. B. (1988). Spongivory in hawksbill turtles: A diet of glass. Science, 239, 393-395.

Meylan, A. B. (1999). International movements of immature and adult hawksbill turtles (Eretmochelys imbricata) in the Caribbean region. Chelonian Conservation and Biology, 3(2), 189-194.

Meylan, A. B. & Donnelly, M. (1999). Status justification for listing the hawksbill turtle (Eretmochelys imbricata) as critically endangered on the 1996 IUCN Red List of Threatened Animals. Chelonian Conservation and Biology, 3(2), 200-224.

Miller, J. D., Limpus, C. J. & Godfrey, M. H. (2003). Nest site selection, oviposition, eggs, development, hatching, and emergence of loggerhead turtles. In A. B. Bolten and B. E. Witherington (Eds.), Loggerhead Sea Turtles (pp. 125-143). Washington, DC: Smithsonion Institution Press.

Moein Bartol S.E., Musick J.A., Keinath J.A., Barnard D.E., Lenhardt M.L., George R. (1995). Evaluation of Seismic Sources for Repelling Sea Turtles from Hopper Dredges, in: L. Z. Hales (Ed.), Sea Turtle Research Program: Summary Report, U.S. Army Engineer Division, South Atlantic, Atlanta, Georgia and U.S. Naval Submarine Base, Kings Bay, Georgia. pp. 90-93.

Morreale, S. J., Standora, E. A., Spotila, J. R. & Paladino, F. V. (1996). Migration corridor for sea turtles. Nature, 384, 319-320.

Mortimer, J. A. (1995). Feeding ecology of sea turtles. In K. A. Bjorndal (Ed.), Biology and Conservation of Sea Turtles (Revised ed., pp. 103-109). Washington, DC: Smithsonian Institution Press.

Mortimer, J. A. & Bresson, R. (1999). Temporal distribution and periodicity in hawksbill turtles (Eretmochelys imbricata) nesting at Cousin Island, Republic of Seychelles, 1971-1997. Chelonian Conservation and Biology, 3(2), 318-325.

Mortimer, J. A. & Donnelly, M. (2008). Hawksbill Turtle (Eretmochelys imbricate): Marine Turtle Specialist Group 2008 IUCN Red List status assessment. [Web Page]. Retrieved from www.iucnredlist.org, 03 September 2009.

Mrosovsky, N. (1980). Thermal biology of sea turtles. American Zoologist, 20(3), 531-547.

Mrosovsky, N. & Pritchard, P. C. H. (1971). Body temperatures of Dermochelys coriacea and other sea turtles. Copeia, 1971(4), 624-631.

Mrosovsky, N., Ryan, G. D. & James, M. C. (2009). Leatherback turtles: The menace of plastic. Marine Pollution Bulletin, 58, 287-289.

Musick, J. A. & Limpus, C. J. (1997). Habitat utilization and migration of juvenile sea turtles. In P. L. Lutz and J. A. Musick (Eds.), The Biology of Sea Turtles (pp. 137-163). Boca Raton, FL: CRC Press.

Myers, A. E. & Hays, G. C. (2006). Do leatherback turtles Dermochelys coriacea forage during the breeding season? A combination of data-logging devices provide new insights. Marine Ecology Progress Series, 322, 259-267.

Nachtigall P.E., Pawloski J.L., Au W.W.L. (2003). Temporary Threshold Shifts and Recovery Following Noise Exposure in the Atlantic Bottlenosed Dolphin (Tursiops truncatus). Journal of the Acoustical Society of America 113:3425-3429.

Nachtigall P.E., Supin A.Y., Pawloski J., Au W.W.L. (2004) Temporary Threshold Shifts after Noise Exposure in the Bottlenose Dolphin (Tursiops truncatus) Measured Using Evoked Auditory Potentials. Marine Mammal Science 20:673–687.

National Marine Fisheries Service. (2003). Taking of threatened or endangered species incidental to commercial fishing operations. Final rule and technical correction. [Final Rule]. Federal Register, 68(241), 69962-69967.

National Marine Fisheries Service. (2005). Endangered Fish and Wildlife; Notice of intent to prepare an environmental impact statement. 70 FR 1871.

National Marine Fisheries Service. (2010a). Endangered and threatened species; proposed listing of nine distinct population segments of loggerhead sea turtles as endangered or threatened. [Proposed Rule]. Federal Register, 75(50), 12598-12656.

National Marine Fisheries Service. (2010b). Marine Turtles. [Web Page] NOAA Fisheries Office of Protected Resources. Retrieved from http://www.nmfs.noaa.gov/pr/species/turtles/, 25 May 2010.

National Marine Fisheries Service, Pacific Islands Fisheries Science Center. (2004). Cause of Stranding Database for Marine Turtle Strandings in the Hawaiian Islands, 1982-2003. (Vol. 154). Honolulu, HI: National Marine Fisheries Service Pacific Islands Fisheries Science Center.

National Marine Fisheries Service, Southeast Fisheries Science Center. (2001). Stock Assessments of Loggerhead and Leatherback Sea Turtles and an Assessment of the Impact of the Pelagic Longline Fishery on the Loggerhead and Leatherback Sea Turtles of the Western North Atlantic. (NOAA Technical Memorandum NMFS-SEFSC-455, pp. 343) U.S. Department of Commerce.

National Marine Fisheries Service. (2008). Programmatic biological opinion on the U.S. Navy's proposal to conduct training exercises in the Hawai'i Range Complex from December 2008 to December 2013. Office of Protected Resources. National Oceanic and Atmospheric Administration, Silver Spring, MD.

National Marine Fisheries Service. (2011). Hawaii Longline Deep Set Quarterly and Annual Status Reports, 2004 2011. Retreived from: http://www.fpir.noaa.gov/OBS/obs_hi_ll_ds_rprts.html.

National Marine Fisheries Service. (2012). Endangered and Threatened Species: Final Rule To Revise the Critical Habitat Designation for the Endangered Leatherback Sea Turtle. 50 CFR Part 226 Docket No. 0808061067–1664–03.

National Marine Fisheries Service & U.S. Fish and Wildlife Service. (1991). Recovery Plan for U.S. Populations of Atlantic Green sea turtle Chelonia mydas. (pp. 52). Washington, DC: National Marine Fisheries Service.

National Marine Fisheries Service & U.S. Fish and Wildlife Service. (1992). Recovery Plan for Leatherback Turtles Dermochelys coriacea in the U.S. Carribean, Atlantic and Gulf of Mexico (pp. 65). Silver Spring, MD: National Marine Fisheries Service.

National Marine Fisheries Service & U.S. Fish and Wildlife Service. (1998a). Recovery Plan for U.S. Pacific Populations of the East Pacific Green sea turtle (Chelonia mydas). (pp. 61). Silver Spring, MD: National Marine Fisheries Service.

National Marine Fisheries Service & U.S. Fish and Wildlife Service. (1998b). Recovery Plan for U.S. Pacific Populations of the Green sea turtle (Chelonia mydas). (pp. 84). Silver Spring, MD: National Marine Fisheries Service.

National Marine Fisheries Service & U.S. Fish and Wildlife Service. (1998c). Recovery Plan for U.S. Pacific Populations of the Hawksbill Turtle (Eretmochelys imbricata). (pp. 83). Silver Spring, MD: National Marine Fisheires Service.

National Marine Fisheries Service & U.S. Fish and Wildlife Service. (1998d). Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (Dermochelys coriacea). (pp. 65). Silver Spring, MD: National Marine Fisheries Service.

National Marine Fisheries Service & U.S. Fish and Wildlife Service. (1998e). Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle (Caretta caretta). (pp. 59). Silver Spring, MD: National Marine Fisheries Service.

National Marine Fisheries Service & U.S. Fish and Wildlife Service. (1998f). Recovery Plan for U.S. Pacific Populations of the Olive Ridley Turtle (Lepidochelys olivacea). (pp. 52). Silver Spring, MD: National Marine Fisheries Service.

National Marine Fisheries Service & U.S. Fish and Wildlife Service. (2007a). Green Sea Turtle (Chelonia mydas) 5-year Review: Summary and Evaluation. (pp. 102). Silver Spring, MD: National Marine Fisheries Service.

National Marine Fisheries Service & U.S. Fish and Wildlife Service. (2007b). Hawksbill Sea Turtle (Eretmochelys imbricata) 5-year Review: Summary and Evaluation. (pp. 90). Silver Spring, MD: National Marine Fisheries Service.

National Marine Fisheries Service & U.S. Fish and Wildlife Service. (2007c). Leatherback Sea Turtle (Dermochelys coriacea) 5-year Review: Summary and Evaluation. (pp. 79). Silver Spring, MD: National Marine Fisheries.

National Marine Fisheries Service & U.S. Fish and Wildlife Service. (2007d). Loggerhead Sea Turtle (Caretta caretta) 5-year Review: Summary and Evaluation. (pp. 65). Silver Spring, MD: National Marine Fisheries Service.

National Marine Fisheries Service & U.S. Fish and Wildlife Service. (2007e). Olive Ridley Sea Turtle (Lepidochelys olivacea) 5-year Review: Summary and Evaluation. (pp. 64). Silver Spring, MD: National Marine Fisheries Service.

National Research Council. (2010). Assessment of Sea-Turtle Status and Trends: Integrating Demography and Abundance. Committee on the Review of Sea-Turtle Population Assessment Methods Ocean Studies Board Division on Earth and Life Studies. The National Academies Press. Washington, D.C.

Neill, W. H. & Stevens, E. D. (1974). Thermal inertia versus thermoregulation in "warm" turtles and tunas. Science, 184, 1008-1010.

Normandeau, Exponent, T., T. & Gill, A. (2011). Effects of Electromagnetic Fields from Undersea Power Cables on Elasmobranchs and Other Marine Species. Camarillo, California: U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific Outer Continental Shelf Region. Available from http://www.gomr.boemre.gov/PI/PDFImages/ESPIS/4/5115.pdf

Office of the Surgeon General. (1991). USA Textbook of Military Medicine; Part 1, Volume 5. Conventional Warfare; Ballistic, Blast and Burn Injuries.

O'Hara J., & Wilcox J.R. (1990). Avoidance responses of loggerhead turtles, Caretta caretta, to low frequency sound. Copeia 2:564-567.

Okuyama, J., S. Tomohito, O. Abe, K. Yoseda, & N. Arai. (2010). Wild versus head-started hawksbill turtles Eretmochelys imbricata: post-release behavior and feeding adaptions. Endangered Species Research, January 2010.

O'Malley, A. E. (2010). The Navy's Nature Guy. Midweek Kaua'i. Retrieved from http://www.midweekkauai.com/2010/09/the-navys-nature-guy

Paladino, F. V., O'Connor, M. P. & Spotila, J. R. (1990). Metabolism of leatherback turtles, gigantothermy and thermoregulation of dinosaurs. Nature, 344, 858-860.

Parker, D. M. & Balazs, G. H. (2005). Diet of the oceanic green sea turtle, Chelonia mydas, in the north Pacific. In H. Kalb, A. S. Rohde, K. Gayheart and K. Shanker (Eds.), Proceedings of the Twenty-fifth Annual Symposioum on Sea Turtle Biology and Conservation [Abstract]. (NOAA Technical Memorandum NMFS-SEFSC-582, pp. 94) U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service.

Parker, D. M., Balazs, G. H., King, C. S., Katahira, L. & Gilmartin, W. (2009). Short-range movements of Hawksbill turtles (Eretmochelys imbricata) from nesting to foraging areas within the Hawaiian Islands. Pacific Science, 63(3), 371-382.

Parker, D. M., Dutton, P. H., Kopitsky, K. & Pitman, R. L. (2003). Movement and dive behavior determined by satellite telemetry for male and female olive ridley turtles in the Eastern Tropical Pacific. In J. A. Seminoff (Ed.), Proceedings of the Twenty-Second Annual Symposium on Sea Turtle

Biology and Conservation [Abstract]. (NOAA Technical Memorandum NMFS-SEFSC-503, pp. 48-49) U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service. Available from http://www.nmfs.noaa.gov/pr/species/turtles/symposia.htm

Parker, L. G. (1995). Encounter with a juvenile hawksbill turtle offshore Sapelo Island, Georgia. Marine Turtle Newsletter, 71, 19-22. Retrieved from http://www.seaturtle.org/mtn/archives/mtn71/mtn71p19.shtml

Pelletier, D., Roos, D. & Ciccione, S. (2003). Oceanic survival and movements of wild and captive-reared immature green sea turtles (Chelonia mydas) in the Indian Ocean. Aquatic Living Resources, 16, 35-41. doi: 10.1016/S0990-7440(03)00005-6

Pepper C.B., Nascarella M.A., Kendall R.J. (2003). A review of the effects of aircraft noise on wildlife and humans, current control mechanisms, and the need for further study. Environmental Management 32:418-432.

Pitman, R. L. (1990). Pelagic distribution and biology of sea turtles in the eastern tropical Pacific. In T. H. Richardson, J. I. Richardson and M. Donnelly (Eds.), Proceedings of the Tenth Annual Workshop on Sea Turtle Biology and Conservation. (NOAA Technical Memorandum NMFS-SEFC-278, pp. 143-150) U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service.

Pitman, R. L. (1992). Sea turtle associations with flotsam in the eastern tropical Pacific Ocean. In M. Salmon and J. Wyneken (Eds.), Proceedings of the Eleventh Annual Workshop on Sea Turtle Biology and Conservation [Abstract]. (NOAA Technical Memorandum NMFS-SEFSC-302, pp. 94) U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service.

Plotkin, P. T., Byles, R. A. & Owens, D. W. (1994). Post-breeding movements of male olive ridley sea turtles Lepidochelys olivacea from a nearshore breeding area. In K. A. Bjorndal, A. B. Bolton, D. A. Johnson and P. J. Eliazar (Eds.), Proceedings of the Fourteenth Annual Symposium on Sea Turtle Biology and Conservation [Abstract]. (NOAA Technical Memorandum NMFC-SEFSC-351) U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service.

Polovina, J. J., Balazs, G. H., Howell, E. A., Parker, D. M., Seki, M. P. & Dutton, P. H. (2004). Forage and migration habitat of loggerhead (Caretta caretta) and olive ridley (Lepidochelys olivacea) sea turtles in the central North Pacific Ocean. Fisheries Oceanography, 13(1), 36-51.

Polovina, J. J., Howell, E., Kobayashi, D. R. & Seki, M. P. (2001). The transition zone chlorophyll front, a dynamic global feature defining migration and forage habitat for marine resources. Progress in Oceanography, 49, 469-483.

Polovina, J. J., Howell, E., Parker, D. M. & Balazs, G. H. (2002). Dive-depth distribution of loggerhead (Caretta caretta) and olive ridley (Lepidochelys olivacea) sea turtles in the central North Pacific:Might deep longline sets catch fewer turtles? Fishery Bulletin, 101(1), 189-193.

Polovina, J. J., Kobayashi, D. R., Parker, D. M., Seki, M. P. & Balazs, G. H. (2000). Turtles on the edge: movement of loggerhead turtles (Caretta caretta) along oceanic fronts, spanning longline fishing grounds in the central North Pacific, 1997-1998. Fisheries Oceanography, 9(1), 71-82.

Polovina, J. J., Uchida, I., Balazs, G. H., Howell, E., Parker, D. M. & Dutton, P. (2006). The Kuroshio Extension Bifurcation Region: A pelagic hotspot for juvenile loggerhead sea turtles. Deep-Sea Research II, 53, 326-339. doi: 10.1016/j.dsr2.2006.01.006

Pritchard, P. C. H. (1982). Nesting of the leatherback turtle, Dermochelys coriacea in Pacific Mexico, with a new estimate of the world population status. Copeia, 1982(4), 741-747.

Pritchard, P. C. H. (1997). Evolution, phylogeny, and current status. In P. L. Lutz and J. A. Musick (Eds.), The Biology of Sea Turtles (pp. 1-28). Boca Raton, FL: CRC Press.

Pritchard, P. C. H. & Plotkin, P. T. (1995). Olive ridley sea turtle, Lepidochelys olivacea. In P. T. Plotkin (Ed.), National Marine Fisheries Service and U.S. Fish and Wildlife Service Status Reviews of Sea Turtles Listed under the Endangered Species Act of 1973. (pp. 123-139). Silver Spring, MD: National Marine Fisheries Service.

Rees, A. F., Frick, M., Panagopoulou, A. & Williams, K. (2008). Proceedings of the twenty-seventh annual symposium on sea turtle biology and conservation National Oceanic and Atmospheric Administration Technical Memorandum. (pp. 262).

Reich, K. J., Bjorndal, K. A., Bolten, A. B. & Witherington, B. (2007). Do some loggerheads nesting in Florida have an oceanic foraging strategy? An assessment based on stable isotopes. In R. B. Mast, B. J. Hutchinson and A. H. Hutchinson (Eds.), Proceedings of the Twenty-fourth Annual Symposium on Sea Turtle Biology and Conservation [Abstract]. (NOAA Technical Memorandum NMFS-SEFSC-567, pp. 32) U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service.

Reinhall, P.G. and P.H. Dahl. (2011). Acoustic radiation during marine pile driving. J. Acoust. Soc. Am., 129, 2460, doi:10.1121/1.3588091, 2011

Renaud, M. L. & Carpenter, J. A. (1994). Movements and submergence patterns of loggerhead turtles (Caretta caretta) in the Gulf of Mexico determined through satellite telemetry. Bulletin of Marine Science, 55(1), 1-15.

Resendiz, A., Resendiz, B., Nichols, W. J., Seminoff, J. A. & Kamezaki, N. (1998). First confirmed east-west transpacific movement of a loggerhead sea turtle, Caretta caretta, released in Baja California, Mexico. Pacific Science, 52(2), 151-153.

Rice, M. R. & Balazs, G. H. (2008). Diving behavior of the Hawaiian green sea turtle (Chelonia mydas) during oceanic migrations. Journal of Experimental Marine Biology and Ecology, 356(1-2), 121-127. doi: 10.1016/j.jembe.2007.12.010

Richmond D.R., Yelverton J.T., Fletcher E.R. (1973). Far-field underwater-blast injuries produced by small charges, Lovelace Foundation for Medical Education and Research, Defense Nuclear Agency, Washington, DC. pp. 108.

Ridgway S.H., Wever E.G., McCormick J.G., Palin J., Anderson J.H. (1969). Hearing in the giant sea turtle, Chelonia mydas. Proceedings of the National Academy of Sciences USA 64:884-890.

Richardson, J. I., R. Bell and T. H. Richardson. (1999). Population ecology and demographic implications drawn from an 11-year study of nesting hawksbill turtles, Eretmochelys imbricata, at Jumby Bay, Long Island, Antigua, West Indies. *Chelonian Conservation and Biology 3*(2): 244-250.

Rivers, J. (2011). Sea turtles nesting and in-water sightings in the Hawaiian Islands. Personal communication with Julie Rivers, Pacific Fleet Marine Biologist via comments on the HSTT DEIS v1.

Rosen, G. & Lutufo, G.R. (2010). Fate and effects of Composition B in multispecies marine exposures. *Environmental Toxicology and Chemistry 29*(6):1330-1337.

Sale, A., Luschi, P., Mencacci, R., Lambardi, P., Hughes, G. R., Hays, G. C., Papi, F. (2006). Long-term monitoring of leatherback turtle diving behaviour during oceanic movements. Journal of Experimental Marine Biology and Ecology, 328, 197-210. doi: 10.1016/j.jembe.2005.07.006

Salmon, M., Jones, T. T. & Horch, K. W. (2004). Ontogeny of diving and feeding behavior in juvenile seaturtles: Leatherback seaturtles (Dermochelys coriacea L) and green seaturtles (Chelonia mydas L) in the Florida current. Journal of Herpetology, 38(1), 36-43.

Sakamoto, W., K. Sato, H. Tanaka, and Y. Naito. (1993). Diving patterns and swimming environment of two loggerhead turtles during internesting. Nippon Suisan Gakkaishi 59(7):1129-1137.

Sarti-Martinez, A. L. (2000). Dermochelys coriacea. In IUCN 2009. IUCN Red List of Threatened Species. Version 2009.2 Retrieved from www.iucnredlist.org, 19 November 2009.

Sarti-Martinez, L., Eckert, S. A., Garcia T., N. & Barragan, A. R. (1996). Decline of the world's largest nesting assemblage of leatherback turtles. Marine Turtle Newsletter, 74, 2-5. Retrieved from http://www.seaturtle.org/mtn/archives/mtn74/mtn74p2.shtml

Sasso, C. R. & Witzell, W. N. (2006). Diving behaviour of an immature Kemp's ridley turtle (Lepidochelys kempii) from Gullivan Bay, Ten Thousand Islands, south-west Florida. Journal of the Marine Biological Association of the United Kingdom, 86, 919-925.

Schecklman, S., Houser, D., Cross, M., Hernandez, D., and M. Siderius. (2011). Comparison of methods used for computing the impact of sound on the marine environment. Marine Environmental Research, vol. 71 (5): 342-350.

Schlundt, C.E., Finneran, J.J., Carder, D.A., and Ridgway, S.H. (2000). Temporary shift in masked hearing thresholds of bottlenose dolphins, Tursiops truncatus, and white whales, Delphinapterus leucas, after exposure to intense tones. J. Acoust. Soc. Am. 107: 3496–3508.

Schofield, G., Hobson, V. J., Lilley, M. K. S., Katselidis, K. A., Bishop, C. M., Brown, P. & Hays, G. C. (2010). Inter-annual variability in the home range of breeding turtles: Implications for current and future conservation management. Biological Conservation, 143(3), 722-730. doi: 10.1016/j.biocon.2009.12.011

Schroeder, B. A., Foley, A. M. & Bagley, D. A. (2003). Nesting patterns, reproductive migrations, and adult foraging areas of loggerhead turtles. In A. B. Bolten and B. E. Witherington (Eds.), Loggerhead Sea Turtles (pp. 114-124). Washington, DC: Smithsonian Institution Press.

Seminoff, J. A., Jones, T. T., Resendiz, A., Nichols, W. J. & Chaloupka, M. Y. (2003). Monitoring green sea turtles (Chelonia mydas) at a coastal foraging area in Baja California, Mexico: multiple indices describe population status. Journal of the Marine Biological Association of the United Kingdom, 83, 1355-1362.

Seminoff, J. A. & Marine Turtle Specialist Group Green sea turtle Task Force (2004). Marine Turtle Specialist Group Review: 2004 Global Status Assessment, Green sea turtle (Chelonia mydas). (pp. 71) The World Conservation Union (IUCN) Species Survival Commission, Red List Programme.

Seminoff, J. A., Nichols, W. J., Resendiz, A. & Brooks, L. (2003). Occurrence of hawksbill turtles, Eretmochelys imbricata (Reptilia: Cheloniidae), near the Baja California peninsula, Mexico. Pacific Science, 57(1), 9-16.

Shankar, K., Ramadevi, J., Choudhary, B. C., Singh, L. & Aggarwal, R. K. (2004). Phylogeography of olive ridley turtles (Lepidochelys olivacea) on the east coast of India: implications for conservation theory. Molecular Ecology, 13 1899-1909. doi: 10.1111/j.1365-294X.2004.02195.x

Skillman, R. A. & Balazs, G. H. (1992). Leatherback turtle captured by ingestion of squid bait on swordfish longline. Fishery Bulletin, 90, 807-808.

Skillman, R. A. & Kleiber, P. (1998). Estimation of Sea Turtle Take and Mortality in the Hawai'i-based Longline Fishery, 1994-96. (NOAA Technical Memorandum NMFS-SWFSC-257, pp. 52) U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service and Southwest Fisheries Science Center.

Smith, S. (2010), NAVFAC PAC. Sea turtles in Pearl Harbor. Telephone call K. Kelly, Tetra Tech, Inc., Honolulu, HI.

Smith, S. H., Deslarzes, K. J. P. & Brock, R. (2006). Characterization of Fish and Benthic Communities of Pearl Harbor and Pearl Harbor Entrance Channel, Hawai'i. (Project Number 03-183, pp. 83). Prepared for NAVFAC Pacific.

Soma, M. (1985). Radio biotelemetry system applied to migratory study of turtle. Journal of the Faculty of Marine Science and Technology, 21, 47-56.

Southall B.L., Bowles A.E., Ellison W.T., Finneran J.J., Gentry R.L., Greene Jr. C.R., Kastak D., Ketten D.R., Miller J.H., Nachtigall P.E., Richardson W.J., Thomas J.A., Tyack P.L. (2007). Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals 33:411-521.

Southwood, A. L., Andrews, R. D., Lutcavage, M. E., Paladino, F. V., West, N. H., George, R. H. & Jones, D. R. (1999). Heart rates and diving behavior of leatherback sea turtles in the eastern Pacific Ocean. Journal of Experimental Biology, 202, 1115-1125.

Spotila, J. R., Dunham, A. E., Leslie, A. J., Steyermark, A. C., Plotkin, P. T. & Paladino, F. V. (1996). Worldwide population decline of Dermochelys coriacea: Are leatherback turtles going extinct? Chelonian Conservation and Biology, 2(2), 209-222.

Spotila, J. R., Reina, R. D., Steyermark, A. C., Plotkin, P. T. & Paladino, F. V. (2000). Pacific leatherback turtles face extinction. Nature, 405, 529-530.

Stancyk, S. E. (1982). Non-human predators of sea turtles and their control. In K. A. Bjorndal (Ed.), Biology and Conservation of Sea Turtles (pp. 139-152). Washington, DC: Smithsonian Institution Press.

Stanley, K. M., Stabenau, E. K. & Landry, A. M. (1988). Debris ingestion by sea turtles along the Texas coast. In Proceedings of the Eighth Annual Workshop on Sea Turtle Conservation and Biology, 24-26 February 1988, Fort Fisher, North Carolina. (NOAA Technical Memorandum NMFS-SEFC-214, pp. 119-121) U. S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

Starbird, C. H., Baldridge, A. & Harvey, J. T. (1993). Seasonal occurrence of leatherback sea turtles (Dermochelys coriacea) in the Monterey Bay region, with notes on other sea turtles, 1986-1991. California Fish and Game, 79(2), 54-62.

Steiner, T. & Walder, R. (2005). Two records of live olive ridleys from central California, USA. Marine Turtle Newsletter, 107, 9-10. Retrieved from http://www.seaturtle.org/mtn/archives/mtn107/mtn107p9.shtml

Stinson, M. L. (1984). Biology of Sea Turtles in San Diego Bay, California, and in the Northeastern Pacific Ocean. San Diego State University, San Diego, CA.

Storch, S., Wilson, R. P., Hillis-Starr, Z. M. & Adelung, D. (2005). Cold-blooded divers: temperature-dependent dive performance in the wild hawksbill turtle Eretmochelys imbricata. Marine Ecology Progress Series, 293, 263-271.

Suarez, A., Dutton, P. H. & Bakarbessy, J. (2000). Leatherback (Dermochelys coriacea) nesting on the north Vogelkop coast of Irian Jaya, Indonesia. In H. Kalb and T. Wibbels (Eds.), Proceedings of the Nineteenth Annual Symposium on Sea Turtle Biology and Conservation [Abstract]. (NOAA Technical Memorandum NMFS-SEFSC-443, pp. 260) U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service.

Tomás, J., Guitart, R., Mateo, R. & Raga, J. A. (2002). Marine debris ingestion in loggerhead sea turtles, Caretta caretta, from the Western Mediterranean. Marine Pollution Bulletin, 44, 211-216.

Turtle Expert Working Group. (2007). An Assessment of the Leatherback Turtle Population in the Atlantic Ocean. (NOAA Technical Memorandum NMFS-SEFSC-555, pp. 116) U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service and Southeast Fisheries Science Center.

U.S. Department of the Navy. (1996). Environmental Assessment of the Use of Selected Navy Test Sites for Development Tests and Fleet Training Exercises of the MK 48 Torpedoes. Program Executive Office Undersea Warfare: Program Manager for Undersea Weapons.

U.S. Department of the Navy. (2001a). Integrated Natural Resources Management Plan: Pacific Missile Range Facility Hawaii [Final Report]. (pp. 376). Honolulu, Hawaii. Prepared by Belt Collins Hawaii Ltd. Prepared for Commander, Navy Region Hawaii.

U.S. Department of the Navy. (2001b). Pearl Harbor Naval Complex Integrated Natural Resources Management Plan. [Final Report]. (pp. 434). Honolulu, Hawai'i. Prepared by Helber Hastert & Fee Planners. Prepared for Commander Navy Region Hawaii.

U.S. Department of the Navy. (2002). Environmental Assessment for the Hawaiian Islands Shallow Water Training Range [Final Report]. Pearl Harbor, Hawaii. Prepared by Commander in Chief U.S. Pacific Fleet.

U.S. Department of the Navy. (2011). Silver Strand Training Complex Final EIS.

U.S. Department of the Navy & San Diego Unified Port District. (2011). San Diego Bay Integrated Natural Resources Management Plan, September 2011. (pp. 674). San Diego, CA. Prepared by T. D. Systems. Prepared for the U.S. Department of the Navy, Southwest Division and San Diego Unified Port District, San Diego, California by Tierra Data Systems, Escondido, California.

Van Dam, R. P. & Diez, C. E. (1996). Diving behavior of immature hawksbills (Eretmochelys imbricata) in a Caribbean cliff-wall habitat. Marine Biology, 127, 171-178.

Viada S.T., Hammer R.M., Racca R., Hannay D., Thompson M.J., Balcom B.J., Phillips N.W. (2008). Review of Potential Impacts to Sea Turtles from Underwater Explosive Removal of offshore Structures. Environmental Impact Assessment Review 28:267-285.

Wallace, B. P., Lewison, R. L., McDonald, S. L., McDonald, R. K., Kot, C. Y., Kelez, S., & Crowder, L. B. (2010). Global patterns of marine turtle bycatch. Conservation Letters, 3(3), 131-142. doi: 10.1111/j.1755-263X.2010.00105.x

Ward, W. D., Glorig, A., & Sklar, D. L. (1958). Dependence of temporary threshold shift at 4 kc on intensity and time. Journal of the Acoustical Society of America, 30, 944-954.

Ward, W. D., Glorig, A., & Sklar, D. L. (1959). Temporary threshold shift from octave-band noise: Applications to damage-risk criteria. Journal of the Acoustical Society of America, 31, 522-528.

Wartzok D., Ketten D.R. (1999). Marine Mammal Sensory Systems, in: J. E. Reynolds III and S. A. Rommel (Eds.), Biology of Marine Mammals, Smithsonian Institution Press, Washington, D.C. pp. 117-175.

Weir, C. (2007). Observations of Marine Turtles in Relation to Seismic Airgun Sound off Angola. *Marine Turtle Newsletter 116*: 17-20.

Wever E.G. (1978). The Reptile Ear: Its Structure and Function Princeton University Press, Princeton, New Jersey.

Witherington, B. & Hirama, S. (2006). Sea turtles of the epi-pelagic sargassum drift community. In M. Frick, A. Panagopoulou, A. F. Rees and K. Williams (Eds.), Book of Abstracts. Twenty-sixth Annual Symposium on Sea Turtle Biology and Conservation (Abstract, pp. 209). Athens, Greece: International Sea Turtle Society.

Witt, M. J., Hawkes, L. A., Godfrey, M. H., Godley, B. J. & Broderick, A. C. (2010). Predicting the impacts of climate change on a globally distributed species: the case of the loggerhead turtle. Journal of Experimental Biology, 213(6), 901-911. doi: 10.1242/jeb.038133

Witzell, W. N. (1983). Synopsis of Biological Data on the Hawksbill Turtle Eretmochelys imbricate (Linnaeus, 1766). (FAO Fisheries Synopsis 137, pp. 78). Rome, Italy: Food and Agriculture Organization of the United Nations.

Wood, F., & J. Wood. (1993). Release and recapture of captive-reared green sea turtles, Chelonia mydas, in the waters surrounding the Cayman Islands. Herpetological Journal 3:84-89.

Wyneken J. (2001). The Anatomy of Sea Turtles, The Anatomy of Sea Turtles [Technical Memorandum]. (National Oceanic and Atmospheric Administration Technical Memorandum NMFS-SEFSC-470, pp. 172) U.S. Department of Commerce. pp. 172.

Yelverton J.T., Richmond D.R., Fletcher E.R., Jones R.K. (1973). Safe distances from underwater explosions for mammals and birds, Lovelace Foundation for Medical Education and Research, Albuquerque, New Mexico. pp. 66.

Yelverton J.T., Richmond D.R., Hicks W., Saunders K., Fletcher E.R. (1975). The Relationship Between Fish Size and Their Response to Underwater Blast, in: Defense Nuclear Agency (Ed.), Lovelace Foundation for Medical Education and Research, Washington, D.C. pp. 40.

Yelverton, J.T. & Richmond D.R. (1981). Underwater Explosion Damage Risk Criteria for Fish, Birds, and Mammals, 102nd Meeting of the Acoustical Society of America Journal of the Acoustical Society of America, Miami Beach, Florida. pp. S84.

Yudhana, A., Din, J., Sundari, A.S., & Hassan, R.B.R. (2010). Green turtle hearing identification based on frequency spectral analysis. *Applied Physics Research 2,* 125-134.

Zenteno, M., Herrera, M., Barragan, A. & Sarti, L. (2008). Impact of Different Kinds and Times of Retention in Olive Ridley's (Lepidochelys olivacea) Hatchlings in Blood Glucose Levels. Presented at the Twnety-Seventh Annual Symposium on Sea Turtles, Myrtle Beach, South Carolina.

Zug, G. R., Chaloupka, M. & Balazs, G. H. (2006). Age and growth in olive ridley sea turtles *(Lepidochelys olivacea*) from the North-central Pacific: a skeletochronological analysis. *Marine Ecology, 27*, 263-270. doi: 10.1111/j.1439-0485.2006.00109.x

Zug, G. R. & Parham, J. F. (1996). Age and growth in leatherback turtles *Dermochelys coriacea* (Testudines: Dermochelyidae): a skeletochronological analysis. *Chelonian Conservation and Biology*, 2(2), 244-249.

3.6 Seabirds

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

There are no figures in this section.

This Page Intentionally Left Blank

3.6 SEABIRDS

SEABIRDS SYNOPSIS

The United States Department of the Navy considered all potential stressors, and the following have been analyzed for birds:

- Acoustic (sonar and other active acoustic sources, underwater explosives, pile driving, swimmer defense airguns, vessel noise, and aircraft noise)
- Energy (electromagnetic devices)
- Physical disturbance and strike (aircraft, vessels and in-water devices, and military expended materials)
- Ingestion (munitions, military expended materials other than munitions)
- Secondary

Preferred Alternative (Alternative 2)

- Acoustics: Pursuant to the Endangered Species Act (ESA), the use of sonar and other active acoustic sources, explosives, swimmer defense airguns, and aircraft noise may affect but is not likely to adversely affect ESA-listed seabirds. Pile driving may affect but is not likely to adversely affect California least terns and would have no effect on other ESA-listed seabirds. Vessels would have no effect on ESA-listed seabirds. Acoustic sources would have no effect on critical habitat.
- Energy: Pursuant to the ESA, the use of electromagnetic devices may affect but is not likely to adversely affect ESA-listed seabirds. Energy sources would have no effect on critical habitat.
- Physical Disturbance and Strike: Pursuant to the ESA, the use of aircraft, vessels and in-water devices, and military expended materials may affect but is not likely to adversely affect ESA-listed seabirds. Physical disturbance and strike sources would have no effect on critical habitat.
- Ingestion: Pursuant to the ESA, the potential for ingestion of military expended materials may affect but is not likely to adversely affect ESA-listed seabirds.
- Secondary: Pursuant to the ESA, secondary stressors may affect but are not likely to adversely affect ESA-listed seabirds. Secondary stressors would not affect critical habitat.

3.6.1 INTRODUCTION

This chapter provides the analysis of potential impacts on seabirds that are found in the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area). This section provides an introduction to the species and taxonomic groups that occur in the Study Area. Section 3.6.2 provides detailed information on the baseline affected environment. The complete analysis and summary of potential impacts of the proposed action on seabirds are found in Sections 3.6.3 and 3.6.4 through 3.6.6, respectively.

Seabirds are found throughout the Study Area. This section introduces the Endangered Species Act (ESA)-listed species, the major taxonomic groups of seabirds that occur in the Study Area, species protected under the Migratory Bird Treaty Act, and United States (U.S.) Fish and Wildlife Service Birds of Conservation Concern, and a general description of major species groups of seabirds in the Study Area.

3.6.1.1 Endangered Species Act Species

Five seabird species that occur in the Study Area are listed under the ESA as endangered or threatened species. Additionally, three seabird species are listed under the ESA as candidates for listing. The status, presence, and nesting occurrence of ESA-listed and candidate seabirds in the Study Area are listed in Table 3.6-1. These species will be further discussed in detailed species profiles (Section 3.6.1.4, United States Fish and Wildlife Service Birds of Conservation Concern).

Table 3.6-1: Endangered Species Act Listed Seabird Species Found in the Study Area

Species Name and Regulatory Status[1]			Presence in Study Area[2]		
Common Name	**Scientific Name**	**Endangered Species Act-Listing**	**Open Ocean Area**	**Large Marine Ecosystem**	**Bays, Estuaries, and Rivers**
California least tern	*Sterna antillarum browni*	Endangered	None	California Current (nesting)	San Diego Bay
Hawaiian petrel	*Pterodroma sandwichensis*	Endangered	North Pacific Subtropical Gyre	Insular Pacific-Hawaiian (nesting)	None
Short-tailed albatross	*Phoebastria albatrus*	Endangered	North Pacific Subtropical Gyre	California Current, Insular Pacific-Hawaiian	None
Marbled murrelet	*Brachyramphus marmoratus*	Threatened	None	California Current	None
Newell's shearwater	*Puffinus auricularis newelli*	Threatened	North Pacific Subtropical Gyre	Insular Pacific-Hawaiian (nesting)	None
Band-rumped Storm Petrel	*Oceanodroma castro*	Candidate	North Pacific Subtropical Gyre	Insular Pacific-Hawaiian (nesting)	None
Guadalupe Murrulet	*Synthliboramphus hypoleucus*	Candidate	None	California Current (nesting)	None
Scripps's Murrelet	*Synthliboramphus scrippsi*	Candidate	None	California Current (nesting)	None

[1] Endangered Species Act listing status
[2] Presence in the Study Area indicates open ocean areas (North Pacific Subtropical Gyre) and coastal waters of large marine ecosystems (California Current, Insular Pacific-Hawaiian) in which the species are found. Nesting in the Study Area is indicated in parentheses.

3.6.1.2 Major Bird Groups

There are three major taxonomic groups of seabirds represented in the Study Area (Table 3.6-2). These seabirds may be found in air, at the water's surface, or in the water column of the Study Area. The vertical distribution descriptions provided in Table 3.6-2 are meant to provide a representative description of the taxonomic group; however, due to variations in species behavior, may not apply to all species within each group. Distribution in the water column is indicative of a species that is known to dive under the surface of the water (for example, during foraging). More detailed species descriptions, including diving behavior, are provided in Sections 3.6.2.13 (Order Procellariiformes), 3.6.2.14 (Order Pelecaniformes), and 3.6.2.15 (Order Charadriiformes).

All three major groups of seabirds in the Study Area occur either in open-ocean areas (North Pacific Subtropical Gyre and North Pacific Transition Zone) or coastal waters of large marine ecosystems (California Current and Insular Pacific-Hawaiian) or coastal bays or estuaries (San Diego Bay) (see map of the Study Area in Figure 3.0-1).

3.6.1.3 Migratory Bird Treaty Act Species

A variety of seabird species would be encountered in the Study Area including those listed under the Migratory Bird Treaty Act (U.S. Fish and Wildlife Service 2010b). The Migratory Bird Treaty Act established federal responsibilities for protecting nearly all migratory species of seabirds, eggs, and nests. Migratory bird means any bird, whatever its origin and whether or not raised in captivity, which belongs to a species listed in Section 10.13 of the Migratory Bird Treaty Act, or which is a mutation or a hybrid of any such species, including any part, nest, or egg of any such bird, or any product, whether or not manufactured, which consists, or is composed in whole or part, of any such bird or any part, nest, or egg thereof. Bird migration is defined as the periodic seasonal movement of birds from one geographic region to another, typically coinciding with available food supplies or breeding seasons. Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 Code of Federal Regulations [C.F.R.] Part 21), the U.S. Fish and Wildlife Service has promulgated a rule that authorizes the incidental take of migratory seabirds under certain circumstances (see Section 3.0.1, Regulatory Framework). Of the 1,007 species protected under the Migratory Bird Treaty Act, 105 species occur in the Study Area. These species are not analyzed individually, but rather are grouped based on taxonomic or behavioral similarities based on the stressor that is being analyzed. Conclusions of potential impacts on species protected under the Migratory Bird Treaty Act are presented at the conclusion of each stressor subsection as well as in Section 3.6.4 (Summary of Potential Impacts [Combined Impacts of All Stressors] on Seabirds).

Table 3.6-2: Descriptions and Examples of Major Taxonomic Groups within the Study Area

Major Bird Groups[1]		Vertical Distribution in the Study Area		
Common Name (Taxonomic Group)	**Description**	**Open Ocean Areas[2]**	**Large Marine Ecosystem[2]**	**Bays, Estuaries, and Rivers**
Albatrosses, petrels, shearwaters, and storm-petrels (Order Procellariiformes)	Group of largely pelagic seabirds, fly nearly continuously when at sea, soar low over the water surface to find prey, some species dive below the surface.	Airborne, surface, water column	Airborne, surface, water column	Airborne, surface, water column
Tropicbirds, boobies, pelicans, cormorants, and frigatebirds (Order Pelecaniformes)	Diverse group of large, fish-eating seabirds with four toes joined by webbing, often occur in large flocks near high concentrations of bait fish.	Airborne, surface, water column	Airborne, surface, water column	Airborne, surface, water column
Phalaropes, gulls, noddies, terns, skua, jaegers, and alcids (Order Charadriiformes)	Diverse group of small to medium sized shorebirds, seabirds and allies inhabiting coastal, nearshore, and open-ocean waters	Airborne, surface, water column	Airborne, surface, water column	Airborne, surface, water column

[1] Major taxonomic groups based on American Ornithologists' Union (American Ornithologists' Union 1998), Sibley (Sibley 2000).
[2] Presence in the Study Area includes open ocean areas (North Pacific Subtropical Gyre and North Pacific Transition Zone) and coastal waters of two Large Marine Ecosystems (California Current and Insular Pacific-Hawaiian).

3.6.1.4 United States Fish and Wildlife Service Birds of Conservation Concern

Birds of Conservation Concern are species, subspecies, and populations of migratory and nonmigratory birds that the U.S. Fish and Wildlife Service has determined to be the highest priority for conservation actions (U.S. Fish and Wildlife Service 2008a). The purpose of the Birds of Conservation Concern list is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions needed to conserve these species. Of the 105 species that occur within the Study Area, 13 are considered Birds of Conservation Concern (Table 3.6-3). These species are not analyzed individually, but rather are grouped by taxonomic or behavioral similarities based on the stressor that is being analyzed.

Table 3.6-3: Migratory Bird Treaty Act Species and Birds of Conservation Concern within the Study Area

Family/Subfamily	Common Name	Scientific Name	Birds of Conservation Concern
Order PROCELLARIIFORMES			
Family DIOMEDEIDAE			
	Laysan albatross	*Phoebastria immutabilis*	X
	Black-footed albatross	*Phoebastria nigripes*	X
	Short-tailed albatross	*Phoebastria albatrus*	
Family PROCELLARIIDAE			
	Northern fulmar	*Fulmarus glacialis*	
	Kermadec petrel	*Pterodroma neglecta*	
	Murphy's petrel	*Pterodroma ultima*	
	Mottled petrel	*Pterodroma inexpectata*	
	Juan Fernandez petrel	*Pterodroma externa*	
	Hawaiian petrel	*Pterodroma sandwichensis*	
	White-necked petrel	*Pterodroma cervicalis*	
	Bonin petrel	*Pterodroma hypoleuca*	
	Black-winged petrel	*Pterodroma nigripennis*	
	Cook's petrel	*Pterodroma cookii*	
	Stejneger's petrel	*Pterodroma longirostris*	
	Phoenix petrel	*Pterodroma alba*	
	Tahiti petrel	*Pseudobulweria rostrata*	
	Bulwer's petrel	*Bulweria bulwerii*	
	Streaked shearwater	*Calonectris leucomelas*	
	Pink-footed shearwater	*Puffinus creatopus*	X
	Flesh-footed shearwater	*Puffinus carneipes*	
	Wedge-tailed shearwater	*Puffinus pacificus*	
	Buller's shearwater	*Puffinus bulleri*	
	Sooty shearwater	*Puffinus griseus*	
	Short-tailed shearwater	*Puffinus tenuirostris*	
	Christmas shearwater	*Puffinus nativitatis*	X
	Townsend's shearwater	*Puffinus auricularis*	
	Black-vented shearwater	*Puffinus opisthomelas*	X
Family HYDROBATIDAE			
	Wilson's storm-petrel	*Oceanites oceanicus*	
	Fork-tailed storm-petrel	*Oceanodroma furcata*	
	Leach's storm-petrel	*Oceanodroma leucorhoa*	
	Ashy storm-petrel	*Oceanodroma homochroa*	X
	Band-rumped storm-petrel	*Oceanodroma castro*	X
	Wedge-rumped storm-petrel	*Oceanodroma tethys*	
	Matsudaira's storm-petrel	*Oceanodroma matsudairae*	
	Black storm-petrel	*Oceanodroma melania*	
	Tristram's storm-petrel	*Oceanodroma tristrami*	X
	Least storm-petrel	*Oceanodroma microsoma*	

Table 3.6-3: Migratory Bird Treaty Act Species and Birds of Conservation Concern within the Study Area (continued)

Family/Subfamily	Common Name	Scientific Name	Birds of Conservation Concern
Order PELECANIFORMES			
Family PHAETHONTIDAE			
	Red-billed tropicbird	*Phaethon aethereus*	
	Red-tailed tropicbird	*Phaethon rubricauda*	
	White-tailed tropicbird	*Phaethon lepturus*	
Family SULIDAE			
	Masked booby	*Sula dactylatra*	
	Blue-footed booby	*Sula nebouxii*	
	Brown booby	*Sula leucogaster*	
	Red-footed booby	*Sula sula*	
Family PELECANIDAE			
	American white pelican	*Pelecanus erythrorhynchos*	
	California brown pelican	*Pelecanus occidentalis californicus*	
Family PHALACROCORACIDAE			
	Brandt's cormorant	*Phalacrocorax penicillatus*	
	Double-crested cormorant	*Phalacrocorax auritus*	
	Pelagic cormorant	*Phalacrocorax pelagicus*	
Family FREGATIDAE			
	Magnificent frigatebird	*Fregata magnificens*	
	Great frigatebird	*Fregata minor*	
Order CHARADRIIFORMES			
Family LARIDAE			
Subfamily LARINAE	Laughing gull	*Larus atricilla*	
	Franklin's gull	*Larus pipixcan*	
	Little gull	*Larus minutes*	
	Black-headed gull	*Larus ridibundus*	
	Bonaparte's gull	*Larus philadelphia*	
	Heermann's gull	*Larus heermanni*	
	Mew gull	*Larus canus*	
	Ring-billed gull	*Larus delawarensis*	
	California gull	*Larus californicus*	
	Herring gull	*Larus argentatus*	
Subfamily LARINAE	Thayer's gull	*Larus thayeri*	
	Slaty-backed gull	*Larus schistisagus*	
	Yellow-footed gull	*Larus livens*	
	Western gull	*Larus occidentalis*	
	Glaucous-winged gull	*Larus glaucescens*	
	Glaucous gull	*Larus hyperboreus*	
	Sabine's gull	*Xema sabini*	
	Black-legged kittiwake	*Rissa tridactyla*	

Table 3.6-3: Migratory Bird Treaty Act Species and Birds of Conservation Concern within the Study Area (continued)

Family/Subfamily	Common Name	Scientific Name	Birds of Conservation Concern
Subfamily STERNINAE	Blue noddy	*Procelsterna cerulea*	X
	Black noddy	*Anous minutus*	
	Brown noddy	*Anous stolidus*	
	White tern	*Gygis alba*	
	Sooty tern	*Onychoprion fuscatus*	
	Gray-backed tern	*Onychoprion lunatus*	
	Little tern	*Sternula albifrons*	
	California Least tern	*Sternula antillarum browni*	
	Caspian tern	*Hydroprogne caspia*	
	Black tern	*Chlidonias niger*	
	Common tern	*Sterna hirundo*	
	Arctic tern	*Sterna paradisaea*	
	Forster's tern	*Sterna forsteri*	
	Black-naped tern	*Sterna sumatrana*	
	Royal tern	*Thalasseus maximus*	
	Great Crested tern	*Thalasseus bergii*	
	Elegant tern	*Thalasseus elegans*	
	Gull-billed tern	*Sterna nilotica*	X
Subfamily RYNCHOPINAE	Black skimmer	*Rynchops niger*	X
Family STERCORARIIDAE			
	South polar skua	*Stercorarius maccormicki*	
	Pomarine jaeger	*Stercorarius pomarinus*	
	Parasitic jaeger	*Stercorarius parasiticus*	
	Long-tailed jaeger	*Stercorarius longicaudus*	
Family ALCIDAE			
	Common murre	*Uria aalge*	
	Thick-billed murre	*Uria lomvia*	
	Pigeon guillemot	*Cepphus columba*	
	Long-billed murrelet	*Brachyramphus perdix*	
	Marbled murrelet	*Brachyramphus marmoratus*	
	Guadalupe murrelet	*Synthliboramphus hypoleucus*	X
	Scripps's murrelet	*Synthliboramphus scrippsi*	X
	Craveri's murrelet	*Synthliboramphus craveri*	
	Ancient murrelet	*Synthliboramphus antiquus*	
	Cassin's auklet	*Ptychoramphus aleuticus*	X
	Parakeet auklet	*Aethia psittacula*	
	Rhinoceros auklet	*Cerorhinca monocerata*	
	Horned puffin	*Fratercula corniculata*	
	Tufted puffin	*Fratercula cirrhata*	

3.6.2 Affected Environment

Seabirds are a diverse group that are adapted to living in marine environments (Enticott and Tipling 1997) and use coastal (nearshore) waters, offshore waters (continental shelf), or open ocean areas (Harrison 1983). There are many biological, physical, and behavioral adaptations that are different for seabirds than for terrestrial birds. Seabirds typically live longer, breed later in life, and produce fewer young than other bird species (Onley and Scofield 2007). The feeding habits of seabirds are related to their individual physical characteristics, such as body mass, bill shape, and wing area (Hertel and Ballance 1999; Spear and Ainley 1998). Some seabirds look for food (forage) on the sea surface, whereas others dive to variable depths to obtain prey (Burger 2001). Many seabirds spend most of their lives at sea and come to land only to breed, nest, and occasionally rest (Schreiber and Chovan 1986). Most species nest in groups (colonies) on the ground of coastal areas or oceanic islands, where breeding colonies number from a few individuals to thousands.

The Hawaiian Islands are important habitat for seabirds in the North Pacific Subtropical Gyre. The shoreline, estuarine, and open ocean environments support a variety and large population of seabird species by providing important nesting and feeding habitats. The Hawaiian Islands are in the warm North Pacific water mass (U.S. Fish and Wildlife Service 2005b). Despite low levels of localized production, recent research estimates that 15 million seabirds inhabit the Hawaiian Islands; 22 species of seabirds regularly nest in the Hawaiian Islands, and many more pass through during migration to and from their breeding grounds elsewhere in the Pacific (Birding Hawaii 2004).

The entire world populations of Hawaiian petrels and Newell's shearwaters and more than 95 percent of the world's Laysan and black-footed albatrosses nest in the northwest Hawaiian Islands. Most of the world's ashy storm-petrels, western gulls, and Brandt's cormorants nest along the west coast of the United States (U.S. Fish and Wildlife Service 2005b). In addition to breeding seabirds, millions of seabirds from more than 100 different species migrate to or through the Study Area. For example, an estimated abundance of 5.5 to 6 million seabirds off California are thought to occur based on at-sea surveys (U.S. Fish and Wildlife Service 2005b). Surveys around the Hawaiian Islands found 40 different species of seabirds, half of which were local breeders and the remainder were migrant species.

The Southern California Bight, within the California Current Large Marine Ecosystem, is important for both breeding and migratory bird species. More than 195 species of birds use coastal or offshore aquatic habitats in the Southern California Bight—the area of the Pacific Ocean lying between Point Conception on the Santa Barbara County coast to a point south of the U.S.-Mexico border (Anderson et al. 2007; Bearzi et al. 2009; Hunt and Butler 1980).

The following sections contain profiles for ESA-listed and ESA-candidate species and species groups that occur in the Study Area. The emphasis on species-specific information is placed on the ESA-protected species list because any threats or potential impacts on those species are subject to consultation with regulatory agencies. Additional information on the biology, life history, and conservation of seabird species, including species-specific profiles, can be found on the following organizations' websites: U.S. Fish and Wildlife Service Endangered Species Program (2010a), Birdlife International (2010), and the International Union for Conservation of Nature and Natural Resources (2010). Sections 3.6.2.5 to 3.6.2.12 describe the taxonomic groups of ESA-listed and candidate seabird species in the Study Area.

3.6.2.1 Group Size

A variety of group sizes and diversity may be encountered throughout the Study Area, ranging from solitary migration of an individual seabird to large concentrations of mixed-species flocks. Depending on season, location, and time of day, the number of seabirds observed (group size) will vary and will likely fluctuate from year to year. During spring and fall periods, diurnal and nocturnal migrants would likely occur in large groups as they migrate over open water. Most seabird species nest in groups (colonies) on the ground of coastal areas or oceanic islands, where breeding colonies number from a few individuals to thousands. This breeding strategy is believed to have evolved in response to the limited availability of relatively predator-free nesting habitats and distance to foraging sites from breeding grounds. (Siegel-Causey and Kharitonov 1990). Outside of the breeding season, most Proceliid (birds within the Order Procelliiformes) seabirds are solitary, though they may join mixed-species flocks while foraging and can be associated with whales and dolphins (Onley and Scofield 2007) or areas where prey density is high (U.S. Fish and Wildlife Service 2005c). During the breeding season, these seabirds usually form large nesting colonies. Similarly, Pelecaniform (birds within the Order Pelecaniformes) breeding, whether on the ground or in trees, is typically colonial. Foraging occurs either singly or in small groups. Foraging seabirds of the order Charadriiformes can range from singles or pairs (murrelets) (International Union for the Conservation of Nature 2010f; U.S. Fish and Wildlife Service 2005b) and can extend upward into larger groups (terns) where juveniles accompany adults to post-breeding foraging areas, where the water is calm and the food supply is good. There are post-season dispersal sites, where adults and fledglings congregate (U.S. Fish and Wildlife Service 2006). Large groups are occasionally observed foraging at great distances from colonies, including at inland water sources (Atwood and Minsky 1983).

3.6.2.2 Diving Information

Most of the seabird species found with the Study Area will dive, skim, or grasp prey at the water's surface or within the upper portion (1 to 2 meters [m] [3.3 to 6.6 feet {ft.}]) of the water column (Sibley 2007). Foraging strategies are species specific such as plunge-diving or pursuit diving. Plunge-diving, as utilized by terns and pelicans, is a foraging strategy in which the bird hovers over the water and dives into the water to pursue fish. Diving behavior in terns is limited to plunge-diving during foraging (U.S. Fish and Wildlife Service 1985) and in general, tern species do not usually dive deeper than 3 ft. (0.9 m). Pursuit divers, a common foraging strategy of seabirds of the Family Alcidae, usually float on the water and dive under to pursue fish and other prey. They most commonly eat fish, squid, and crustaceans (Burger 2004).

Petrels forage both night and day; they capture prey by resting on the water surface and dipping their bill and by aerial pursuit of flying fish (International Union for the Conservation of Nature 2010d). Hawaiian petrels eat mostly squid (50–75 percent of their diet), fish, and crustaceans (International Union for the Conservation of Nature 2010d).

More specific diving information in regard to taxonomic groups is provided in Sections 3.6.2.13 (Order Procellariiformes), 3.6.2.14 (Order Pelecaniformes) and 3.6.2.15 (Order Charadriiformes).

3.6.2.3 Bird Hearing

The majority of the published literature on bird hearing focuses on terrestrial birds and their ability to hear in air as there is a paucity of data regarding underwater hearing abilities (Melvin and Parrish 1999). A review of 32 terrestrial and marine species indicates that birds generally have greatest hearing sensitivity between 1 and 4 kilohertz (kHz) (see Beason 2004). Very few can hear below 20 hertz (Hz), most have an upper frequency hearing limit of 10 kHz, and none exhibit hearing at frequencies higher than 20 kHz (Dooling et al. 2000). Thiessen (1958) reported the lower hearing threshold for the ring-billed gull (*Larus delawarensis*) of 2 kHz. Starlings (*Sturnus vulgais*) and house sparrows (*Passer domesticus*) have reported hearing ranges of 0.2–18 kHz (Brand and Kellogg 1939) while the hearing range of pigeons (*Columba livia*) is 0.1 to 10 kHz (Necker 1983). Hearing capabilities have been studied for only a few seabirds (Beason 2004, Beuter et al. 1986, Thiessen 1958, Wever et al. 1969); these studies show that seabird hearing ranges and sensitivity are consistent with what is known about bird hearing in general.

There is little published literature on the hearing abilities of birds underwater. In fact, there are no measurements of the underwater hearing of any diving birds (Therrien et al. 2011). There are some studies of bird behavior underwater when exposed to sounds, from which some hearing abilities of birds underwater could be inferred. Common murres (*Uria aalge*) were deterred from gillnets by acoustic pingers emitting 1.5 kHz pings at 120 decibels (dB) referenced (re) to 1 microPascal (μPa); however, there was no significant reduction in rhinoceros auklet (*Cerorhinca monocerata*) bycatch in the same nets (Melvin et al. 1999).

3.6.2.4 General Threats

Threats to seabird populations in the Study Area include human-caused stressors such as incidental mortality from interactions with commercial and recreational fishing gear, predation by introduced species, disturbance and degradation of nesting areas by humans and domesticated animals, noise pollution from construction and other human activities, nocturnal collisions with power lines and artificial lights, collisions with aircraft, and pollution, such as that from oil spills and plastic debris (Anderson et al. 2007; Burkett et al. 2003; California Department of Fish and Game 2010; Carter and Kuletz 1995; Carter et al. 2005; Clavero et al. 2009; International Union for Conservation of Nature and Natural Resources 2010; North American Bird Conservation Initiative 2010; Piatt and Naslund 1995; U.S. Fish and Wildlife Service 2005b, 2008a, 2010a). Disease, volcanic eruptions, storms, and harmful algal blooms are also threats to seabirds (Anderson et al. 2007; Jessup et al. 2009; North American Bird Conservation Initiative 2010; U.S. Fish and Wildlife Service 2005b). In addition, seabird distribution, abundance, breeding, and other behaviors are affected by cyclical environmental events, such as the El Niño Southern Oscillation and Pacific Decadal Oscillation in the Pacific Ocean (Vandenbosch 2000).

In the long term, climate change could be the largest threat to seabirds (North American Bird Conservation Initiative 2010). Climate change effects include changes in air and sea temperatures, precipitation, the frequency and intensity of storms, pH level of sea water, and sea level. These changes could affect overall marine productivity, which could affect the food resources, distribution, and reproductive success of seabirds (Aebischer et al. 1990; Congdon et al. 2007). The projection for global sea levels rise from 2090 to 2099 is up to 1 ft. (0.3 m) relative to 1980–1999 levels (Church and White 2006; Solomon et al. 2007). As a result, seabird nesting colonies that occur along sections of coastlines undergoing sea level rise may experience a loss of nesting habitat (Congdon et al. 2007; Gilman and Ellison 2009; Gilman et al. 2008; Hitipeuw et al. 2007; Mullane and Suzuki 1997).

3.6.2.5 California Least Tern (*Sternula antillarum browni*)

3.6.2.5.1 Status and Management

The California least tern (*Sternula antillarum browni*) was federally listed as endangered in 1970 and is listed as endangered by the state of California (California Department of Fish and Game 2010). In 2006, the U.S. Fish and Wildlife Service completed the most recent 5-year status review for the species and recommended that the California least tern be downlisted to threatened under the ESA. The population increased from 600 pairs in 1973 to approximately 7,100 pairs in 2005, and least tern nesting sites have nearly doubled since the species was first listed (U.S. Fish and Wildlife Service 2006). In 2007, an estimated 6,744 to 6,989 California least tern breeding pairs established nests at 48 locations in

California (Marschalek 2008); however, the species' population increase does not meet the requirements in the 1985 recovery plan to warrant delisting.

No critical habitat has been designated for the California least tern. Conservation for the California least tern is addressed in multiple memoranda of understanding and integrated natural resource management plans for military lands in the Southern California region, including Marine Corps Base Camp Pendleton, Naval Amphibious Base Coronado (U.S. Department of the Navy 2002), and Naval Base Ventura County Point Mugu.

3.6.2.5.2 Habitat and Geographic Range

The preferred nesting habitat consists of beaches, dunes, and sand bars on the ocean shore (U.S. Fish and Wildlife Service 1985). The California least tern nests in areas generally free of vegetation above the high tide mark. Colony sites are often near estuaries, lagoons, rivers, or the seacoast (U.S. Fish and Wildlife Service 1985). Atwood and Minsky (1983) noted that before the decline of the species, at least 82 percent of known nesting sites in California were within 1 mile (mi.) (1.6 kilometers [km]) of a river mouth or estuarine habitat.

California least terns spend the breeding season (April through August) in coastal waters along the central and Southern California coast, as well as along the west and southwestern coast of Mexico. Their distribution is from San Francisco to Baja California on the Pacific Coast of North America (U.S. Fish and Wildlife Service 2010b). The California least tern historically nested on coastal beaches of Monterey, California, to Cabo San Lucas, Baja California.

Foraging habitats include nearshore ocean waters, bays, river mouths, salt marshes, marinas, river channels, lakes, and ponds (Thompson et al. 1997). California least terns feed within 2 mi. (3.2 km) of the shoreline in ocean waters less than 60 ft. (18.3 m) deep, with most foraging within 1 mi. (1.6 km) of shore (Atwood and Minsky 1983). Atwood and Minsky (1983) also observed a tendency for foraging birds to be concentrated in coastal waters near major river mouths. Foraging habitat use varies within and between years, depending on the stage of breeding and prey availability (Atwood and Minsky 1983, BirdLife International 2009). Atwood and Minsky (1983) noted in their coastal colony study that, before terns disperse after breeding, they typically forage within 2 mi. (3.2 km) of nesting sites, although large groups were occasionally observed foraging at greater distances from colonies, including inland water sources. The presence of eelgrass is important because it is habitat for several prey species of the least tern such as topsmelt, one of the California least terns' preferred prey (BirdLife International 2009).

3.6.2.5.2.1 California Current Large Marine Ecosystem

California least terns occur in coastal waters throughout the Southern California portion of the Study Area during the breeding, non-breeding, and migration seasons. The current nesting range is from San Francisco Bay and south along the California coast to San Diego County which includes the Southern California portion of the Study Area in the California Current Large Marine Ecosystem and parts north of the Study Area (Massey and Fancher 1989). During migration, California least terns remain near the coast, although they have been observed foraging in multispecies feeding flocks 1–20 mi. (1.6–32.2 km) off the western coast of Baja California in late April and early May (U.S. Fish and Wildlife Service 2005b). The California least tern can be found in more offshore waters during the breeding season (courtship and incubation stages) when they forage farther from the nest site over open and deep water. Adults tend to travel farther when food availability is low, foraging in open ocean waters (BirdLife International 2009).

3.6.2.5.3 Population and Abundance

The California least tern population in California averaged about 4,300 pairs between 2000 and 2002, making up about 10 percent of the North American population (U.S. Fish and Wildlife Service 2005b). The California population has increased almost 12-fold from a low of 600 pairs in the early 1970s to roughly 7,100 pairs in 2005 (U.S. Fish and Wildlife Service 2001, 2005b).

3.6.2.5.4 Predator and Prey Interactions

California least terns forage by plunge-diving to catch prey in upper surface waters, usually within the first meter of water depth. In general, other tern species do not usually dive deeper than 3 ft. (0.9 m) (Eriksson 1985). No information exists on specific dive depths for California least terns. Prey species include anchovies, topsmelt, silverside smelt, opaleye, and gobies (BirdLife International 2009). Prey species composition varies throughout the year, depending on availability. Length of foraging and peak foraging behavior typically occur from the end of May through mid-July after chicks hatch.

California least terns are preyed upon by various species; these include gulls, ravens, crows, rodents, raccoons, and coyotes, which prey upon tern eggs, chicks, and adults (U.S. Fish and Wildlife Service 2006).

3.6.2.5.5 Species-Specific Threats

Threats to breeding least terns include the alteration of river habitat, flooding and development of coastal areas, disruptive recreation, an increase in aggressive gulls that compete for nesting sites, and predation by native and feral species, such as rats, great horned owls, black-crowned night herons, dogs, and cats (Sidle et al. 1992; U.S. Fish and Wildlife Service 1990). Oil pollution is also a concern within coastal and inland habitats.

3.6.2.6 Hawaiian Petrel (*Pterodroma sandwichensis*)

The Hawaiian petrel (*Pterodroma sandwichensis*) was recently split from the Galapagos petrel (*Pterodroma phaeopygia*) based on genetic and morphological evidence; before the split they were collectively known as the dark-rumped petrel (U.S. Fish and Wildlife Service 2005a).

3.6.2.6.1 Status and Management

The Hawaiian petrel is found only in Hawaii and is listed as endangered throughout its range under the ESA (U.S. Fish and Wildlife Service 2005a); there is no designated critical habitat. The greatest threat to adult survival and breeding success is predation by introduced animals, such as mongooses, cats, and rats. In some cases, predation has caused more than 70 percent nesting failure (U.S. Fish and Wildlife Service 2005a).

3.6.2.6.1.1 Habitat and Geographic Range

Hawaiian petrels nest only in Hawaii, specifically in the main Hawaiian Islands, though there are specimen records from Japan, Philippines, and Mollucas at the western edge of the distribution (International Union for the Conservation of Nature 2010d). Under pressure of predation, most nesting habitat is at the highest elevations available in the main Hawaiian Islands. Most sites (Haleakala National Park in Maui and Mauna Kea, Mauna Loa, and Kilauea in Hawaii) are characterized by high elevation (6,560–9,840 ft. [1,999.5–2,999.2 m]), dry climate, and sparse vegetation (less than 10 percent plant cover). Nesting habitat is poorly known on other islands. The Hawaiian petrel is present throughout the offshore waters of the Hawaiian Islands (International Union for the Conservation of Nature 2010d).

The Hawaiian petrel typically feeds well offshore but tends to feed closer to shore (0–45 mi. [0–72.4 km]) during spring than in the fall (most abundant at 170–230 mi. [273.6–370.1 km]) (Spear et al. 1999). The Hawaiian petrel favors open ocean water conditions, with an average sea surface temperature of 80 degrees (°) Fahrenheit (F) (27° Celsius [C]), sea surface salinity of 34 parts per thousand, wind speed of 19 mi. per hour (30.6 km per hour), and a wave height of 5 ft. (1.5 m). It also prefers an average depth from the warmer surface water to the point where cold water begins (the thermocline) of 35 ft. (10.7 m) (Spear et al. 1995).

The Hawaiian petrel is an open ocean species of the central tropical Pacific (U.S. Fish and Wildlife Service 2005a). They occur in open ocean waters throughout most of the Hawaii portion of the Study Area and the western portion of the Transit Corridor in the Insular Pacific-Hawaiian Large Marine Ecosystem. The Hawaiian petrel occurs largely in equatorial waters of the eastern tropical Pacific, generally from 10° South (S) to 20° North (N). Because of the difficulty in identification, the precise southeastern extent of the Hawaiian petrel and the northwestern extent of the similar Galapagos petrel remains uncertain (Spear et al. 1995).

3.6.2.6.1.2 Insular Pacific-Hawaiian Large Marine Ecosystem

Hawaiian petrels have important resting sites in coastal waters throughout the Hawaii portion of the Study Area in portions of the Insular Pacific-Hawaiian Large Marine Ecosystem. An area of the north shore of Kauai is widely known as a resting location for Hawaiian petrels (Birding Hawaii 2004). Based on known or suspected colony sites, gathering areas likely occur near shore on Lehua Rock, Kauai, Molokai, Lanai, Maui, and Hawaii (Day and Cooper 1995; Day et al. 2003; International Union for the Conservation of Nature 2010d; U.S. Fish and Wildlife Service 2005a) and perhaps around Kahoolawe (U.S. Fish and Wildlife Service 2005a). These areas provide resting habitat before the birds fly to inland nesting colonies. Hawaiian petrels move to and from nesting colonies during dusk and dawn (International Union for the Conservation of Nature 2010d).

3.6.2.6.2 Population and Abundance

The total population of Hawaiian petrels was estimated at 20,000, with a breeding population of 4,500–5,000 pairs (Spear et al. 1995; U.S. Fish and Wildlife Service 2005a); overall population trends on the Hawaiian islands are not known (U.S. Fish and Wildlife Service 2005a). Numbers of breeding Hawaiian petrels on Maui appear stable and have increased in areas of the Haleakala National Park, where predators are being managed (U.S. Fish and Wildlife Service 2005a). On Hawaii, numbers may be declining because of predation by introduced species (U.S. Fish and Wildlife Service 2005a).

3.6.2.6.3 Predator and Prey Interactions

Hawaiian petrels eat mostly squid (50 to 75 percent of their diet), fish, and crustaceans (International Union for the Conservation of Nature 2010d). They forage both night and day; they capture prey by resting on the water surface and dipping their bill and by aerial pursuit of flying fish (International Union for the Conservation of Nature 2010d). The foraging member of a pair may fly up to 930 mi. (1,496.7 km) from the nesting island (U.S. Fish and Wildlife Service 2005a).

Adult and young Hawaiian petrels are preyed on by introduced animals such as mongooses, cats, and rats.

3.6.2.6.4 Species-Specific Threats

Threats to this endangered seabird include predation by introduced mammals, development, light attraction and collision, ocean pollution, and disturbance of its breeding grounds. The petrel does not have any natural defenses against predators such as rats, feral cats, and mongooses, and its burrows are very vulnerable. Collisions with artificial lights, utility poles, and fences kill Hawaiian petrels on some islands (International Union for the Conservation of Nature 2010d).

3.6.2.7 Short-tailed Albatross (*Phoebastria albatrus*)

The short-tailed albatross (*Phoebastria albatrus*) was formerly in the genus *Diomedea* and known as Steller's albatross; it is the largest of the North Pacific albatrosses.

3.6.2.7.1 Status and Management

The short-tailed albatross is widely regarded as one of the rarest species of albatrosses and one of the world's rarest birds (Harrison 1983; International Union for the Conservation of Nature 2010c). The short-tailed albatross is listed as endangered under the ESA throughout its range. Additionally, it is listed as endangered by the state of Hawaii (NatureServe 2004; U.S. Fish and Wildlife Service 2000, 2005b). No critical habitat has been designated for this species because little is known about its life in the open ocean (Piatt et al. 2006; U.S. Fish and Wildlife Service 2000).

3.6.2.7.2 Habitat and Geographic Range

Short-tailed albatrosses are typically found in the open ocean and tend to concentrate along the edge of the continental shelf (NatureServe 2004). Upwelling zones are not only nutrient rich, but they also bring prey (for example, squid and fish) typically found only in deeper water to the surface, where they become available to albatrosses. Upwelling occurs when the wind moves warm, nutrient poor water away from the area, which allows colder, nutrient rich water to rise to the surface of the ocean. Short-tailed albatross nest on isolated, windswept, offshore islands with restricted human access (U.S. Fish and Wildlife Service 2000). Current and historical nesting habitat can be described as flat to steep slopes that are sparsely or fully vegetated. Short-tailed albatrosses disperse throughout the temperate and subarctic North Pacific approximately from May to October when they are not breeding, from Japan through California (U.S. Fish and Wildlife Service 2005b; 2008b). Nonbreeders and failed breeders disperse from the colony months sooner. While many nonbreeders return to the colonies each year, the presence of immature birds far from the colony (such as the U.S. Pacific coast) during the breeding season suggests that some immature birds may spend years at sea before they return to the colony (U.S. Fish and Wildlife Service 2005c).

3.6.2.7.2.1 Open Ocean

The short-tailed albatross is an open ocean species that occurs throughout the Hawaii Range Complex (HRC), Transit Corridor, and Southern California (SOCAL) Range Complex portions of the Study Area. The range of the short-tailed albatross extends from Siberia south to the China coast, into the Bering Sea and Gulf of Alaska south to Baja California, Mexico, and throughout the North Pacific, including the Northwestern Hawaiian Islands (Committee on the Status of Endangered Wildlife in Canada 2003; Harrison 1983; Roberson 2000). Their at-sea distribution includes the entire North Pacific Ocean north of about 20° N latitude. Short-tailed albatrosses move seasonally around the North Pacific Ocean, with high densities observed during the breeding season (December through May) in Japan and throughout Alaska and along the west coast of North America during the non-breeding season (April through September) (International Union for the Conservation of Nature 2010c). Non-breeding subadults can be found in all areas throughout the year. They are seen regularly in the North Pacific Subtropical Gyre (U.S. Fish and Wildlife Service 2005c).

3.6.2.7.2.2 California Current Large Marine Ecosystem

Short-tailed albatross occasionally occur in SOCAL Range Complex portion of the California Current Large Marine Ecosystem, which is part of the Study Area. As the population began a gradual recovery after 1950, sporadic sightings have been recorded off California (International Union for the Conservation of Nature 2010c). Based on the number of sightings in the SOCAL Range Complex, the short-tailed albatross is considered rare in that portion of the Study Area, as well as off the entire California coast. Breeding does not occur in the SOCAL Bight, but because of the unique circulation and upwelling characteristics of this area, potential foraging habitat exists. Two documented sightings of the short-tailed albatross have occurred in SOCAL. Roberson (2000) reported a sighting in 1977 of an all-dark immature bird approximately 90 mi. (144.8 km) west of the San Diego area. McCaskie and Garrett (2002) reported a sighting in the vicinity of Santa Barbara Island in late February of 2002.

3.6.2.7.2.3 Insular Pacific-Hawaiian Large Marine Ecosystem

Short-tailed albatross occur in coastal waters throughout the Hawaii portion of the Study Area in the Insular Pacific-Hawaiian Large Marine Ecosystem. The short-tailed albatross regularly occurs on Midway Atoll and has been observed at other Northwestern Hawaiian Islands. Since the 1930s, short-tailed albatrosses have been occasionally reported during the breeding season at Midway Atoll. Some of these short-tailed albatrosses were recorded for several successive years. Although unconfirmed successful nesting was reported in 1961 and 1962 (Tickell 2000), the first confirmed nest site that produced an egg did not occur until 1993 (International Union for the Conservation of Nature 2010c). Nesting on the Northwestern Hawaiian Islands has been attempted, but successful nesting has not been confirmed (U.S. Fish and Wildlife Service 2005c). In the Hawaiian Islands, there was an unconfirmed sighting at Barking Sands on Kauai during March 2000 (Birding Hawaii 2004). Other known occurrences in Hawaii are of single birds (in 1976 and 1981) at French Frigate Shoals in the Northwestern Hawaiian Islands (U.S. Fish and Wildlife Service 2008b).

3.6.2.7.3 Population and Abundance

In 2005, the total population was estimated at 1,712, with 513 pairs at Torishima and 340 birds and 85 breeding pairs at Minami-Kojima (located northeast of Taiwan) (U.S. Fish and Wildlife Service 2005c). The Japan and Taiwan population is growing extremely rapidly at about 7.3 percent annually (International Union for the Conservation of Nature 2010c; U.S. Fish and Wildlife Service 2005c). Average population survival rate is 96 percent, and the current annual population growth is greater than 6 percent (U.S. Fish and Wildlife Service 2005c). Short-tailed albatross regularly visit the Hawaiian islands; although breeding attempts on Midway Atoll have been unsuccessful historically (U.S. Fish and Wildlife Service 2005c), a pair successfully bred in late 2010, hatching a chick in early 2011 which successfully fledged.

3.6.2.7.4 Predator and Prey Interactions

Short-tailed albatrosses are surface feeders and scavengers, feeding more inshore than other North Pacific albatrosses. In Japan, their diet consists of shrimp, squid, and fish (including bonita, flying fish, and sardines); diet information is not available for birds in the Study Area (U.S. Fish and Wildlife Service 2005c). Unlike other North Pacific albatrosses, short-tailed albatrosses frequently feed in sight of land.

Short-tailed albatross chicks are predated by other birds and introduced mammals such as cats and rats on nesting colonies (U.S. Fish and Wildlife Service 2005c).

3.6.2.7.5 Species-Specific Threats

Short-tailed albatrosses have survived multiple threats to their existence. During the late 1800s and early 1900s, feather hunters clubbed to death an estimated five million of them, stopping only when the species was nearly extinct. In the 1930s, nesting habitat on the only active nesting island in Japan was damaged by volcanic eruptions, leaving fewer than 50 birds by the 1940s. Loss of nesting habitat to volcanic eruptions, severe storms, and competition with black-footed albatrosses for nesting habitat continue to be natural threats to short-tailed albatrosses today.

Current threats to this species include ingestion of plastics mistaken for food items, volcanic eruption (at Torishima, Japan), typhoons, sunken longline fishing in Alaska and Russia, jig/troll fishery in Japan, invasive species at colonies (cats, rats, and plants), and researcher disturbance (U.S. Fish and Wildlife Service 2005c). Additional human-induced threats include hooking and drowning on commercial longline gear, contamination from oil spills, and potential predation by introduced mammals on breeding islands.

3.6.2.8 Marbled Murrelet (*Brachyramphus marmoratus*)

3.6.2.8.1 Status and Management

The marbled murrelet (*Brachyramphus marmoratus*) is listed as a threatened species in California, Oregon, and Washington under the ESA (U.S. Fish and Wildlife Service 1992) and is considered endangered by the state of California (California Department of Fish and Game 2010). Marbled murrelet populations have suffered significant declines in the Pacific Northwest, caused primarily by the removal of essential habitat by logging and coastal development (International Union for the Conservation of Nature 2010a). To stem these declines, critical habitat was designated in 1996 in mature and old-growth forest nesting habitat within 30 mi. (48.3 km) off the coast in Washington, Oregon, and California (U.S. Fish and Wildlife Service 1997). The entire critical habitat, as well as Primary Constituent Elements, are outside of the Study Area.

3.6.2.8.2 Habitat and Geographic Range

Marbled murrelets do not build a nest but use natural features, such as moss, clumps of mistletoe, or piles of needles as a nest site on tree limbs (International Union for the Conservation of Nature 2010a). Nests are in large conifers, such as coast redwood and western hemlock, in old-growth stands typically within 35 mi. (56.3 km) of marine waters. Important features in nesting habitat are stands of 500 acres (ac.) (202.3 hectares [ha]) or larger, multistoried canopy layers, and less than average canopy closures (Grenier and Nelson 1995; Hamer and Nelson 1995; Miller and Ralph 1995). In addition, habitat along major drainages (e.g., rivers and streams) is a key component (International Union for the Conservation of Nature 2010a), as murrelets tend to use these drainages as flight corridors to and from inland nest sites.

Marbled murrelets generally remain near breeding sites year-round in most areas (U.S. Fish and Wildlife Service 2005b). Foraging habitat is generally found within 3 mi. (4.8 km) from shore and in water less than 195 ft. (59.4 m) deep (Day and Nigro 2000; International Union for the Conservation of Nature 2010a). Birds occur closer to shore in exposed coastal areas and farther offshore in protected coastal areas (International Union for the Conservation of Nature 2010a). The highest concentrations are found in protected inshore waters (U.S. Fish and Wildlife Service 2005b). Physical and biological oceanographic processes that concentrate prey (such as upwelling and rip currents) have an important influence on the foraging distribution of marbled murrelets (Ainley et al. 1995; Burger 1995, 2002; Day and Nigro 2000; International Union for the Conservation of Nature 2010a; Strong et al. 1995). They are more commonly found inland during the summer breeding season but make daily trips to the ocean to gather food and have been detected in forests throughout the year. When not nesting, the birds live at sea, spending their days feeding close to shore and then moving several miles offshore at night.

3.6.2.8.2.1 California Current Large Marine Ecosystem

Marbled murrelets only occur in coastal waters of the California Current Large Marine Ecosystem within the northeast corner of the SOCAL Range Complex portion of the Study Area. Eight reported sightings of marbled murrelets have been documented within the Study Area off the California coast. Sightings have been reported at Marina del Rey, off Santa Barbara Island, at Mugu Lagoon in Ventura County, along the coast in San Diego County, and at the northern end of the Study Area near San Simeon Point (McCaskie and Garrett 2001). All of these documented sightings were recorded between November and March.

Foraging habitat in the Southern California Bight occurs usually within 3 mi. (4.8 km) of the coast in waters less than 195 ft. (59.4 m) deep (Day and Nigro 2000; International Union for the Conservation of Nature 2010a); however, because upwelling areas represent important foraging habitat for the marbled murrelet, the potential exists for individuals to be observed farther offshore in the Southern California Bight.

Winter distributions of marbled murrelets are poorly documented. In California, most birds appear to be year-round residents near breeding areas (Naslund 1993), although dispersal in the winter as far south as SOCAL and northern Mexico has been documented (Erickson et al. 1995). A single sighting has occurred at Enseñada Harbor (Erickson et al. 1995). The species is a rare fall/winter vagrant (occurring outside of its normal range) to SOCAL, and is “accidental” from the U.S.-Mexico border south along the Mexico coastline (International Union for the Conservation of Nature 2010a).

3.6.2.8.3 Population and Abundance

The largest number of marbled murrelets occurs in Alaska, where the population is estimated at 270,000, although the population has experienced a dramatic decline of approximately 70 percent over the last 25 years (Piatt et al. 2007). The population in British Columbia is estimated to be between 54,000 and 92,000 (Piatt et al. 2007). Current populations in Washington, Oregon, and California are small compared with the historical populations of British Columbia and Alaska, which at one time were believed to number in the hundreds of thousands (Piatt et al. 2007). A recent population estimate for Washington, Oregon, and California is a combined 20,200 (Raphael et al. 2007).

3.6.2.8.4 Predator and Prey Interactions

Marbled murrelets feed opportunistically on small fish, including sand lance, anchovy, herring, capelin, and smelt, and also on invertebrates (U.S. Fish and Wildlife Service 1997, 2005b). Feeding takes place in the nearshore marine environment, primarily in protected waters where both Pacific sand lance and surf smelt occur (Burger 2002; Whitworth et al. 2000). Individuals forage by diving, using their wings for underwater propulsion. The murrelet forages by pursuit diving in relatively shallow waters, usually between 20 and 80 m (6.1 and 24.4 ft.) in depth. The majority of birds are found as pairs or as singles in a band about 300 to 2,000 m (91.4 to 609.6 ft.) from shore. Foraging dive times averaged about 16 seconds. Murrelets generally forage during the day, and are most active in the morning and late afternoon hours. Some foraging occurs at night (Ralph et al. 1995).

While at sea, marbled murrelets are preyed on by birds and mammals including peregrine falcons, bald eagles, western gulls, and northern fur seals. Birds such as common ravens, Steller’s jays, and sharp-shinned hawks are predators of marbled murrelet eggs, chicks, and adults during the nesting season (Nelson 1997).

3.6.2.8.5 Species-Specific Threats

The principal factor threatening the persistence of marbled murrelet over the southern portions of its range is harvesting of old-growth and mature forests. In addition to habitat loss, interactions with fisheries, especially gill-net fisheries, and oil spills have also contributed to population declines (Ralph et al. 1995). An estimated 3,500 murrelets are killed annually in Alaska by gill-net fisheries (Carter et al. 2005; Piatt and Naslund 1995). In addition, more than 1,000 oiled marbled murrelet carcasses were collected after the Exxon Valdez oil spill in Alaska (Carter and Kuletz 1995). Nest failure is caused by predation by raptors, ravens, and jays (Nelson 1997).

3.6.2.9 Newell's Shearwater (*Puffinus auricularis newelli*)

The classification of the Newell's shearwater (*Puffinus auricularis newelli*) is in flux. It was, until recently, regarded by some authorities as a distinct species, *Puffinus newelli* (International Union for the Conservation of Nature 2010a). Since 1982, most authorities have considered it a subspecies of Townsend's shearwater (*Puffinus auricularis*) (American Ornithologists' Union 1998). At least one author (Harrison 1983) regarded Newell's shearwater as a subspecies of Manx shearwater (*Puffinus puffinus newelli*). The U.S. Fish and Wildlife Service (2005b) identifies Newell's shearwater as a subspecies of Townsend's shearwater. Newell's shearwater is also known as Newell's dark-rumped shearwater.

3.6.2.9.1 Status and Management

Newell's shearwater is an ESA-listed threatened species, found only in the Hawaiian Islands. This species is also listed as threatened by the state of Hawaii (U.S. Fish and Wildlife Service 2005b). A federal recovery plan was finalized in 1983 (U.S. Fish and Wildlife Service 1983). Within the Hawaiian Islands Bird Conservation Region, Newell's shearwater is evaluated as highly imperiled, the most serious category, because of restricted breeding distribution and threats to breeding populations (U.S. Fish and Wildlife Service 2003). There is no critical habitat designation for the Newell's shearwater.

Newell's shearwater was thought to be extinct by 1908 as a consequence of subsistence hunting by Polynesians and predation by introduced rats, pigs, and dogs. However, they were rediscovered offshore in 1947. One was collected on Oahu in 1954 (Day et al. 2003) and Newell's shearwaters were confirmed as still breeding on Kauai in 1967 (U.S. Fish and Wildlife Service 2005b).

3.6.2.9.2 Habitat and Geographic Range

Newell's shearwater occurs in open ocean waters in the southern portion of the Hawaii portion of the Study Area and into the western portion of the Transit Corridor Study Area. They spend most of their time in the open ocean year-round (U.S. Fish and Wildlife Service 2005b) and come ashore only to nest. They avoid inshore waters except when gathering before they fly inland to breeding colonies at night (International Union for the Conservation of Nature 2010e).

Newell's shearwaters forage only over open ocean waters of depths reportedly much greater than 6,560 ft. (1,999.5 m) (Spear et al. 1995). Even when nesting, they feed over deep waters and are typically not within 15 mi. (24.1 km) of island shores (International Union for the Conservation of Nature 2010e). In particular, they find abundant food along oceanic fronts, such as the Equatorial Countercurrent (Spear et al. 1995). Preferred average ocean conditions are 80°F (26.7°C) sea surface temperature, 34.5 parts per thousand sea surface salinity, and 250 ft. (76.2 m) depth to cold water

(Spear et al. 1995). The meteorological conditions favored by Newell's shearwaters are frequent clouds and rain squalls typical of intertropical convergence zones (Spear et al. 1995).

3.6.2.9.2.1 Insular Pacific-Hawaiian Large Marine Ecosystem

Newell's shearwater occurs in coastal waters throughout the Hawaii portion of the Study Area during the breeding season. Newell's shearwater nesting is entirely confined to the main Hawaiian Islands, from Lehua Rock east to Hawaii. Nesting is known on Lehua Rock, Kauai, Molokai, and Hawaii. No population estimates exist for the small nesting colonies that exist on Lehua Rock and Molokai (Day and Cooper 1995; International Union for the Conservation of Nature 2010e; U.S. Fish and Wildlife Service 2005b). About 20 breeding colonies of Newell's shearwaters are known in the main Hawaiian Islands, but others probably exist (International Union for the Conservation of Nature 2010e). In 1992, 11 colonies were known on Kauai. There is evidence but no confirmation of nesting on Oahu, Maui, and Lanai (U.S. Fish and Wildlife Service 2005b).

Newell's shearwaters nest on Kauai at high elevations (525–3,935 ft.) (160.02–1,199.4 m) on steep, densely vegetated mountain slopes and in burrows or deep rock crevices, although a substantial number also nest on dry sparsely vegetated cliffs on the Na Pali coast of Kauai and on Lehua Island (Reynolds and Ritchotte 1997; U.S. Fish and Wildlife Service 2005b). The use of steep slopes (mostly greater than 65°) for nesting is probably a consequence of predation pressure from introduced pigs, mongooses, and cats; they select sites where there is either an open canopy of trees and ground cover of uluhe ferns or a dense ground cover of tussock grasses (International Union for the Conservation of Nature 2010e).

On the Island of Hawaii, Newell's shearwaters fly over the entire island except the southwestern coast. Shearwaters are most numerous flying to and from the Kohala Mountains on the north coast (Day et al. 2003). During adult presence in the breeding season (April to September), Newell's shearwaters gather on the water close to shore before they fly inland around sunset (International Union for the Conservation of Nature 2010e). Based on known or suspected colony locations, Newell's shearwaters are expected to be found gathering in early evening at Niihau (north end around Lehua Rock), Kauai, Oahu, Maui, Molokai, Lanai, and Hawaii from April to September.

3.6.2.9.2.2 Open Ocean

During the breeding season, some birds forage west and north of the Hawaiian Islands so that the central part of their marine range moves northward in the Transit Corridor portion of the Study Area (International Union for the Conservation of Nature 2010e; U.S. Fish and Wildlife Service 2005b).

3.6.2.9.3 Population and Abundance

Population in the 1980s and early 1990s was estimated at about 84,000, but numbers in 2000 may have been only 21 percent of what they were in 1987 (U.S. Fish and Wildlife Service 2005b). The largest known population, found on Kauai, was devastated by two hurricanes in 1982 and 1992. Since that last storm, the species has been in steady decline on Kauai. The remaining adults and fledglings are suffering significant deaths from utility pole and line strikes (International Union for the Conservation of Nature 2010e). Continuing forest habitat destruction and predation from introduced mammals are also taking a toll on this species (International Union for the Conservation of Nature 2010e).

3.6.2.9.4 Predator and Prey Interactions

Although diet is not well known, evidence suggests that squid are a major dietary item. Newell's shearwaters capture food by pursuit-plunging (diving into water and swimming after prey, typically 10 to 30 m [32.8 to 98.4 ft.] deep), usually in company with multispecies feeding flocks associated with tuna

(International Union for the Conservation of Nature 2010e). This species is not attracted to discarded fish byproducts and does not follow ships (Onley and Scofield 2007).

Newell's shearwaters are preyed on by introduced animals at their breeding sites, such as cats and birds such as barn owls (Ainley et al. 1997). Nocturnal activity and cavity-nesting behaviors are their only defense against mammal predators.

3.6.2.9.5 Species-Specific Threats

Historical threats included subsistence hunting by Polynesians and predation by rats, dogs, and pigs. Current threats include artificial lights (e.g., street and resort lights) along the coast that blind and disorient fledglings. Once on the ground, these fledglings are unable to fly and thousands are killed each year by cars, cats, and dogs. In addition, adults can collide with power facilities and associated utility wires and associated lines are in the direct path of known Newell's flight corridors. Additional threats are the loss and degradation of forested habitat caused by introduced plants and herbivores.

3.6.2.10 Band-Rumped Storm-Petrel (*Oceanodroma castro*)

The band-rumped storm-petrel (*Oceanodroma castro*) is also known as Madeira or Madeiran storm-petrel, Harcourt's storm-petrel, or Hawaiian storm-petrel (American Ornithologists' Union 1998, Harrison 1983).

3.6.2.10.1 Status and Management

Storm-petrels are the smallest of all the oceanic seabirds (Onley and Scofield 2007). The Hawaii population has been a candidate for listing under the ESA since 1989 (U.S. Fish and Wildlife Service 2004). Their global population is not a conservation concern due to large populations in Japan and the Galapagos Islands (International Union for the Conservation of Nature 2010b, U.S. Fish and Wildlife Service 2005b). In the Hawaiian Islands, band-rumped storm-petrels are the rarest breeding seabirds (International Union for the Conservation of Nature 2010b, U.S. Fish and Wildlife Service 2005b). The State of Hawaii categorizes the local population as endangered (U.S. Fish and Wildlife Service 2005b) and regards it as highly imperiled within the Hawaiian Islands Bird Conservation Region, based on population size, breeding distribution, and threats to breeding distribution (U.S. Fish and Wildlife Service 2003).

3.6.2.10.2 Habitat and Geographic Range

Band-rumped storm-petrels prefer warm deep water of 3,280 ft. to more than 6,560 ft. (999.7 to 1,999.5 m) deep. This species occurs close to land where deep water is near an island; otherwise, they occur offshore or in upwelling regions (International Union for the Conservation of Nature 2010b). Preferred waters range from 80 to 84°F (26.7 to 28.9°C) (International Union for the Conservation of Nature 2010b). Nesting habitat in the main Hawaiian Islands consists of steep cliffs and barren lava flows at high elevations. Nests are in burrows or crevices in rock or lava (International Union for the Conservation of Nature 2010b; U.S. Fish and Wildlife Service 2004, 2005b). Also, they have been documented using artificial nest boxes (Mitchell et al. 2005). These sites may well be the last resort of predator avoidance for a species that formerly most likely nested closer to the coast (International Union for the Conservation of Nature 2010b).

Insular Pacific-Hawaiian Large Marine Ecosystem

Band-rumped storm-petrels occur in coastal waters of the Hawaii portion of the Study Area and into the western portion of the Transit Corridor portion of the Study Area. Colonies in the main Hawaiian Islands are known or suspected on Lehua Rock, Kauai, Maui, Kahoolawe, and Hawaii. Other colonies are likely in Waimea Canyon and Hanapepe Valley on the western side of Kauai. On Hawaii, one small population is known to nest on the upper west slope of Mauna Loa. There are no confirmations of occurrence on the other islands (Lehua Rock, Maui, and Kahoolawe), where nesting is suspected, although Lehua Rock and Maui (Haleakala crater) are likely (International Union for the Conservation of Nature 2010b, U.S. Fish and Wildlife Service 2004). There is no known nesting in the Northwestern Hawaiian Islands (U.S. Fish and Wildlife Service 2004).

During the nesting season, deep water (more than 3,280 ft. [999.7 m]) close to shore can be used for foraging. Fishermen report them mostly at about 3 mi. (4.8 km) off the Na Pali coast of Kauai (International Union for the Conservation of Nature 2010b). Band-rumped storm-petrels are known to gather in nearshore waters before they fly inland to nesting colonies in the early evening.

Open Ocean

Band-rumped storm-petrels occur in the Hawaii portion of the Study Area and the western portion of the Transit Corridor Study Area. They are distributed in the Pacific from Japan east to Central America and northern South America (Harrison 1983). Pacific populations are divided into distinct Japanese, Hawaiian, and Galapagos breeding populations (U.S. Fish and Wildlife Service 2004). The Hawaiian population at sea is thought to remain in the central Pacific, ranging south to the Equatorial Countercurrent. Some individuals spend most of their time in open ocean, occurring far offshore from nesting islands; others seem to remain close to nesting colonies year-round (U.S. Fish and Wildlife Service 2005b).

3.6.2.10.3 Population and Abundance

The Hawaiian populations, a tiny remnant of historical numbers, are of unknown size and trends (U.S. Fish and Wildlife Service 2005b). In 2004, the population of band-rumped storm-petrels at sea was estimated at about 5,500 (U.S. Fish and Wildlife Service 2004). In 2002, the population on Kauai was estimated at 171 to 221 breeding pairs, mostly occurring along the Na Pali coast (Pohakuao Valley, Kalalau Valley, Awaawapuhi Valley, Nuololo Aina, and Nuololo Kay) on the west side of the island.

3.6.2.10.4 Predator and Prey Interactions

Band-rumped storm-petrels most likely feed on small fish, squid, and crustaceans, based on records from the Galapagos Islands; diet information is not available for Hawaiian birds (U.S. Fish and Wildlife Service 2005b). Foraging is confirmed diurnally and suspected nocturnally. Food is captured while sitting on the water or off the surface by bill snatching as the bird gently flaps just above the surface of the water (International Union for the Conservation of Nature 2010b). Foraging occurs mostly in deep water in all seasons. They are attracted to discarded fish by-product from fishing boats (Onley and Scofield 2007). Band-rumped storm-petrels are vulnerable to predation by introduced rats, mice, cats, mongooses, pigs, and barn owls (U.S. Fish and Wildlife Service 2005b).

3.6.2.10.5 Species-Specific Threats

This small seabird is highly vulnerable to predation by introduced rats, mice, cats, mongooses, pigs, and barn owls, as well as being vulnerable to striking power lines and street lights at night (U.S. Fish and Wildlife Service 2005b). Street and resort lights disorient fledglings, causing them to collide with structures or fall to the ground, where they are at risk from predators and cars. Additional threats are the loss and degradation of forested habitat caused by introduced plants and herbivores.

3.6.2.11 Guadalupe Murrelet (*Synthliboramphus hypoleucus*)

The Guadalupe murrelet (*Synthliboramphus hypoleucus*) was until recently a subspecies of the Xantus's murrelet, along with the Scripps's murrelet (*Synthliboramphus scrippsi*). These species can be distinguished by differences in breeding range, facial plumage, bill size, and vocalizations (International Union for the Conservation of Nature 2010b).

3.6.2.11.1 Status and Management

The (formerly known as) Xantus's murrelet population as a whole is designated as a candidate species under the ESA and as a threatened species by the State of California (California Department of Fish and Game 2010). In 2012, the two subspecies of Xantus's murrelet (*Synthliboramphus hypoleucus hypoleucus* and *Synthliboramphus hypoleucus scrippsi*) were elevated to species status (Chesser et al. 2012). As the Xantus's murrelet was considered a candidate species (and included both subspecies), the Guadalupe murrelet is considered a candidate species following the taxonomic split.

3.6.2.11.2 Habitat and Geographic Range

Guadalupe murrelets are found only on the Pacific coast of North America, ranging from Baja California, Mexico (23° N), to British Columbia (52° N), and offshore to a distance of approximately 310 mi. (499 km) (Carter et al. 2005). Guadalupe murrelets prefer to nest on offshore islands free from human disturbance and predators. Nest locations include natural cavities, under shrubs or in hollows beneath adequate vegetation, along or near steep cliffs, on offshore rocks, and in sea caves (Burkett et al. 2003).

The open water distributions of *Synthliboramphus hypoleucus* and *Synthliboramphus scrippsi* overlap extensively, after breeding and dispersing, and at-sea distributions are highest over the upper continental slope at depths of 655–3,280 ft. (200–1,000 m). Individuals of both subspecies disperse offshore, moving from the breeding colonies as far north as British Columbia (U.S. Fish and Wildlife Service 2005b). The Guadalupe murrelet breeds only off of Baja California, on the three San Benito Islands, and on two rocks offshore of Guadalupe Island. The breeding range overlaps with that of Scripps's murrelet only at the San Benito Islands off Baja California. (Carter et al. 2005, International Union for the Conservation of Nature 2010f, Karnovsky et al. 2005).

During the breeding season, Guadalupe murrelets forage in waters surrounding nesting islands within 60–95 mi. (96.6–153 km) of colonies (Whitworth et al. 2000). Non-breeding birds forage in surface waters, with the highest densities observed over the upper continental slope in water depths of 655–3,280 ft. (200–1,000 m) (Briggs et al. 1987, Karnovsky et al. 2005). Moderately high densities of Xantus's murrelets are found foraging over the outer continental slope at depths of 3,280–9,840 ft. (1,000–3,000 m), and the lowest densities are observed over the continental shelf (depth less than 655 ft. [200 m]) and in open ocean waters (depths greater than 9,840 ft. [3,000 m]).

California Current Large Marine Ecosystem

Guadalupe murrelets occur in coastal and open ocean areas of the Southern California portion of the Study Area and the eastern portion of the Transit Corridor Study Area. This species is present at nesting colonies in central Baja California from approximately February to May (Wolf et al. 2005). After breeding, they are more evenly distributed, extending from southern British Columbia to southern Baja California. The highest concentrations offshore occur from Point Conception to Cape Mendocino and off Baja California (Briggs et al. 1987, Karnovsky et al. 2005).

3.6.2.11.3 Population and Abundance

Historical accounts of the species from the 1940s indicate that all murrelets were once more abundant, although there are no reliable estimates of historical populations. The most recent worldwide population estimate based on at-sea surveys is 39,700, consisting of 17,900 breeding birds and 21,800 subadults and nonbreeders (Karnovsky et al. 2005), though this is an estimate of the two subspecies of Xantus murrelet. The Coronado Island (Mexico) breeding population is approximately 750, which makes up about 20 percent of the total population of the subspecies *Synthliboramphus hypoleucus scrippsi* (International Union for the Conservation of Nature 2010f). Current population estimates are not available for Guadalupe Island. In 1968, an estimated 2,400–3,500 Xantus's murrelet breeding pairs were on Guadalupe Island (U.S. Fish and Wildlife Service 2007).

Predator/Prey Interactions

Guadalupe murrelets capture prey underwater by using their wings for propulsion in a technique known as pursuit-diving (International Union for the Conservation of Nature 2010f). Few studies have been conducted on the food habits of the Guadalupe murrelet. They are known to feed on small schooling fish and zooplankton near the surface of the water. Predators of adult murrelets include peregrine falcons, barn owls, Western gulls, and feral cats. Deer mice and rats are significant egg predators (Drost and Lewis 1995).

3.6.2.11.4 Species-Specific Threats

Numerous threats have contributed to declines in the Guadalupe murrelet populations, including nonnative mammals (e.g., rats) that directly prey on murrelets or destroy or alter habitat. Other threats are from oil pollution, native predators feeding on eggs, chicks, or adults, artificial light pollution from seagoing vessels, human disturbance at nesting colonies, oceanographic changes that affect prey species abundance, military operations, and being caught in fishing nets (Burkett et al. 2003).

3.6.2.12 Scripps's Murrelet (*Synthliboramphus scrippsi*)

Scripps's murrelet (*Synthliboramphus scrippsi*) was until recently a subspecies of the Xantus's murrelet, along with the Guadalupe murrelet (*Synthliboramphus hypoleucus*). These species can be distinguished by differences in breeding range, facial plumage, bill size, and vocalizations (International Union for the Conservation of Nature 2010b).

3.6.2.12.1 Status and Management

The (formerly known as) Xantus's murrelet population as a whole is designated as a candidate species under the ESA and as a threatened species by the State of California (California Department of Fish and Game 2010). In 2012, the two subspecies of Xantus's murrelet (*Synthliboramphus hypoleucus hypoleucus* and *Synthliboramphus hypoleucus scrippsi*) were elevated to species status (Chesser et al. 2012). As the Xantus's murrelet was considered a candidate species (and included both subspecies), Scripps's murrelet is considered a candidate species following the taxonomic split.

3.6.2.12.2 Habitat and Geographic Range

Scripps's murrelets are found only on the Pacific coast of North America, ranging from Baja California, Mexico (23° N), to British Columbia (52° N), and offshore to a distance of approximately 310 mi. (499 km) (Carter et al. 2005). Scripps's murrelets prefer to nest on offshore islands free from human disturbance and predators. Nest locations include natural cavities, under shrubs or in hollows beneath adequate vegetation, along or near steep cliffs, on offshore rocks, and in sea caves (Burkett et al. 2003).

The open water distributions of *Synthliboramphus scrippsi and Synthliboramphus hypoleucus* overlap extensively, after breeding and dispersing, and at-sea distributions are highest over the upper continental slope at depths of 655–3,280 ft. (200–1,000 m). Individuals of both subspecies disperse offshore, moving from the breeding colonies as far north as British Columbia (U.S. Fish and Wildlife Service 2005b). *Synthliboramphus hypoleucus scrippsi* nests primarily on the Channel Islands and Coronado Islands in the Southern California Bight, but also south to the San Benito Islands where it overlaps with *Synthliboramphus hypoleucus hypoleucus* (Carter et al. 2005, International Union for the Conservation of Nature 2010f, Karnovsky et al. 2005).

During the breeding season, Scripps's murrelets forage in waters surrounding nesting islands within 60–95 mi. (96.6–153 km) of colonies (Whitworth et al. 2000). Non-breeding birds forage in surface waters, with the highest densities observed over the upper continental slope in water depths of 655–3,280 ft. (200–1,000 m) (Briggs et al. 1987, Karnovsky et al. 2005). Moderately high densities of Scripps's murrelets are found foraging over the outer continental slope at depths of 3,280–9,840 ft. (1,000–3,000 m), and the lowest densities are observed over the continental shelf (depth less than 655 ft. [200 m]) and in open ocean waters (depths greater than 9,840 ft. [3,000 m]).

California Current Large Marine Ecosystem

Scripps's murrelets occur in coastal and open ocean areas of the Southern California portion of the Study Area and the eastern portion of the Transit Corridor Study Area. This species is present at nesting colonies in the Southern California Bight from approximately March to June. During this period, Xantus's murrelets occur from northern Oregon to southern Baja California but tend to be concentrated in the Southern California Bight (Karnovsky et al. 2005). After breeding, they are more evenly distributed, extending from southern British Columbia to southern Baja California. The highest concentrations offshore occur from Point Conception to Cape Mendocino and off Baja California (Briggs et al. 1987, Karnovsky et al. 2005).

3.6.2.12.3 Population and Abundance

Historical accounts of the species from the 1940s indicate that all murrelets were once more abundant, although there are no reliable estimates of historical populations. The most recent worldwide population estimate based on at-sea surveys is 39,700, consisting of 17,900 breeding birds and 21,800 subadults and nonbreeders (Karnovsky et al. 2005), though this is an estimate of the two subspecies of Xantus murrelet. The California population is now considered "uncommon," with an estimated 3,460 breeding birds. The breeding distribution is restricted to about 12 offshore islands of Southern California and Baja California, Mexico (U.S. Fish and Wildlife Service 2005b). Santa Barbara Island hosts the largest breeding colony in California with 500–750 pairs (Whitworth et al. 2005). Santa Barbara Island is located just outside the northern border of the Study Area off the coast of California and is part of a series of islands, the Channel Islands, which are partially included in the Study Area. Although Santa Barbara Island is the smallest of the Channel Islands, with an area of just 1 square mile (2.6 square kilometers), it is the most important of these islands for Scripps's murrelets because 51 percent of the California population nests on this island (Burkett et al. 2003). Research in the Southern California Bight from the 1970s to 1991 indicated a decline of approximately 30 percent in Scripps's murrelets on Santa Barbara Island; however, multiple studies used different methods and are therefore difficult to compare and use to deduce accurate population estimates (Burkett et al. 2003). Difficulty in accurately censusing populations at breeding colonies is also compounded by Scripps's murrelet's crevice-nesting behavior.

The murrelet populations at Anacapa Island historically experienced significant declines primarily caused by predation following the introduction of the black rat in the mid-1800s and early 1900s (Burkett et al.

2003). The eradication of rats in 2002 has resulted in improved hatching success and colony expansion (Whitworth et al. 2005). Burkett et al. (2003) estimated approximately 200–600 breeding pairs of Xantus's murrelets on Anacapa Island. Scripps's murrelet breeding pairs on other Channel Islands in the Study Area include Santa Cruz (100–300), San Miguel (50–300), Santa Catalina (25–75) (U.S. Fish and Wildlife Service 2007), and San Clemente Island at Seal Cove and China Point (10–15) (U.S. Department of the Navy - Southwest Division 2001). Santa Catalina and San Clemente are the only islands that are within the Study Area. Individuals have also been known to use offshore rock outcrops near the island for roosting and as takeoff points for foraging (U.S. Department of the Navy - Southwest Division 2001).

Predator/Prey Interactions

Scripps's murrelets capture prey underwater by using their wings for propulsion in a technique known as pursuit-diving (International Union for the Conservation of Nature 2010f). Few studies have been conducted on the food habits of the Scripps's murrelet. They are known to feed on small schooling fish and zooplankton near the surface of the water. Larval fish, especially anchovies but also Pacific sauries and rockfish, are major food items during the nesting period at Santa Barbara Island (Hunt and Butler 1980). Predators of adult Scripps's murrelets include peregrine falcons, barn owls, Western gulls, and feral cats. Deer mice and rats are significant egg predators (Drost and Lewis 1995).

3.6.2.12.4 Species-Specific Threats

Numerous threats have contributed to declines in the Guadalupe murrelet populations, including nonnative mammals (e.g., rats) that directly prey on murrelets or destroy or alter habitat. Other threats are from oil pollution, native predators feeding on eggs, chicks, or adults, artificial light pollution from seagoing vessels, human disturbance at nesting colonies, oceanographic changes that affect prey species abundance, military operations, and being caught in fishing nets (Burkett et al. 2003).

3.6.2.13 Albatrosses, Petrels, Shearwaters, and Storm-Petrels (Order Procellariiformes)

The Procellariiformes is a large order of open ocean seabirds that are divided into four families: Diomedeidae (albatrosses), Procellariidae (petrels and shearwaters), Hydrobatidae (storm-petrels), and Pelecanoididae (diving-petrels) (Enticott and Tipling 1997; Onley and Scofield 2007). There are 39 species representing three families—albatrosses, petrels and shearwaters, and storm-petrels—that occur in the Study Area (Table 3.6-2 and Table 3.6-3). These species are generally long-lived, breed once a year, and lay only one egg. They have extremely broad distributions and include all marine birds that spend most of their lives at sea and exclusively feed in the open ocean, primarily on fish, crustaceans, and crabs. They can be found in high numbers resting on the water in flocks where prey is concentrated (Enticott and Tipling 1997). Some species feed around fishing boats or become injured from longline gear (Enticott and Tipling 1997; Onley and Scofield 2007). They nest in colonies on remote islands uninhabited by people. Some are ground nesters; others nest in cavities or burrows (Ramos et al. 1997). They return to their birth colonies. Most species of this order are monogamous and mate for life. Both parents participate in egg incubation and chick rearing (Elphick et al. 2001). Representative species include Laysan albatross, Northern fulmar, mottled petrel, pink-footed shearwater, and Wilson's storm-petrel.

3.6.2.14 Tropicbirds, Boobies, Pelicans, Cormorants, and Frigatebirds (Order Pelecaniformes)

The Pelecaniformes order includes anhingas, pelicans, gannets and boobies, tropicbirds, cormorants, and frigatebirds. There are 14 species representing 5 families that occur in the Study Area: tropicbirds, boobies, pelicans, cormorants, and frigatebirds (Table 3.6-2 and Table 3.6-3). They all have webbed feet and eight toes, and all have a throat sac, called a gular sac (Brown and Harshman 2008). This sac is highly developed and visible in pelicans and frigatebirds but is also readily apparent in boobies and cormorants. Pelicans use the sac to trap fish, frigatebirds use it as a mating display and to feed on fish, squid, and similar marine life (Dearborn et al. 2001), and cormorants and boobies utilize the sac for heat regulation. These birds nest in colonies, but individual birds are monogamous (Brown and Harshman 2008). Representative species within the Study Area include white-tailed tropicbird, blue-footed booby, California brown pelican, pelagic cormorant, and magnificent frigatebird.

3.6.2.15 Phalaropes, Gulls, Noddies, Terns, Skua, Jaegers, and Alcids (Order Charadriiformes)

There are 54 species representing three families from this diverse group that occur within the Study Area (Table 3.6-2 and Table 3.6-3). Gulls, noddies, and terns in the family Laridae are a diverse group of small to medium sized seabirds that inhabit coastal, nearshore, and open sea waters. Skuas and jaegers in the family Stercorariidae are stocky powerful birds with long pointed wings, long tails, strong hooked bills, and sharp talons known for robbing the food of smaller seabirds, teasing and harassing them until they drop their prey. Murres, murrelets, and auklets in the family Alcidae are good swimmers and divers and have short wings, which require them to flap their wings rapidly to fly.

Species in the order Charadriiformes occupy diverse habitats. Some species in this order spend most of their time at sea (e.g., jaegers, skuas, alcids), whereas others are more coastal or near shore (e.g., gulls). Many charadriiforms inhabit marine and freshwater wetlands; others spend most of their lives in or near the ocean. Many species breed in colonies, and some species lay more than one egg (Ericson et al. 2003; Fain and Houde 2007; Harrison 1983; Onley and Scofield 2007). Representative species within the Study Area include Sabine’s gull, black-legged kittiwake, black noddy, sooty tern, South polar skua, pomerine jaeger, common murre, long-billed murrelet, rhinoceros auklet, and horned puffin.

3.6.3 Environmental Consequences

This section evaluates how and to what degree the activities described in Chapter 2 (Description of Proposed Action and Alternatives) affect seabirds and seabird communities known to occur within the Study Area. For this Environmental Impact Statement (EIS)/Overseas EIS (OEIS), seabirds are evaluated as groups of species characterized by distribution, body type, or behavior relevant to the stressor being evaluated. Activities are evaluated for their potential effect on all seabirds in general, on each taxonomic grouping, and on the five seabirds in the Study Area listed as endangered or threatened under the ESA. An impacts analysis for seabirds has been conducted for potential mortality, habitat destruction, or breeding and roosting disturbance. Migratory and breeding seabirds utilize portions of the Study Area to differing degrees depending on the foraging and breeding requirements of each species. As listed in the ESA-listed species descriptions, there is no critical habitat or primary constituent elements for listed species within the Study Area. Therefore, the analysis of stressors on critical habitat is not carried though this EIS document.

The alternatives for training and testing activities were examined to determine if the Proposed Action would produce one or more of the following impacts:

- A direct or indirect impact on seabirds or seabird populations from mortality attributed to military training and testing activities taking place within the Study Area.
- A direct or indirect impact on seabird populations from destruction or disturbance of foraging habitat attributed to military training and testing activities taking place within the Study Area.

- A direct or indirect impact on seabird populations from destruction or disturbance of seabird breeding colonies, foraging or roosting areas attributed to military training and testing activities taking place within the Study Area.

The consequences of the proposed military readiness activities on non-federally listed migratory seabirds or on modification of their habitat are evaluated based on the criteria described in the Final Rule authorizing DoD to incidentally take migratory seabirds during military readiness activities (50 C.F.R. Part 21, 28 February 2007) which states that military readiness activities are authorized to take migratory birds provided they do not result in a significant adverse effect on a population of a migratory seabird species. An activity has a significant adverse effect if, over a reasonable period of time, it diminishes the capacity of a population of migratory seabird species to maintain genetic diversity, to reproduce, and to function effectively in its native ecosystem. A population is defined as "a group of distinct, coexisting, same species, whose breeding site fidelity, migration routes, and wintering areas are temporally and spatially stable, sufficiently distinct geographically (at some point of the year), and adequately described so that the population can be effectively monitored to discern changes in its status." (U.S. Bureau of Land Management and U.S. Fish and Wildlife Service 2010).

Navy training and testing activities have the potential to contribute acoustic, energy, physical disturbance/strike, entanglement or ingestion stressors to seabird populations within the Study Area. These stressor types are induced by the training and testing activity types noted in Chapter 2 (Description of Proposed Action and Alternatives), which vary in intensity, frequency, duration, and location within the Study Area; therefore, seabird species may be impacted by different proposed activities. Certain activities take place in specific locations or depth zones within the Study Area outside of the range or foraging abilities of seabirds. Therefore, seafloor device strike, cable and wire entanglement, parachute entanglement, and ingestion of munitions were not carried forward in this analysis for seabirds. Tables 2.8-1 through 2.8-5 present the baseline and proposed training and testing activity locations for each alternative (including number of events and ordnance expended). Based on the general threats to seabirds and shorebirds discussed in Section 3.6.2 (Affected Environment) the stressors applicable to ESA-listed species in the Study Area and analyzed below include the following:

- Acoustic (sonar, other active acoustic sources, explosives, pile driving, swimmer defense airguns, vessel noise, aircraft noise)
- Energy (electromagnetic devices)
- Physical disturbance and strike (aircraft, vessels and in-water devices, military expended materials)
- Ingestion (munitions, military expended materials other than munitions)
- Secondary

3.6.3.1 Acoustic Stressors

This section evaluates the potential for acoustic and explosive stressors to affect seabirds during training and testing activities in the Study Area. These stressors are associated with sonar and other underwater active acoustic sources, explosives, pile driving, aircraft noise, and vessel noise. Following the Conceptual Framework for Assessing Effects from Sound-Producing Activities (Section 3.0.5.7.1), categories of potential impacts from exposure to explosions and noise are direct trauma, hearing loss, auditory masking, behavioral reactions, and physiological stress. Potential negative nonphysiological consequences to seabirds from acoustic and explosive stressors include disturbance of foraging, roosting, or breeding; degradation of foraging habitat; and degradation of known seabird breeding colonies.

The types of seabirds exposed to noise-producing activities or explosive detonations depend on where training and testing activities occur relative to the coast. Seabirds can be divided into three groups based on breeding and foraging habitat: (1) those species such as albatrosses, petrels, frigatebirds, tropicbirds, boobies, and some terns that forage over the ocean and nest on oceanic islands; (2) species such as pelicans, cormorants, gulls, and some terns that nest along the coast and forage in nearshore areas; and (3) those few species such as marbled murrelet that nest in inland habitats and come to the coastal areas to forage.

The area from the beach to about 10 nautical miles (nm) offshore provides foraging areas for breeding terns, gulls, skimmers, and pelicans; a migration corridor and winter habitat for terns, gulls, skimmers, pelicans, loons, cormorants, and gannets; and supports nonbreeding and transient pelagic seabirds. Offshore pelagic waters support nonbreeding and transient pelagic seabirds, loons, gannets, and several tern species (Davis et al. 2000; Hunter et al. 2006a). Pelagic seabirds are generally widely distributed, but they tend to congregate in areas of higher productivity and prey availability (Haney 1986). Such areas include the Pacific Current, particularly areas of eddies and upwelling; areas with productive live/hard bottom habitats; and large algal mats.

Seabirds and migrating birds could be exposed to noises from sources near the water surface or from airborne sources. While foraging seabirds will be present near the water surface, migrating birds may fly at various altitudes. Some species such as sea ducks and loons may be commonly seen flying just above the water's surface, but the same species can also be spotted flying so high that they are barely visible through binoculars (United States Geological Service 2006). While there is considerable variation, the favored altitude for most small birds appears to be between 500 ft. (152.4 m) and 1,000 ft. (304.8 m). Radar studies have demonstrated that 95 percent of the migratory movements occur at less than 10,000 ft. (3,048 m), the bulk of the movements occurring under 3,000 ft. (914.4 m) (United States Geological Service 2006).

Seabirds use a variety of foraging behaviors that could expose them to underwater noise. Most seabirds plunge-dive from the air into the water or perform aerial dipping (the act of taking food from the water surface in flight); others surface-dip (swimming and then dipping to pick up items below the surface) or jump-plunge (swimming, then jumping upward and diving under water). Birds that plunge-dive typically submerge for no more than a few seconds, and any exposure to underwater noise would be very brief. Other seabirds pursue prey under the surface, swimming deeper and staying underwater longer than other plunge-divers. Some of these seabirds may stay underwater for up to several minutes and reach depths between 50 ft. (15.2 m) and 550 ft. (167.6 m) (Jones 2001; Ronconi 2010). Noises generated under water during training and testing would be more likely to impact seabirds that pursue prey, although as previously stated, little is known about seabird hearing ability underwater. Birds that forage in the open ocean often forage more actively at night, when prey species are more likely to be near the surface and naval training and testing is more limited.

If a seabird is close to an explosive detonation, the exposure to high pressure levels and noise impulse can cause barotrauma, physical injury due to a difference in pressure between an air space inside the body and the surrounding air or water. Damage could occur to the structure of the ear, resulting in hearing loss, or to internal organs, causing hemorrhage and rupture.

If a seabird is close to an intense noise source, it could suffer auditory fatigue. Auditory fatigue manifests itself as hearing sensitivity loss over a portion of hearing range, called a noise-induced threshold shift. A threshold shift may be either permanent threshold shift (PTS) or temporary threshold shift (TTS). Studies have examined hearing loss and recovery in only a few species of birds, and none studied hearing loss in seabirds (e.g., Hashino et al. 1988; Ryals et al. 1999; Ryals et al. 1995; Saunders and Dooling 1974). A bird may experience permanent threshold shift if exposed to a continuous over 110 A-weighted decibels (dBA) re 20 µPa sound pressure level in air or blast noise over 140 dB re 20 µPa sound pressure level in air (Dooling and Therrien 2012). Unlike other species, birds have the ability to regenerate hair cells in the ear, usually resulting in considerable anatomical, physiological, and behavioral recovery within several weeks. Still, intense exposures are not always fully recoverable, even over periods up to a year after exposure, and damage and subsequent recovery vary significantly by species (Ryals et al. 1999). Birds may be able to protect themselves against damage from sustained noise exposures by regulating inner ear pressure, an ability that may protect ears while in flight (Ryals et al. 1999). Diving birds have adaptations to protect the middle ear and tympanum from pressure changes during diving that may affect hearing (Dooling and Therrien 2012). Auditory fatigue can impair an animal's ability to hear biologically important sounds within the affected frequency range. Biologically important sounds come from social groups, potential mates, offspring, or parents; environmental sounds; or predators.

Numerous studies have documented that birds respond to anthropogenic noise, including aircraft overflights, weapons firing, and explosions (Larkin et al. 1996; National Park Service 1994; Plumpton 2006). Studies generally indicate that birds hear in-air sounds over a very limited range between 1 and 5 kHz but specific species hearing can extend to higher and lower frequencies (Beason 2004). The manner in which birds respond to noise depends on several factors, including life-history characteristics of the species, characteristics of the noise source, loudness, onset rate, distance from the noise source, presence or absence of associated visual stimuli, and previous exposure (Larkin et al. 1996; National Park Service 1994; Plumpton 2006). Researchers have documented a variety of behavioral responses of birds to noise, such as alert behavior, startle response, flying or swimming away, diving into the water, and increased vocalizations. While they are difficult to measure in the field, some of these behavioral responses may be accompanied by physiological responses, such as increased heart rate short-term changes in stress hormone levels (Partecke et al. 2006).

Chronic stress due to disturbance may compromise the general health and reproductive success of birds (Kight et al. 2012), but a physiological stress response is not necessarily indicative of negative consequences to individual birds or to populations (Larkin et al. 1996; National Parks Service 1994). The reported behavioral and physiological responses of birds to noise exposure can fall within the range of normal adaptive responses to external stimuli, such as predation, that birds face on a regular basis. These responses can include activation of the neural and endocrine systems, causing changes such as increased blood pressure, available glucose, and blood levels of corticosteroids (Manci et al. 1988). It is possible that individuals would return to normal almost immediately after exposure, and the individual's metabolism and energy budget would not be affected long-term. Studies also have shown that birds can become habituated to noise following frequent exposure and cease to respond behaviorally to the noise (Larkin et al. 1996; National Park Service 1994; Plumpton 2006). However, the likelihood of habituation is dependent upon a number of factors, including species of bird (Bowles et al. 1991), and frequency of and proximity to exposure. Raptors have been shown to shift their terrestrial home range when concentrated military training activity was introduced to the area (Andersen et al. 1990). On the other hand, cardinals nesting in areas with high levels of military training activity (including gunfire, artillery, and explosives)were observed to have similar reproductive success and stress hormone levels as cardinals in areas of low activity (Barron et al. 2012).

3.6.3.1.1 Impacts from Sonar and Other Active Acoustic Sources

Sonar and other underwater active acoustic sources could be used throughout the Study Area. Information regarding the impacts from sonar on seabirds and the ability for seabirds to hear underwater is virtually unknown. The exposure to these sounds by seabirds, other than pursuit diving species, is likely to be very limited due to spending a very short time under water (plunge-diving or surface-dipping) or foraging only at the water surface. Pursuit divers may remain under water for minutes, increasing the chance of underwater sound exposure.

A physiological impact, such as hearing loss, would likely occur if a seabird is close to an intense sound source. In general, birds are less susceptible to both temporary and permanent threshold shift than mammals (Saunders and Dooling 1974), so an underwater sound exposure would have to be intense and of a sufficient duration to cause temporary or permanent threshold shift. Avoiding the sound by returning to the surface would limit extended or multiple sound exposures underwater. There have been no studies documenting diving seabirds' reactions to sonar.

Seabirds that approach vessels while foraging would be most likely to be exposed to underwater active acoustic sources. If the presence of a ship attracts diving seabirds, the seabirds could be more likely to be exposed to an underwater sound if the ship is engaged in anti-submarine warfare or mine warfare with active acoustic sources. Some seabirds commonly follow vessels, including certain species of gulls, storm petrels, and albatrosses, for increased potential of foraging success as the prop wake brings prey to the surface (Hamilton III 1958; Hyrenbach 2001, 2006b; Melvin et al. 2001). However, most hull-mounted sonars do not project sound aft of ships (behind the ship, opposite the direction of travel), so most seabirds diving in ship wakes would not be exposed to sonar.

The possibility of an ESA-listed seabird species being exposed to sonar and other active acoustic sources depends on whether it submerges during foraging and whether it forages in areas where these sound sources may be used. Although petrels and albatrosses forage in open ocean areas where sonar training and testing occurs, they would not be exposed to underwater sound because they forage at the surface. Least terns forage in coastal shallow waters where they could be exposed to sonar and other active acoustic sources, notably near ports and shipyards where sonar maintenance and testing occur. However, their plunge dives are brief, so any chance of exposure would be minimal. Most other sonar use occurs farther offshore, however, so the chance for an exposure would be low.

3.6.3.1.1.1 No Action Alternative

Training Activities

Training activities under the No Action Alternative include activities that produce in-water sound from the use of sonar and other active non-impulsive acoustic sources include anti-submarine warfare, mine warfare, object detection and navigation, communication, and maintenance. These activities could occur throughout the Study Area, but would be concentrated in the SOCAL and HRC portions of the study area. The Pacific Current runs through the SOCAL Range Complex portion of the Study Area, and is an area of increased productivity that attracts foraging seabirds. Therefore, seabirds that forage in these open ocean areas would have a greater chance of underwater sound exposure than seabirds that forage in coastal areas.

Diving seabirds may not respond to an underwater sound, but if a diving seabird does react to an underwater sound source, it could result in a short-term behavioral response. Seabirds would avoid any additional exposures during a foraging dive when they surface. Due to the limited duration of training events and widespread availability of open ocean foraging habitat, any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population.

Least terns may briefly submerge while foraging, so there is a remote chance that a least tern could be briefly exposed to underwater sound sonar and other active acoustic sources. However, least terns forage in the nearshore waters, in areas where the acoustic sources used are minimal, further reducing the potential for exposure.

It is likely that few seabirds would be affected by sonar and other underwater active acoustic sources because:

- sources are used intermittently during a training event,
- training events are dispersed in space and time,
- most seabirds spend little time submerged, and
- exposures sufficiently intense (i.e., of a certain duration or within a close proximity) to cause physiological impacts are unlikely.

Pursuant to the ESA, the use of sonar and other active acoustic sources during training activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of sonar and other active acoustic sources during training activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Testing activities under the No Action Alternative include activities that produce in-water sound from the use of sonar and other active non-impulsive acoustic sources could occur throughout the Study Area, but would be concentrated in the SOCAL and HRC portions of the study area. The Pacific Current runs through the SOCAL Range Complex portion of the Study Area, and is an area of increased productivity that attracts foraging seabirds. Therefore, seabirds that forage in these open ocean areas would have a greater chance of underwater sound exposure than seabirds that forage in coastal areas.

Diving seabirds may not respond to an underwater sound, but if a diving seabird does react to an underwater sound source, it could result in a short-term behavioral response. Seabirds would avoid any additional exposures during a foraging dive when they surface. Due to the limited duration of training events and widespread availability of open ocean foraging habitat, any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population.

It is likely that few seabirds would be affected by sonar and other underwater active acoustic sources because:

- sources are used intermittently during a training event,
- training events are dispersed in space and time,
- most seabirds spend little time submerged, and
- exposures sufficiently intense (i.e., of a certain duration or within a close proximity) to cause physiological impacts are unlikely.

Hawaiian petrels and short-tailed albatrosses do not submerge while foraging; therefore, they would not be exposed to underwater sound from sonar and other active acoustic sources. Least terns, marbled murrelet, and Newell's shearwater may briefly submerge while foraging, either during plunge-diving (terns) or pursuit diving (murrelet and shearwater), so there is a remote chance that these species could be exposed to underwater sound sonar and other active acoustic sources.

Pursuant to the ESA, the use of sonar and other active acoustic sources during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of sonar and other underwater acoustic sources during testing activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.1.2 Alternative 1

Training Activities

The number of annual training activities that produce in-water sound from the use of sonar and other active acoustic sources under Alternative 1 would approximately double from the No Action Alternative. This includes overall increases to anti-submarine warfare; mine warfare; object detection and navigation; communication; and maintenance. Training activities would occur in similar areas as under the No Action Alternative for similar activities. Based on the increased operations under Alternative 1 versus the No Action Alternative, more seabirds could be exposed to sonar and other active acoustic sources. Although the quantity of underwater acoustic stressors would increase, any impacts on seabirds would likely be limited to short-term behavioral reactions by diving seabirds as described under the No Action Alternative. Due to the limited duration of training events and widespread availability of open ocean foraging habitat, any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population.

Hawaiian petrels and short-tailed albatrosses do not submerge while foraging; therefore, they would not be exposed to underwater sound from sonar and other active acoustic sources. Least terns, marbled murrelet, and Newell's shearwater may briefly submerge while foraging, either during plunge-diving (terns) or pursuit diving (murrelet and shearwater), so there is a remote chance that these species could be exposed to underwater sound sonar and other active acoustic sources. However, any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population.

Pursuant to the ESA, the use of sonar and other active acoustic sources during training activities under the Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of sonar and other active acoustic sources during training activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources) and Table 3.0-8 describe the use of sonar and other underwater active acoustic sources during testing activities under Alternative 1. Use of sonar and other active acoustic sources would approximately double under Alternative 1 versus the No Action Alternative. Sonar and other active acoustic sources would be used in waters throughout the range complexes and testing ranges, and smaller amounts would be used in waters beyond the range complexes or in nearshore areas, including locations not used under the No Action Alternative. Although the quantity of underwater acoustic stressors would increase, any impacts on seabirds would likely be limited to short-term behavioral reactions by diving seabirds, as described under the No Action Alternative. Due to the limited duration of testing events and widespread availability of open ocean foraging habitat, any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population.

Hawaiian petrels and short-tailed albatrosses do not submerge while foraging; therefore, they would not be exposed to underwater sound from sonar and other active acoustic sources. Least terns, marbled murrelet, and Newell's shearwater may briefly submerge while foraging, either during plunge-diving (terns) or pursuit diving (murrelet and shearwater), so there is a remote chance that these species could be exposed to underwater sound sonar and other active acoustic sources. However, any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population.

Pursuant to the ESA, the use of sonar and other active acoustic sources during testing activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of sonar and other active acoustic sources during testing activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.1.3 Alternative 2

Training Activities

The number of annual training activities that produce in-water noise from the use of sonar and other active acoustic sources under Alternative 2 would increase over the No Action Alternative. This includes overall increases to anti-submarine warfare; mine warfare; object detection and navigation; communication; and maintenance. Training activities would occur in similar areas as under the No Action Alternative for similar activities. Based on the increased operations under Alternative 2 versus the No Action Alternative, more seabirds could be exposed to sonar and other active acoustic sources. Although the quantity of underwater acoustic stressors would increase, any impacts on seabirds would likely be limited to short-term behavioral reactions by diving seabirds, as described under the No Action Alternative. Due to the limited duration of training events and widespread availability of open ocean foraging habitat, any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population.

Hawaiian petrels and short-tailed albatrosses do not submerge while foraging; therefore, they would not be exposed to underwater sound from sonar and other active acoustic sources. Least terns, marbled murrelet, and Newell's shearwater may briefly submerge while foraging, either during plunge-diving (terns) or pursuit diving (murrelet and shearwater), so there is a remote chance that these species could be exposed to underwater sound sonar and other active acoustic sources.

Pursuant to the ESA, the use of sonar and other active acoustic sources during training activities under the Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of sonar and other active acoustic sources during training activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources) describes the use of sonar and other underwater active acoustic sources during testing activities under Alternative 2, including relative concentrations and locations within the Study Area. Use of sonar and other active acoustic sources would increase under Alternative 2 versus the No Action Alternative. The proposed testing activities would also increase over Alternative 1. Sonar and other active acoustic sources would be used in waters throughout the range complexes and testing ranges, and smaller amounts would be used in waters beyond the range complexes or in nearshore areas, including locations not used under the No Action Alternative. Although the quantity of underwater acoustic stressors would increase, any impacts on seabirds would likely be limited to short-term behavioral reactions by diving seabirds, as described under the No Action Alternative. Due to the limited duration of testing events and widespread availability of open ocean foraging habitat, any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population.

Hawaiian petrels and short-tailed albatrosses do not submerge while foraging; therefore, they would not be exposed to underwater sound from sonar and other active acoustic sources. Least terns, marbled murrelet, and Newell's shearwater may briefly submerge while foraging, either during plunge-diving (terns) or pursuit diving (murrelet and shearwater), so there is a remote chance that these species could be exposed to underwater sound sonar and other active acoustic sources.

Pursuant to the ESA, the use of sonar and other active acoustic sources during testing activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of sonar and other active acoustic sources during testing activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.2 Impacts from Explosives and Swimmer Defense Airguns

The potential for seabirds to be exposed to explosive detonations from training or testing activities depends on several factors, including the presence of seabirds at, beneath, or above the water surface near the detonation; location of the detonation at, below, or above the water surface; size of the explosive; and distance from the detonation. Explosions are associated with detonations of high-explosive missiles and projectiles in air; high-explosive grenades, bombs, missiles, rockets, and projectiles at or immediately below the sea surface; mine neutralization charges on the bottom and in the water column; high-explosive torpedoes near the surface and in the water column; explosive sonobuoys in the water column; and other small charges used at various depths during testing. Section 3.0 describes the shock waves and acoustic waves imparted to a surrounding medium by an explosive detonation and how these waves propagate. Because airguns are an impulsive source, with the potential for similar non-traumatic impacts as explosives, they are considered in this section.

A seabird close to an explosive detonation could be killed or injured. Blast injuries are usually most evident in the gas-containing organs, such as those of the respiratory and gastrointestinal systems. Blasts can also damage pressure-sensitive components of the auditory system. In general, the impacts of explosions would be reduced with increasing distance of the seabird from the explosion, and would range from lethal injury in the immediate vicinity of an explosion to short-term behavioral impacts on the outer edges of the zone of influence.

Underwater detonations could affect diving seabirds and seabirds on the water surface. Studies have shown that birds are more susceptible to underwater explosions when they are submerged versus on the surface (Yelverton et al. 1973). Underwater detonations could have lethal impacts on seabirds in water if impulse exceeds 36 pounds per square inch (in.) (psi)-milliseconds (msec) (psi-msec) (248 Pascal [Pa]-second [sec]) for birds underwater and 100 psi-msec (690 Pa-sec) just below the water surface for birds at the water surface (Yelverton et al. 1973). These impulse levels correspond to onset mortality, or the level at which one percent of animals would not be expected to survive. Exposures to higher impulse levels would have greater likelihoods of mortality. No injuries would be expected for seabirds underwater at blast pressures below 6 psi-msec (41 Pa-sec) and for seabirds on the surface at blast pressures below 30 psi-msec (207 Pa-sec). Table 3.6-4 shows estimated ranges to onset mortality and to the safety range (no injury expected) for several classes of charges proposed to be used in the Study Area, assuming a diving seabird is exposed at 15 ft. (4.6 m) below the water surface, using the Yelverton method. Ranges to impacts are based on several factors including charge size, depth of the detonation, and how far the seabird is beneath the water surface. It should be cautioned that these are estimates, and actual ranges to impacts would depend on conditions at each detonation site.

Detonations in air could also injure seabirds while either in flight or at the water surface. Experiments that exposed seabirds to blast waves in air provided a relationship between charge size, distance from detonation, and likelihood of seabird injury or mortality (Damon et al. 1974). Table 3.6-5 shows the safe distance from a detonation in air beyond which no injuries to seabirds would be expected.

Table 3.6-4: Estimated Ranges to Impacts for Diving Birds Exposed to Underwater Detonations

Source Class	Representative Munitions	Net Explosive Weight (lb.)	Depth of Charge	Distance to Onset Mortality	Safety Range
E6	Air-to-Surface missile	11–20	33 ft. (10 m)	220–330 ft. (70–100 m)	780–920 ft. (240–280 m)
E12	2,000 lb. bomb	601–1,000	10 ft. (3 m)	460–600 ft. (140–180 m)	1,000–1,200 ft. (330–370 m)
E17	40,000 lb. HBX charge	14,501–58,000	200 ft. (61 m)	2,700–3,900 ft. (800–1200 m)	7,300–9,700 ft. (2,200–3,000 m)

Notes: ft. = feet, HBX = high blast explosive, lb. = pounds, m = meters

Table 3.6-5: Safe Distance from Detonations in Air for Birds

Explosive Source Class	Sample Ordnance	Net Explosive Weight	Safe Distance (no Injury)[1]
E3	76 mm round	0.6–2 lb.	22 ft. (7 m)
E5	5 in. projectiles	6–10 lb.	22 ft. (10 m)
E7	Rolling Airframe Anti-Air Missile	21–60 lb.	70 ft. (21 m)

[1] Damon 1974
Notes: ft. = feet, in. = inches, lb.= pounds, m = meters, mm = millimeters

The airborne noise associated with underwater explosions and airgun use is minimal. Because of the differences in acoustic transmission in water and in air, an effect called the Lloyd mirror reflects underwater noise at the water surface. Therefore, noise generated in the water will not pass over to the air (refer to the acoustic and explosives primer in Section 3.0). Noises generated by most small underwater explosions, therefore, are unlikely to disturb seabirds above the water surface. If a detonation is sufficiently large or is near the water surface, however, pressure will be released at the air-water interface. Birds above this pressure release could be injured or killed.

Most high-explosive ordnance used in anti-surface warfare training and testing detonates at the water surface or a short distance below the water surface. The blast waves and acoustic waves would propagate through both water and air, although near the surface most pressure release would be into the air. Birds close to the detonation point would be injured or killed. Detonations in air during anti-air warfare training and testing would typically occur at much higher altitudes (greater than 3,000 ft. [914.4 m] above sea level) where seabirds and migrating birds are less likely to be present (U.S. Geological Survey 2006). Foraging seabirds will typically be at lower elevations where they are likely to be unaffected by in-air explosions. Therefore, seabirds are unlikely to be injured or killed by high-altitude in-air detonations.

At distances beyond those to injury, responses to noise from an explosive detonation would be limited to short-term behavioral or physiological responses (e.g., alert response, startle response, and temporary increase in heart rate). Startle or alert reactions to muzzle blasts are not likely to disrupt major behavior patterns, such as migrating, breeding, feeding, and sheltering, or to result in serious injury to any seabirds. Birds may be temporarily displaced and there may be temporary increases in stress levels; however, behavior and use of habitat would return shortly after the training is complete. Beason (2004) notes that birds exposed to up to 146 dBA within 325 ft. (99.1 m) of the noise source flushed but then returned within minutes of the disturbance. The range of impacts could depend on the charge size, distance from the charge, and the seabird's life activity at the time of the exposure.

Fleeing response to an initial explosion may reduce seabird exposure to any additional explosions that occur within a short timeframe. Seabirds could also be attracted to an area to forage if an explosion resulted in a fish kill. This would only be a concern for events that involved multiple explosions in the same area within a single event, such as firing exercises, which involves firing multiple high-explosive 5 in. rounds at a target area, and bombing exercises, which could involve multiple bomb drops separated by several minutes.

3.6.3.1.2.1 No Action Alternative

Training Activities

Explosive detonations are associated with training activities under the No Action Alternative that use high-explosive charges, including bombs, missiles, explosive munitions, explosive sonobuoys, grenades, munitions used in sinking exercises, and underwater detonations associated with mine neutralization training. The detonations would include explosive source classes up to E13 (1,000–1,740 lb. net explosive weight) (see Table 3.0-9). Training activities involving explosive detonations are spread throughout the Study Area, but would be concentrated in the SOCAL Range Complex portion of the Study Area, followed in descending order of numbers of activities by HRC, Silver Strand Training Complex (SSTC), and the Transit Corridor. Training activities using explosives generally do not occur within 1.6 nm of shore or within 3 nm of bays, rivers, or estuaries except those used in the San Diego Bay and boat training lanes of SSTC (E1–E6 [less than 20 lb. net explosive weight]). A more detailed description of these training activities and their proposed locations are presented in Table 2.8-1 of Chapter 2 (Description of Proposed Action and Alternatives).

Nearshore waters are the primary foraging habitat for many seabird species. Any small detonations close to shore could have a short-term adverse impact on nesting and nearshore foraging species. Most larger detonations would occur near areas with the potential for relatively high concentrations of seabirds (upwelling areas associated with the Pacific Current; productive live/hard bottom habitats; and large algal mats); therefore, any impacts on seabirds are likely to be greater in these areas. While the impacts of explosive detonations on seabirds under the No Action Alternative cannot be quantified due to limited data on seabird density, lethal injury to some seabirds could occur. Lethal injuries would likely be associated with detonations of bombs with larger net explosive weights, although any event employing static targets may attract seabirds to the detonation site. Because explosive detonations occur at varying locations over a short time period and seabird presence changes seasonally and on a short-term basis, individual seabirds would not be expected to be repeatedly exposed to explosive detonations. Any impacts on migratory or breeding seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term and infrequent and would not impact seabird or migratory bird populations.

Airborne detonations would occur during gunnery and air-to-air missile activities, although these would occur at relatively high altitudes. Any impacts would likely be limited to short-term startle reactions, as the detonations would occur far above typical seabird flight altitudes.

ESA-listed seabirds are known to be present in areas where detonations would occur during training under the No Action Alternative. While the information known about seabird distribution limits the ability to quantify the impacts of explosions, the likelihood of an injurious exposure seems remote based on the very low density of seabirds. An exposure resulting in a short-term behavioral response would be more likely to occur than an exposure that causes injury. Least terns could startle in the vicinity of explosive detonations from training at SSTC as they forage areas where detonations occur. However, the detonations used in these foraging areas are restricted to less than 20 lb. net explosive weight. If a detonation occurred in the vicinity of least terns, impacts would likely be limited to short-term startle reactions as the zone of impact around these smaller detonations are minimal. Protective measures, such as restricting underwater explosions if flocks of seabirds are rafting on the water's surface inside a mitigation zone or if flocks of seabirds are migrating directly above the proposed training site minimize impacts on seabirds (Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring). Mitigation measures include visual surveillance from surface vessels or aircraft beginning 30 minutes before, during, and 30 minutes after the completion of the exercise within the mitigation zones around the detonation site. If a seabird is visually detected within the mitigation zone, then the exercise will cease until the mitigation zone has been clear from any additional sightings for 30 minutes. These mitigation measures further reduce the potential impact upon seabirds.

Pursuant to the ESA, the use of explosives during training activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of explosives during training activities described under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Explosive detonations are associated with testing activities under the No Action Alternative that use high-explosive charges, including bombs, missiles, explosive munitions, explosive sonobuoys, grenades, munitions used in sinking exercises, and underwater detonations associated with mine neutralization training. The detonations would include explosive source classes up to E11 (500–650 lb. net explosive weight) (see Table 3.0-9). Testing activities involving explosive detonations are spread throughout the Study Area, but would be concentrated in the SOCAL Range Complex portion of the Study Area, followed in descending order of numbers of activities by the HRC. Further, under the No Action Alternative, the vast majority (4,546) of explosive detonations are explosive source class E1–E4 (less than 5 lb. net explosive weight). A more detailed description of these testing activities and their proposed locations are presented in Tables 2.8-2 through 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives).

Nearshore waters are the primary foraging habitat for many seabird species. Any small detonations close to shore could have a short-term adverse impact on nesting and nearshore foraging species. Most larger detonations would occur near areas with the potential for relatively high concentrations of seabirds (upwelling areas associated with the Pacific Current; productive live/hard bottom habitats; and large algal mats); therefore, any impacts on seabirds are likely to be greater in these areas. However, under the No Action Alternative, only 15 explosive detonations of explosive class source E5 or greater (greater than 5 lb. net explosive weight) (Table 3.0-9) would occur. While the impacts of explosive detonations on seabirds under the No Action Alternative cannot be quantified due to limited data on seabird density, lethal injury to some seabirds could occur. Lethal injuries would likely be associated with detonations of bombs with larger net explosive weights, although any event employing static targets may attract seabirds to the detonation site. While some seabird mortality could occur, the mortality potential is very low, given the low number of large net explosive weight detonations and the dispersed nature of seabirds in the study area. Because explosive detonations occur at varying locations over a short time period and seabird presence changes seasonally and on a short-term basis, individual seabirds would not be expected to be repeatedly exposed to explosive detonations. Airgun detonations may startle diving birds foraging in port areas where underwater airgun detonations would occur. Any impacts on migratory or breeding seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term and infrequent and would not impact seabird or migratory bird populations.

ESA-listed seabirds are known to be present in areas where detonations would occur during training under the No Action Alternative. While the information known about seabird distribution limits the ability to quantify the impacts of explosions, the likelihood of an injurious exposure seems remote based on the very low density of seabirds and low net explosive weight used. An exposure resulting in a short-term behavioral response would be more likely to occur than an exposure that causes injury.

Pursuant to the ESA, the use of explosives during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of explosives during testing activities described under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.2.2 Alternative 1

Training Activities

The total number of explosive detonations throughout the Study Area would decrease by 15 percent under Alternative 1 (Table 3.0-9) as compared to the No Action Alternative. The detonations would include explosive source classes up to E13 (1,000–1,740 lb. net explosive weight). Training activities involving explosive detonations occur throughout the Study Area, but would be concentrated in the SOCAL Range Complex portion of the Study Area, followed in descending order of numbers of activities by HRC, SSTC, and the Transit Corridor. Training activities using explosives generally do not occur within 1.6 nm of shore or within 3 nm of bays, rivers, or estuaries except those used in the San Diego Bay and boat training lanes of SSTC (E1–E7 [less than 60 lb. net explosive weight]). Alternative 1 would introduce the use of high explosive rockets. The majority of these rockets would be used in the SOCAL Range Complex portions of the Study Area, with the remainder being used in the HRC portion of the Study Area, and none would be used in the SSTC portion of the Study Area. A more detailed description of these training activities and their proposed locations are presented in Table 2.8-1 of Chapter 2 (Description of Proposed Action and Alternatives).

Potential impacts on seabirds by explosive detonations are expected to be similar to those under the No Action Alternative, but the potential for exposure would decrease with lower number of explosive detonations. While some seabird mortalities could occur, only a small number of seabirds would be affected. Any impacts on seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term (behavioral) and infrequent and would not impact seabird or migratory bird populations. Repeated exposure of individual seabirds or groups of seabirds would be unlikely, based on the large operational area of the Study Area and the dispersed nature of the activities.

ESA-listed seabirds are known to be present in areas where detonations would occur during training under Alternative 1. While the information known about seabird distribution limits the ability to quantify the impacts of explosions, the likelihood of an injurious exposure seems remote based on the very low density of seabirds and smaller number of explosive detonations. An exposure resulting in a short-term behavioral response would be more likely to occur than an exposure that causes injury.

Pursuant to the ESA, the use of explosives during training activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of explosives during training activities described under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Explosive detonations associated with testing activities under Alternative 1 would nearly triple as compared to the No Action Alternative. The detonations would include explosive source classes up to E11 (500–650 lb. net explosive weight) (see Table 3.0-9). However, the vast majority (16,136 of 16,424) of explosive detonations are explosive source class E1–E4 (less than 5 lb. net explosive weight).Testing activities involving explosive detonations are spread throughout the Study Area, but would be concentrated in the SOCAL Range Complex portion of the Study Area, followed in descending order of numbers of activities by the HRC. A more detailed description of these testing activities and their proposed locations are presented in Tables 2.8-2 through 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives).

Small detonations close to shore could have a short-term adverse impact on nesting and nearshore foraging species. Most larger detonations would occur near areas with the potential for relatively high concentrations of seabirds (upwelling areas associated with the Pacific Current; productive live/hard bottom habitats; and large algal mats); therefore, any impacts on seabirds are likely to be greater in these areas. However, under Alternative 1, only 288 explosive detonations are of explosive class source E5 or greater (greater than 5 lb. net explosive weight) (Table 3.0-9). While the impacts of explosive detonations on seabirds under Alternative 1 cannot be quantified due to limited data on seabird density, lethal injury to some seabirds could occur. Lethal injuries would likely be associated with explosive detonations with larger net explosive weights, although any event employing static targets may attract seabirds to the detonation site. While some seabird mortality could occur, the mortality potential is low, given the number of large net explosive weight detonations and the dispersed nature of seabirds in the study area. Because explosive detonations occur at varying locations over a short time period and seabird presence changes seasonally and on a short-term basis, individual seabirds would not be expected to be repeatedly exposed to explosive detonations. Similar to the No Action Alternative, any impacts on migratory or breeding seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term and infrequent and would not impact seabird or migratory bird populations.

ESA-listed seabirds are known to be present in areas where detonations would occur during training under Alternative 1. While the information known about seabird distribution limits the ability to quantify the impacts of explosions, the likelihood of an injurious exposure seems remote based on the very low density of seabirds and net explosive weight used. An exposure resulting in a short-term behavioral response would be more likely to occur than an exposure that causes injury.

Pursuant to the ESA, the use of explosives during testing activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of explosives during testing activities described under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.2.3 Alternative 2

Training Activities

The total number of explosive detonations throughout the Study Area would decrease by 15 percent under Alternative 2 (Table 3.0-9) as compared to the No Action Alternative. The detonations would include explosive source classes up to E13 (1,000–1,740 lb. net explosive weight). Training activities involving explosive detonations occur throughout the Study Area, but would be concentrated in the SOCAL Range Complex portion of the Study Area, followed in descending order of numbers of activities by HRC, SSTC, and the Transit Corridor. Training activities using explosives generally do not occur within 1.6 nm of shore or within 3 nm of bays, rivers, or estuaries except those used in the San Diego Bay and boat training lanes of SSTC (E1–E7 [less than 60 lb. net explosive weight]). Alternative 2 would introduce the use of high explosive rockets. The majority of these rockets would be used in the SOCAL Range Complex portions of the Study Area, with the remainder being used in the HRC portion of the Study Area, and none would be used in the SSTC portion of the Study Area. A more detailed description of these training activities and their proposed locations are presented in Tables 2.8-2 through 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives).

Potential impacts on seabirds by explosive detonations are expected to be similar to those under the No Action Alternative, but the potential for exposure would decrease with lower number of explosive detonations. While some seabird mortalities could occur, only a small number of seabirds would be affected. Any impacts on seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term (behavioral) and infrequent and would not impact seabird or migratory bird populations. Repeated exposure of individual seabirds or groups of seabirds would be unlikely, based on the large operational area of the Study Area and the dispersed nature of the activities.

ESA-listed seabirds are known to be present in areas where detonations would occur during training under Alternative 2. While the information known about seabird distribution limits the ability to quantify the impacts of explosions, the likelihood of an injurious exposure seems remote based on the very low density of seabirds and smaller number of explosive detonations. An exposure resulting in a short-term behavioral response would be more likely to occur than an exposure that causes injury.

Pursuant to the ESA, the use of explosives during training activities under Alternative 2 may affect, but is not likely to adversely affect ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of explosives during training activities described under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Explosive detonations associated with testing activities under Alternative 2 would approximately triple as compared to the No Action Alternative. The detonations would include explosive source classes up to E11 (500–650 lb. net explosive weight) (see Table 3.0-9). However, the vast majority (18,244 of 18,561) of explosive detonations are explosive source class E1–E4 (less than 5 lb. net explosive weight).Testing activities involving explosive detonations occur throughout the Study Area, but would be concentrated in the SOCAL Range Complex portion of the Study Area, followed in descending order of numbers of activities by the HRC. A more detailed description of these testing activities and their proposed locations are presented in Tables 2.8-2 through 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives).

Small detonations close to shore could have a short-term adverse impact on nesting and nearshore foraging species. Most larger detonations would occur near areas with the potential for relatively high concentrations of seabirds (upwelling areas associated with the Pacific Current; productive live/hard bottom habitats; and large algal mats); therefore, any impacts on seabirds are likely to be greater in these areas. However, under Alternative 2, only 317 explosive detonations of explosive class source E5 or greater (greater than 5 lb. net explosive weight) would occur (Table 3.0-9). While the impacts of explosive detonations on seabirds under Alternative 1 cannot be quantified due to limited data on seabird density, lethal injury to some seabirds could occur. Lethal injuries would likely be associated with explosive detonations with larger net explosive weights, although any event employing static targets may attract seabirds to the detonation site. While some seabird mortality could occur, the mortality potential is low, given the number of large net explosive weight detonations and the dispersed nature of seabirds in the study area. Because explosive detonations occur at varying locations over a short time period and seabird presence changes seasonally and on a short-term basis, individual seabirds would not be expected to be repeatedly exposed to explosive detonations. Similar to the No Action Alternative, any impacts on migratory or breeding seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term and infrequent and would not impact seabird or migratory bird populations.

ESA-listed seabirds are known to be present in areas where detonations would occur during training under the No Action Alternative. While the information known about seabird distribution limits the ability to quantify the impacts of explosions, the likelihood of an injurious exposure seems remote based on the very low density of seabirds and net explosive weight used. An exposure resulting in a short-term behavioral response would be more likely to occur than an exposure that causes injury.

Pursuant to the ESA, the use of explosives during testing activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of explosive detonations during testing activities described under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.3 Impacts from Pile Driving

Acoustic sources from pile driving could occur within the SSTC portion of the Study Area during elevated causeway construction activities. During an elevated causeway event, a pier is constructed off of the beach. The pier is designed to allow for offload of materials and equipment from supply ships. Piles are driven into the sand with an impact hammer. Causeway platforms are then hoisted and secured onto the piles with hydraulic jacks and cranes. The elevated causeway pier, including associated piles, is removed at the conclusion of training. Noise associated with elevated causeway installation activities includes a loud impulsive noise derived from driving piles into the soft sandy substrate of the SSTC waters to temporarily support a causeway of linked pontoons.

Information regarding the impacts from acoustic sources on seabirds and the ability for seabirds to hear underwater is virtually unknown. The exposure to these noises by seabirds, other than pursuit diving species, is likely to be very limited due to spending a very short time under water (plunge-diving or surface-dipping) or foraging only at the water surface. Pursuit divers may remain under water for minutes, increasing the chance of underwater noise exposure.

Responses to noise from pile driving would be limited to short-term behavioral or physiological responses (e.g., alert response, startle response, and temporary increase in heart rate). Startle or alert reactions to muzzle blasts are not likely to disrupt major behavior patterns, such as migrating, breeding, feeding, and sheltering, or to result in serious injury to any seabirds. Birds may be temporarily displaced and there may be temporary increases in stress levels; however, behavior and use of habitat would return shortly after the training is complete. Beason (2004) notes that birds exposed to up to 146 dBA within 325 ft. (99.1 m) of the noise source flushed but then returned within minutes of the disturbance. The range of impacts could depend on the charge size, distance from the charge, and the seabird's life activity at the time of the exposure.

3.6.3.1.3.1 No Action Alternative, Alternative 1, and Alternative 2

Training Activities

Pile driving is associated with four training activities annually under the No Action Alternative, Alternative 1, and Alternative 2. Training activities involving pile driving is limited to the SSTC portion of the Study Area.

Nearshore waters are the primary foraging habitat for many seabird species. Noise from pile driving close to shore could have a short-term adverse impact on nesting and nearshore foraging species. However, human activity such as vessel or boat movement, and equipment setting and movement, could cause seabirds to flee the activity area before the onset of pile driving. If seabirds were in the activity area, they would likely flee the area prior to the release of military expended materials or just after the initial strike of the pile. In-air pile driving noise could elicit short-term behavioral or physiological responses but are not likely to disrupt major behavior patterns, such as migrating, breeding, feeding, and sheltering, or to result in serious injury to any seabirds. Beason (2004) notes that birds exposed to up to 146 dBA within 325 ft. (99.1 m) of the noise source flushed but then returned within minutes of the disturbance. Pile driving noise is not expected to be at this noise level in air.

Information regarding the impacts from underwater pile driving noise on seabirds and the ability for seabirds to hear underwater is virtually unknown. The exposure to these noises by seabirds, other than pursuit diving species, is likely to be very limited due to spending a very short time under water (plunge-diving or surface-dipping) or foraging only at the water surface. Pursuit divers may remain under water for minutes, increasing the chance of underwater noise exposure. Assuming that a seabird disturbed by an underwater noise would avoid the stressor by swimming to the surface, a physiological impact, such as hearing loss, would only occur if a seabird is close to an intense noise source. In general, birds are less susceptible to both temporary and permanent threshold shift than mammals (Saunders and Dooling 1974), so an underwater noise exposure would have to be intense and of a sufficient duration to cause temporary or permanent threshold shift. Avoiding the noise by returning to the surface would limit extended or multiple noise exposures underwater. Any impacts on migratory or breeding seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term and infrequent and would not impact seabird or migratory bird populations.

One ESA-listed seabird is known to be present in areas where pile driving would occur during training under the No Action Alternative, Alternative 1, or Alternative 2. California least terns could be exposed to intermittent pile driving noise during the approximate two week period of each elevated causeway event. However, during the elevated causeway activity, any impact based on displacement from the activity area would be minimized due to the availability of suitable foraging habitat in adjacent boat training lanes at SSTC. Further, an exposure resulting in a short-term behavioral response would only be expected if the seabirds did not leave the area prior to the start of the elevated causeway activity. Repeated exposure of individual seabirds is unlikely based on the seabird’s capability to avoid or rapidly vacate an area of disturbance and availability of non-impacted foraging habitats.

Pursuant to the ESA, pile driving during training activities under all alternatives may affect, but is not likely to adversely affect, the ESA-listed California least tern. Noise from pile driving events from training activities under all alternatives would have no effect on the remaining ESA-listed seabirds in the Study Area.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), pile driving during training activities under any alternative would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under the No Action Alternative, Alternative 1, or Alternative 2, no pile driving events are planned during testing activities.

3.6.3.1.4 Impacts from Weapons Firing, Launch, and Impact Noise

Navy activities in the Study Area include firing or launching a variety of weapons, including missiles; rockets; and small-, medium-, and large-caliber projectiles. Types of weapons-firing activities, the sounds they produce, and areas where weapons firing are most likely to occur are described in Section 3.0.5.3.1.5 (Weapons Firing, Launch, and Impact Noise). Because most weapons firing activities occur far from shore, seabirds that forage or migrate greater than 3 nm offshore are most likely to hear and respond to weapons-firing noise. In addition to noise from weapons firing and launching, birds could be briefly disturbed by the impact of non-explosive practice munitions at the water surface.

Sounds produced by weapons firing (muzzle blast), launch boosters, and projectile travel are potential stressors to birds. Sound generated by a muzzle blast is intense, but very brief. A seabird very close to a large weapons blast could be injured or experience hearing loss due to acoustic trauma or threshold shift. Sound generated by a projectile travelling at speeds greater than the speed of sound can produce a sonic boom in a narrow area around its flight path. Bird responses to weapons-firing and projectile travel noise may include short-term behavioral or physiological responses such as alert responses, startle responses, or temporary increases in heart rate. Once surface weapons firing activities begin, birds would likely disperse away from the area around the ship and the path of projectiles.

Other activities in the general area that precede these activities, such as vessel movement or target setting, potentially would disperse birds away from the area in which weapons-firing noise would occur. Any increased ship activity at a critical time or in an important foraging area could drive these and other species from their natural habitat (Borberg et al. 2005b). On the other hand, some birds commonly follow vessels, including certain species of gulls, storm petrels, and albatrosses (Hyrenbach 2001, 2006). A number of seabird species are attracted to ships because of the increased potential for foraging success (Melvin et al. 2001). The propeller wake generated by all ships, but particularly larger ships, disrupts the water column, causing prey to be brought to the surface where it is more easily captured by a greater variety of seabird species. Seabirds that are attracted to ships are more likely to be exposed to weapons-firing noise.

Airborne weapons firing at airborne targets typically occur at high altitudes of 15,000 to 25,000 ft. during air-to-air gunnery exercises. Noise generated by firing at such high altitudes is unlikely to generate a strong reaction in birds migrating at lower altitudes or foraging at the surface. The altitudes at which migrating birds fly can vary greatly based on the type of bird, where they are flying (over water or over land), and other factors such as weather. Approximately 95 percent of bird flight during migrations occurs below 10,000 ft. (3,048 m) with the majority below 3,000 ft. (914 m) (Lincoln 1998). While there is considerable variation, the favored altitude for most small birds appears to be between 500 ft. (152 m) and 1,000 ft. (305 m).

3.6.3.1.4.1 No Action Alternative

Training Activities

Weapons firing, launch, and non-explosive impact noise would be associated with small-, medium-, and large-caliber munitions; missiles; and bombs (non-explosive impact) used during training under the No Action Alternative. Activities are spread throughout the Study Area as presented in Table 2.8-1 of Chapter 2 (Description of Proposed Action and Alternatives). The types of noise produced are discussed in Section 3.0.5.3.1.5 (Weapons Firing, Launch, and Impact Noise).

Exposure of seabirds to weapons firing, launch, and impact noise would be very brief and temporary. Bird responses to weapons-firing and projectile travel noise may include short-term behavioral or physiological responses such as alert responses, startle responses, or temporary increases in heart rate. While an individual bird may be exposed to multiple noises during a weapons-firing activity, repeated exposures to individual birds over days is extremely unlikely. Both birds and Navy vessels change location frequently, and weapons-firing and launch activities occur over short periods of time. Startle or alert reactions to muzzle blasts are not likely to disrupt major behavior patterns, such as migrating, breeding, feeding, and sheltering, or to result in serious injury to any seabirds (unless they are very close to the muzzle blast). Activities with multiple weapons blasts may cause birds to disperse from the area for the duration of the firing activity. Because weapons-firing activities would not occur close to shore where seabird colonies are located, large impacts on breeding seabird populations would not result from weapons-firing noise. For these reasons, the impact on seabirds from noise produced by weapons firing under the No Action Alternative would be minor and short-term and would not have any population-level impacts.

Because weapon firing occurs at varying locations over a short time period and seabird presence changes seasonally and on a short-term basis, individual birds would not be expected to be repeatedly exposed to weapons firing, launch, or projectile noise. Any impacts on migratory or breeding seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term and infrequent and would not impact seabird or migratory bird populations. If individual birds forage in or migrate through areas where weapons-firing activities are occurring, they could be exposed to and temporarily disturbed by weapons firing and associated noise. Temporary disturbance due to weapons noise is not expected to result in major impacts on ESA-listed species.

Pursuant to the ESA, weapons firing, launch, and impact noise generated during training activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), weapons firing, launch, and impact noise generated during training activities described under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Weapons firing, launch, and non-explosive impact noise would be associated with small-, medium-, and large-caliber munitions; missiles; rockets; and bombs (non-explosive impact) used during testing under the No Action Alternative. Activities are spread throughout the Study Area as presented in Tables 2.8-2 through 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives). The types of noise produced are discussed in Section 3.0.5.3.1.5 (Weapons Firing, Launch, and Impact Noise).

Exposure of seabirds to weapons firing, projectile noise, and launch noise would be very brief and temporary. Bird responses to weapons-firing and projectile travel noise may include short-term behavioral or physiological responses such as alert responses, startle responses, or temporary increases in heart rate. While an individual bird may be exposed to multiple noises during a weapons-firing activity, repeated exposures to individual birds over days is extremely unlikely. Both birds and Navy vessels change location frequently, and weapons-firing and launch activities occur over short periods. Startle or alert reactions to muzzle blasts are not likely to disrupt major behavior patterns, such as migrating, breeding, feeding, and sheltering, or to result in serious injury to any seabirds (unless they are very close to the muzzle blast). Activities with multiple weapons blasts may cause birds to disperse from the area for the duration of the firing activity. Because weapons-firing activities would not occur close to shore where seabird colonies are located, large impacts on breeding seabird populations would not result from weapons-firing noise. For these reasons, the impact of noise produced by weapons firing on seabirds under the No Action Alternative would be minor and short-term, and would not have any population-level impacts.

Because weapon firing occurs at varying locations over a short period and seabird presence changes seasonally and on a short-term basis, individual birds would not be expected to be repeatedly exposed to weapons firing, launch, or projectile noise. Any impacts on migratory or breeding seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term and infrequent and would not impact seabird or migratory bird populations. If individual birds forage in or migrate through areas where weapons firing activities are occurring, they could be exposed to and temporarily disturbed by weapons firing and associated noise, but the noise would not result in major impacts.

Pursuant to the ESA, weapons firing, launch, and impact noise generated during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), weapons firing, launch, and impact noise generated during testing activities described under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.4.2 Alternative 1

Training Activities

Weapons firing, launch, and non-explosive impact noise would be associated with small-, medium-, and large-caliber munitions; missiles; and bombs (non-explosive impact) used during training under Alternative 1. The number of weapons firing, launch, and non-explosive would increase from the No Action Alternative (Table 3.0-65). Activities are spread throughout the Study Area, as presented in Table 2.8-1 of Chapter 2 (Description of Proposed Action and Alternatives). The types of noise produced are discussed in Section 3.0.5.3.1.5 (Weapons Firing, Launch, and Impact Noise). Due to increased numbers of activities, noise produced by these activities would increase under Alternative 1 compared to the No Action Alternative.

Exposure of seabirds to weapons firing, launch, and impact noise would be very brief and temporary. Bird responses to weapons-firing and projectile travel noise may include short-term behavioral or physiological responses such as alert responses, startle responses, or temporary increases in heart rate. While an individual bird may be exposed to multiple noises during a weapons firing activity, repeated exposures to individual birds over days is extremely unlikely. Both birds and Navy vessels change location frequently, and weapons firing and launch activities occur over short periods. Startle or alert reactions to muzzle blasts are not likely to disrupt major behavior patterns, such as migrating, breeding, feeding, and sheltering, or to result in serious injury to any seabirds (unless they are very close to the muzzle blast). Activities with multiple weapons blasts may cause birds to disperse from the area for the duration of the firing activity. Because weapons firing activities would not occur close to shore where seabird colonies are located, large impacts on breeding seabird populations would not result from weapons firing noise. For these reasons, the impact of noise produced by weapons firing on seabirds under Alternative 1 would be minor and short-term and would not have any population-level impacts.

Because weapons firing occurs at varying locations over a short time and seabird presence changes seasonally and on a short-term basis, individual birds would not be expected to be repeatedly exposed to weapons firing, launch, or projectile noise. Any impacts on migratory or breeding seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term and infrequent and would not impact seabird or migratory bird populations. If individual birds forage in or migrate through areas where weapons-firing activities are occurring, they could be exposed to and temporarily disturbed by weapons firing and associated noise, but the noise would not result in major impacts on ESA-listed species.

Pursuant to the ESA, weapons firing, launch, and impact noise generated during training activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), weapons firing, launch, and impact noise generated during training activities described under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Weapons firing, launch, and non-explosive impact noise would be associated with small-, medium-, and large-caliber munitions; missiles; rockets; and bombs (non-explosive impact) used during testing under Alternative 1. The number of weapons firing, launch, and non-explosive would increase from the No Action Alternative (Table 3.0-65). Activities are spread throughout the Study, as presented in Tables 2.8-2 to 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives). The types of noise produced are discussed in Section 3.0.5.3.1.5 (Weapons Firing, Launch, and Impact Noise). Noise produced by these activities would substantially increase under Alternative 1 compared to the No Action Alternative.

Exposure of seabirds to weapons firing, and launch noise would be very brief and temporary. Bird responses to weapons-firing and projectile travel noise may include short-term behavioral or physiological responses such as alert responses, startle responses, or temporary increases in heart rate. While an individual bird may be exposed to multiple noises during a weapons firing activity, repeated exposures to individual birds over days is extremely unlikely. Both birds and Navy vessels change location frequently, and weapons firing and launch activities occur over short periods. Startle or alert reactions to muzzle blasts are not likely to disrupt major behavior patterns such as migrating, breeding, feeding, and sheltering or to result in serious injury to any seabirds (unless they are very close to the muzzle blast). Activities with multiple weapons blasts may cause birds to disperse from the area for the duration of the firing activity. Because weapons-firing activities would not occur close to shore where seabird colonies are located, large impacts on breeding seabird populations would not result from weapons firing noise. For these reasons, the impact of noise produced by weapons firing on seabirds under Alternative 1 would be minor and short-term, and is not expected to have any population-level impacts.

Because weapon firing occurs at varying locations over a short period and seabird presence changes seasonally and on a short-term basis, individual birds would not be expected to be repeatedly exposed to weapons firing, launch, or projectile noise. Any impacts on migratory or breeding seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term and infrequent and would not impact seabird or migratory bird populations. If individual birds forage in or migrate through areas where weapons-firing activities are occurring, they could be exposed to and temporarily disturbed by weapons firing and associated noise, but the noise would not result in major impacts on ESA-listed species.

Pursuant to the ESA, weapons firing, launch, and impact noise generated during testing activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), weapons firing, launch, and impact noise generated during testing activities described under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.4.3 Alternative 2

Training Activities

The number and location of training activities under Alternative 2 are identical to training activities under Alternative 1. Therefore, impacts and comparisons to the No Action Alternative will also be identical as described in Section 3.6.3.1.4.2 (Alternative 1).

Pursuant to the ESA, weapons firing, launch, and impact noise generated during training activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), weapons firing, launch, and impact noise generated during training activities described under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Weapons firing, launch, and non-explosive impact noise would be associated with small-, medium-, and large-caliber munitions; missiles; rockets; and bombs (non-explosive impact) used during testing under Alternative 2. The number of weapons firing, launch, and non-explosive would increase from the No Action Alternative (Table 3.0-65). Activities are spread throughout the Study Area, as presented in Tables 2.8-2 through 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives). The types of noise produced are discussed in Section 3.0.5.3.1.5 (Weapons Firing, Launch, and Impact Noise). Noise produced by these activities would substantially increase under Alternative 2 compared to the No Action Alternative.

Although more birds could be exposed to weapons noise under Alternative 2 than under the No Action Alternative, the types of impacts to individual birds are expected to be the same. Although individual birds may exhibit short-term behavioral reactions, long-term impacts to populations are not expected. In addition, although exposures to weapons noise impacts to ESA-listed species may increase, the types of impacts are not expected to differ from those discussed under Alternative 1.

Pursuant to the ESA, weapons firing, launch, and impact noise generated during testing activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), weapons firing, launch, and impact noise generated during testing activities described under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.5 Impacts from Aircraft and Vessel Noise

The training and testing proposed in the Study Area involve maneuvers by various types of surface ships, boats, and submarines (collectively referred to as vessels). Birds could be exposed to noise from vessels throughout the Study Area, but few exposures would occur based on the infrequency of operations and the low density of vessels within the Study Area at any given time. However, if in the immediate area where vessels are operating, seabirds from any of the six taxonomic groups found within the Study Area (Table 3.6-2 and Table 3.6-3) could potentially be disturbed by vessel noise. Noise impacts on wildlife from recreational and commercial activities, vehicle traffic, and military training operations can include altering habitat use and activity patterns, increasing stress response, decreasing immune response, reducing reproductive success, increasing predation risk, degrading conspecific communication, and damaging hearing (Pater et al. 2009).

Birds respond to vessels in various ways. Some seabirds are commonly attracted to and follow vessels including certain species of gulls, storm petrels, and albatrosses (Hamilton 1958; Hyrenback 2001, 2006), while other species such as frigatebirds and sooty terns seem to avoid vessels (Borberg et al. 2005, Hyrenback 2006). Vessel noise could elicit short-term behavioral or physiological responses but are not likely to disrupt major behavior patterns, such as migrating, breeding, feeding, and sheltering, or to result in serious injury to any seabirds. Beason (2004) notes that birds exposed to up to 146 dBA within 325 ft. (99.1 m) of the noise source flushed but then returned within minutes of the disturbance. Vessel noise is not expected to be at this noise level. Harmful seabird/vessel interactions are commonly associated with commercial fishing vessels because birds are attracted to concentrated food sources around these vessels (Melvin and Parrish 1999); Dietrich and Melvin 2004). The concentrated food sources that attract seabirds to commercial fishing vessels are not present around Navy vessels.

Fixed wing aircraft and helicopters are used for a variety of training and testing activities throughout the Study Area. Impacts of those activities on seabirds are applicable to everywhere in the Study Area that aircraft overflights occur, although some areas experience more aircraft activity than others. Various types of fixed-wing aircraft and helicopters are used in training and testing exercises throughout the Study Area (see Chapter 2, Description of Proposed Action and Alternatives). Seabirds and other migratory birds could be exposed to airborne noise associated with subsonic and supersonic fixed-wing aircraft overflights and helicopter operations while foraging or migrating in open water, near-shore, or coastal environments within the Pacific Ocean. If in an area where overflights are occurring, all taxonomic groups found within the Study Area (Table 3.6-2 and Table 3.6-3) could potentially be temporarily disturbed by aircraft noise.

Seabird exposure to fixed-wing aircraft noise would be brief (seconds) as an aircraft quickly passes overhead. Exposures would be infrequent based on the transitory and dispersed nature of the overflights; repeated exposure of individual seabirds over a short period of time (hours or days) is unlikely. If seabirds were to respond to an overflight, the responses would be limited to short-term behavioral or physiological reactions (e.g., alert response, startle response, temporary increase in heart rate), and the general health of individual seabirds would not be compromised. Birds repeatedly exposed to aircraft noise often become habituated to the noise and do not respond behaviorally (National Park Service 1994, Larkin et al. 1996, Plumpton 2006). However, habituation seems unlikely in the Study Area given the widely dispersed nature of the operations and the relative infrequency of the operations.

Most fixed-wing aircraft flights occur at distances greater than 12 nm offshore. Birds could be exposed to elevated noise levels while foraging or migrating in these open water environments, as well as in near-shore or coastal environments when aircraft flights occur in those areas. Most fixed-wing sorties would occur greater than 3,000 ft. (914.4 m) altitude and would be associated with air combat maneuver training and U.S. Navy Air Systems Command testing. Typical altitudes would range from 5,000 to 30,000 ft. (1,524 to 9,144 km) and typical airspeeds would range from very low (less than 100 knots [kt]) to high subsonic (less than 600 kt). Sound exposure levels at the sea surface from most air combat maneuvers overflights are expected to be less than 85 dBA re 20 µPa, based on an F/A-18 aircraft flying at an altitude of 5,000 ft. and at a subsonic airspeed of 400 knots (kt). Exceptions include sorties associated with air-to-surface ordnance delivery and sonobuoy drops from 500 to 5,000 ft. (152.4 to 1,524 m) altitude. Approximately 95 percent of bird flight during migrations occurs below 10,000 ft. (3,048 m) with the majority below 3,000 ft. (914.4 m) (U.S. Geological Survey 2006). While there is considerable variation, the favored altitude for most small birds appears to be between 500 and 1,000 ft. (152.4 and 304.8 m). Bird exposure to fixed-wing aircraft noise would be brief (seconds) as an aircraft quickly passes. Unlike the situation at a busy commercial airport or military landing field, repeated exposure of individual seabirds or groups of seabirds would be unlikely based on the dispersed nature of the overflights.

Some air combat maneuver training would involve high altitude, supersonic flight, which would produce sonic booms, but such airspeeds would be infrequent. Boom duration is generally less than 300 milliseconds. Sonic booms would cause seabirds to startle, but the exposure would be brief, and any reactions are expected to be short-term. Startle impacts range from altering behavior (e.g., stop feeding or preening), minor behavioral changes (e.g., head turning), or at worst, a flight response. Because most fixed-wing flights are not supersonic and both seabirds and aircraft are transient in any area, exposure of seabirds in the open ocean to sonic booms would be infrequent. It is unlikely that individual seabirds would be repeatedly exposed to sonic booms in the open ocean.

Unlike fixed-wing aircraft, helicopters typically operate below 1,000 ft. (304.8 m) altitude and often occur as low as 75–100 ft. (22.9–30.5 m) altitude. This low altitude increases the likelihood that seabirds would respond to noise from helicopter overflights. Helicopters travel at slower speeds (less than 100 kt) which increases durations of noise exposure compared to fixed-wing aircraft. In addition, some studies have suggested that birds respond more to noise from helicopters than from fixed-wing aircraft (Larkin et al. 1996; National Park Service 1994). Noise from low-altitude helicopter overflights would be expected to elicit short-term behavioral or physiological responses in exposed seabirds. Repeated exposure of individual seabirds or groups of seabirds is unlikely based on the dispersed nature of the overflights and seabird's capability to avoid or rapidly vacate an area of disturbance. Therefore, the general health of individual seabirds would not be compromised.

3.6.3.1.5.1 No Action Alternative

Training Activities

Under the No Action Alternative, a variety of aircraft and vessels would be used throughout the Study Area, as presented in Tables 2.8-1 through 2.8-5 (Description of Proposed Action and Alternatives). Under the No Action Alternative, 7,846 training activities utilize some types of vessel (Table 3.0-30) and 10,623 fleet training activities utilize some type of aircraft ranging from fixed-wing aircraft to helicopters (Table 3.0-77). Although loud sudden noises can startle and flush birds, Navy vessels are not expected to result in major acoustic disturbance of seabirds in the Study Area. Noise from Navy vessels are similar to or less than those of the general maritime environment. Birds respond to the physical presence of a vessel, regardless of the associated noise. The potential is very low for noise generated by Navy vessels to impact seabirds and would not result in major impacts on seabird populations.

The highest concentrations of aircraft noise would be associated with the greater number of flights in the SOCAL Range Complex compared to other portions of the Study Area, although training flights occur in each range complex and outside of the range complexes. These activities involve low-flying aircraft as part of training. Most of the helicopter training operations occur at low altitudes (75–100 ft. [22.9–30.5 m]), which increases the exposure of seabirds to their noise. Takeoffs and landings occur at established airfields and on vessels at sea at unspecified locations throughout the Study Area. Aircraft noise under the No Action Alternative could elicit short-term behavioral or physiological responses in some individual seabirds. Helicopter overflights are more likely to elicit responses than fixed-wing aircraft, but the general health of individual seabirds would not be compromised.

Navy aircraft training activities over the Pacific Ocean are concentrated near the continental shelfs and surrounding islands, removed from seabird nesting areas. Seabirds that forage in these areas may have greater presence in these productive areas, so aircraft overflights may cause more behavioral disturbances in these areas. A seabird in the open ocean would be exposed for a few seconds to fixed-wing aircraft noise as the aircraft quickly passes overhead. Seabirds foraging or migrating through a training area in the open ocean may respond by avoiding areas of concentrated aircraft noise. Exposures to seabirds would be infrequent, based on the brief duration and dispersed nature of the overflights. Repeated exposure to individual seabirds over hours or days is unlikely. Startle or alert reactions to aircraft are not likely to disrupt major behavior patterns, such as migrating, breeding, feeding, and sheltering, or to result in serious injury to any seabirds. While behavioral or physiological impacts of airborne activity on individual seabirds may occur, none of these impacts are long-lasting, and none are expected to have an adverse impact on seabirds at the population level.

Birds using wetlands, mud flats, beaches, and other shoreline habitats or shallow coastal foraging areas would be exposed to noise from near-shore helicopter training and aircraft in transit to off-shore training areas. The presence of dense aggregations of seabirds (terns) is a potential concern during low-attitude helicopter operations. Although seabirds may be more likely to react to helicopters than to fixed-wing aircraft, Navy helicopter pilots would avoid large flocks of seabirds to protect aircrews and equipment, thereby reducing disturbance to seabirds as well.

California least terns could be exposed to intermittent aircraft noise from aircraft originating from airfields located along the coast. If present in the open water areas where training activities involving aircraft overflights occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be temporarily disturbed while foraging or migrating. Short-term behavioral responses such as startle responses, head turning, or flight responses would be expected. Repeated exposures would be limited due to the transient nature of aircraft use and regular movement of seabirds. No long-term or population-level impacts are expected.

Pursuant to the ESA, noise from aircraft and vessels during training activities under the No Action Alternative may affect, but is not likely to adversely affect ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from noise from aircraft and vessels during training activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under the No Action Alternative, 9,419 training activities utilize some types of vessel (Table 3.0-30). Although loud sudden noises can startle and flush birds, Navy vessels are not expected to result in major acoustic disturbance of seabirds in the Study Area. Noise from Navy vessels are similar to or less than those of the general maritime environment. Birds respond to the physical presence of a vessel, regardless of the associated noise. The potential is very low for noise generated by Navy vessels to impact seabirds and would not result in major impacts on seabird populations.

Under the No Action Alternative, approximately 10,172 testing activities involve the use of some type of aircraft ranging from fixed-wing aircraft to helicopters; however, no activities occur within the SSTC portion of the Study Area. Testing activities involving aircraft closely resemble training activities and would therefore have similar aircraft noise impacts.

California least terns could be exposed to intermittent aircraft noise from aircraft originating from airfields located along the coast. If present in the open water areas where testing activities involving aircraft overflights occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be temporarily disturbed while foraging or migrating. Short-term behavioral responses such as startle responses, head turning, or flight responses would be expected. Repeated exposures would be limited due to the transient nature of aircraft use and regular movement of seabirds. No long-term or population-level impacts are expected.

Pursuant to the ESA noise from aircraft and vessels during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from noise from aircraft and vessels during testing activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.5.2 Alternative 1

Training Activities

Under Alternative 1, the total number of training activities involving vessels throughout the Study Area would increase 20.9 percent over the No Action Alternative, from 7,846 to 9,490 activities (Table 3.0-30). The number of training activities involving aircraft throughout the Study Area would increase 15.6 percent over the No Action Alternative from 10,623 to 12,284 activities (Table 3.0-77), with the highest increase in aircraft training events occurring in the HRC portion of the Study Area (1,982 to 2,842 activities). The locations and types of aircraft or vessels would not differ from the No Action Alternative, as presented in Table 2.8-1 (Description of Proposed Action and Alternatives). The additional aircraft hours would increase noise overall but would not change the nature of the short-term reversible impacts described for the No Action Alternative.

Based on the increased training operations under Alternative 1, more seabirds could be exposed to noise; the number of times an individual seabird is exposed could also increase. Similar to the No Action Alternative, the responses would be limited to short-term behavioral or physiological reactions, and the general health of individual seabirds would not be compromised. While behavioral or physiological impacts of airborne activity on individual seabirds may occur, none of these impacts are long-lasting, and none are expected to have an adverse impact on migratory seabirds at the population level.

California least terns could be exposed to intermittent aircraft noise from aircraft originating from airfields located along the coast. If present in the open water areas where training activities involving aircraft overflights occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be temporarily disturbed while foraging or migrating. Short-term behavioral responses such as startle responses, head turning, or flight responses would be expected. Repeated exposures would be limited due to the transient nature of aircraft use and regular movement of seabirds. No long-term or population-level impacts are expected.

Pursuant to the ESA, noise from aircraft and vessels during training activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from noise from aircraft and vessels during training activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under Alternative 1, the total number of testing activities involving vessels throughout the Study Area would increase 8.6 percent over the No Action Alternative, from 9,419 to 10,233 activities (Table 3.0-30). Navy vessels are not expected to result in major acoustic disturbance of seabirds in the Study Area. Noise from Navy vessels are similar to or less than those of the general maritime environment. Birds respond to the physical presence of a vessel, regardless of the associated noise. The potential is very low for noise generated by Navy vessels to impact seabirds and would not result in major impacts on seabird populations.

The number of testing activities involving aircraft throughout the Study Area would increase approximately 8.1 percent over the No Action Alternative from 10,172 to 11,001 annual events. The locations and types of aircraft would not differ from the No Action Alternative, as presented in Tables 2.8-2 through 2.8-5 (Description of Proposed Action and Alternatives). The additional aircraft activities would increase noise overall but would not change the nature of the short-term reversible impacts described for the No Action Alternative.

Based on the increased testing operations under Alternative 1, more seabirds could be exposed to noise; the number of times an individual seabird is exposed could also increase. Similar to the No Action Alternative, the responses would be limited to short-term behavioral or physiological reactions, and the general health of individual seabirds would not be compromised. While behavioral or physiological impacts of airborne activity on individual seabirds may occur, no long-term or population level impacts are expected.

California least terns could be exposed to intermittent aircraft noise from aircraft originating from airfields located along the coast. If present in the open water areas where testing activities involving aircraft overflights occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be temporarily disturbed while foraging or migrating. Short-term behavioral responses such as startle responses, head turning, or flight responses would be expected. Repeated exposures would be limited due to the transient nature of aircraft use and regular movement of seabirds. No long-term or population-level impacts are expected.

Pursuant to the ESA, noise from aircraft and vessels during testing activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from noise from aircraft and vessels during testing activities Alternative 1 would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.5.3 Alternative 2

Training Activities

Under Alternative 2, the total number of training activities involving vessels throughout the Study Area would increase 20.9 percent over the No Action Alternative from 7,846 to 9,490 activities (Table 3.0-30). The number of training activities involving the total number of training activities involving aircraft throughout the Study Area would increase 15.6 percent over the No Action Alternative, from 10,623 to 12,284 activities (Table 3.0-77), with the highest increase in aircraft training events occurring in the HRC portion of the Study Area (1,982 to 2,842 activities). The locations and types of aircraft would not differ from the No Action Alternative, as presented in Table 2.8-1 (Description of Proposed Action and

Alternatives). The additional aircraft hours would increase noise overall but would not change the nature of the short-term reversible impacts described for the No Action Alternative.

Pursuant to the ESA, noise from aircraft and vessels during training activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from noise from aircraft and vessels during training activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under Alternative 2, the total number of testing activities involving vessels throughout the Study Area would increase 22.0 percent over the No Action Alternative, from 9,419 to 11,496 activities (Table 3.0-30). Navy vessels are not expected to result in major acoustic disturbance of seabirds in the Study Area. Noise from Navy vessels are similar to or less than those of the general maritime environment. Birds respond to the physical presence of a vessel, regardless of the associated noise. The potential is very low for noise generated by Navy vessels to impact seabirds and would not result in major impacts on seabird populations.

The number of testing activities involving aircraft throughout the Study Area would increase approximately 8.1 percent over the No Action Alternative, from 10,172 to 11,001 annual events. The locations and types of aircraft would not differ from the No Action Alternative, as presented in Tables 2.8-2 through 2.8-5 (Description of Proposed Action and Alternatives). The additional aircraft activities would increase noise overall but would not change the nature of the short-term reversible impacts described for the No Action Alternative.

Based on the increased testing operations under Alternative 2, more seabirds could be exposed to noise; the number of times an individual seabird is exposed could also increase. Similar to the No Action Alternative, the responses would be limited to short-term behavioral or physiological reactions, and the general health of individual seabirds would not be compromised. While behavioral or physiological impacts of airborne activity on individual seabirds may occur, no long-term population level impacts are expected.

Pursuant to the ESA, noise from aircraft and vessel during testing activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from noise from aircraft and vessels during testing activities Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.6 Summary of Impacts of Acoustic Stressors

Under the No Action Alternative, Alternative 1, or Alternative 2, noise from sonar, explosive detonations, pile driving, vessel noise, and aircraft noise would be expected to elicit brief behavioral or physiological responses in exposed seabirds. Repeated exposure of individual seabirds or groups of seabirds would be unlikely, based on the large operational area of the Study Area and the dispersed nature of the overflights, and the ability to easily avoid or rapidly vacate the action area. The general health of individual seabirds would not be compromised. Birds could be exposed to elevated noise levels while foraging or migrating, but would only be exposed to potentially disturbing levels of noise during low altitude helicopter or fixed wing exercises, especially in nearshore areas, or when in immediate proximity of an in-air explosion, firing event, or underwater detonation. Transiting seabirds or those resting on the water may be startled and also experience concussive injury from in-air explosions, firing events, or underwater detonations. However, protective measures, such as restricting activities to when seabirds are absent from the immediate vicinity of an underwater detonation training or testing activity, are implemented prior to and during these activities to minimize impacts on seabirds from these activities. Individual seabirds may be affected, but in-air explosions, firing events, or underwater detonations would have no impact on species or populations due to (1) the vast area over which training activities occur, (2) the implementation of Navy resource protection measures, and (3) the ability of seabirds to flee disturbance.

3.6.3.2 Energy Stressors

This section analyzes the potential impacts of the various types of energy stressors that can occur during training and testing activities within the Study Area. This section includes analysis of the potential impacts from electromagnetic devices.

3.6.3.2.1 Impacts from Electromagnetic Devices

Several different types of electromagnetic devices are used during training and testing activities throughout the Study Area, as described in Chapter 2 (Description of Proposed Action and Alternatives). Electromagnetic training and testing activities include an array of magnetic sensors used in mine countermeasure operations in the Study Area. Some electromagnetic devices such as a vessel radar and radio are devices that could impact seabirds above the water. Towed electromagnetic device impacts to seabirds would only occur underwater and would only impact diving species or species on the surface in the immediate area where the device is deployed. There is no information available on how birds react to electromagnetic fields underwater.

Electromagnetic devices are used primarily in towed-mine neutralization and port security training. Similar testing activities include the use of electromagnetic devices (e.g., mine detection/neutralization and electromagnetic activities [Littoral Combat Ship mission package testing, unmanned and autonomous surface/underwater vehicle testing, etc.]). The kinetic energy weapon is also included as an electromagnetic testing activity. In most cases, such as mine detection/neutralization, the device simply mimics the electromagnetic signature of a vessel passing through the water. None of the devices emit any type of electromagnetic “pulse.”

Potential impacts of those activities on seabirds are applicable to everywhere in the Study Area that electromagnetic devices are used. Electromagnetic devices used in Navy training and testing activities may potentially impact seabird navigation through disruption of electromagnetic fields. Birds use numerous other orientation cues to navigate in addition to magnetic fields. These include position of the sun, celestial cues, visual cues, wind direction, and scent (Fisher 1971, Haftorn et al. 1988, Wiltschko and Wiltschko 2005, Åkesson and Hedonström 2007). It is believed that by using a combination of these cues birds are able to successfully navigate long distances.

It has been demonstrated that some seabirds use the Earth’s magnetic field as a navigational cue during seasonal migrations (Fisher 1971, Wiltschko and Wiltschko 2005, Åkesson and Hedonström 2007). A magnetite-based receptor mechanism in the upper bill of some birds provides information on position and compass direction (Wiltschko and Wiltschko 2005). Electromagnetic devices send out electromagnetic signals into the environment that seabirds could potentially detect and respond to.

Studies have been conducted on electromagnetic sensitivity in birds typically associated with land, though little information exists specifically on seabird response to electromagnetic changes at sea. Results from a study conducted by Larkin and Sutherland (1977) show that during nocturnal flights, birds are capable of sensing electromagnetic fields emitted from antenna in Wisconsin used for the Navy's Project Seafarer. A study conducted by Hanowski et al. (1993) on the effects of extremely low frequency electromagnetic fields on breeding and migrating birds around the Navy's extra low frequency communication system antenna in Wisconsin found no evidence that bird distribution or abundance was affected by electromagnetic fields produced by the antenna.

Possible effects on birds from disrupting electromagnetic fields include behavioral responses such as temporary disorientation and change in flight direction (Larkin and Sutherland 1977, Wiltschko and Wiltschko 2005). Many bird species return to the same stopover, wintering, and breeding areas every year and often follow the exact same or very similar migration routes (Åkesson 2003, Alerstam et al. 2006). However, ample evidence exists that displaced birds can successfully reorient and find their way when one or more cues are removed (Haftorn et al. 1988, Åkesson 2003). For example, Haftorn et al. (1988) found that after removal from their nests and release into a different area, snow petrels (*Pagodrama nivea*) were able to successfully navigate back to their nests even when their ability to smell was removed. Furthermore, Wiltschko and Wiltschko (2005) report that electromagnetic pulses administered to birds during an experimental study on orientation do not deactivate the magnetite-based receptor mechanism in the upper beak altogether, but instead cause the receptors to provide altered information, which in turn causes birds to head in different directions. However, these effects were temporary and the ability of the birds to correctly orient themselves returned after a few days.

3.6.3.2.1.1 No Action Alternative

Training Activities

Under the No Action Alternative, electromagnetic activities are planned as presented in Table 2.8-1 (Description of Proposed Action and Alternatives). Training activities that include an electromagnetic component include anti-air warfare and electronic warfare.

The distribution of seabirds in the Study Area is patchy (Fauchald et al. 2002, Schneider and Duffy 1985). Exposure of seabirds would be limited to those foraging at or below the surface (e.g., cormorants, loons, petrels, grebes, etc.) because that is where the devices are used. Birds that forage inshore could be exposed to these electromagnetic stressors because their habitat overlaps with some of the activities that occur in the nearshore portions of SOCAL Range Complex and SSTC. However, the electromagnetic fields generated would be distributed over time and location, and any influence on the surrounding environment would be temporary and localized. More importantly, the electromagnetic devices used are typically towed by a helicopter and it is likely that any seabirds in the vicinity of the approaching helicopter would be dispersed by the noise and disturbance generated by the helicopter (see Section 3.6.3.1.5, Impacts from Aircraft and Vessel Noise) and move away from the device before any exposure could occur.

In the unlikely event that a seabird is temporarily disoriented by an electromagnetic device, it would still be able to re-orient using their internal magnetic compass to aid in navigation (Wiltschko et al. 2011).

California least terns could be exposed to intermittent electromagnetic stressors in nearshore areas where training activities occur. If present in the open water areas where training activities involving electromagnetic stressors occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be temporarily disturbed while foraging or migrating. Impacts on seabirds from potential exposure to electromagnetic fields would be temporary and inconsequential based on: (1) relatively low intensity of the magnetic fields generated (0.2 microtesla at 656 ft. [200 m] from the source), (2) very localized potential impact area, (3) temporary duration of the activities (hours), and (4) occurring only underwater. No long-term or population-level impacts are expected.

Pursuant to the ESA, the use of electromagnetic devices during training activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabirds.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of electromagnetic devices during training activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under the No Action Alternative, electromagnetic activities are planned as presented in Tables 2.8-2 through 2.8-5 (Description of Proposed Action and Alternatives).

For reasons stated in Section 3.6.3.2.1.1 (No Action Alternative), any behavioral changes are not expected to have lasting effects on the survival, growth, recruitment, or reproduction of seabird populations. California least terns could be exposed to intermittent electromagnetic stressors in nearshore areas where testing activities occur. If present in the open water areas where testing activities involving electromagnetic stressors occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be temporarily disturbed while foraging or migrating. Any temporary disorientation experienced by seabirds from electromagnetic changes caused by testing activities in the Study Area may be considered a short-term impact and would not hinder seabird navigation abilities. Repeated exposures would be limited due to the transient nature of the testing activities using electromagnetic devices and regular movement of seabirds. No long-term or population-level impacts are expected.

Pursuant to the ESA, the use of electromagnetic devices during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabirds.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of electromagnetic devices during testing activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.2.1.2 Alternative 1

Training Activities

The number of electromagnetic activities proposed for the Study Area under Alternative 1 each year does not increase from the No Action Alternative, as presented in Table 2.8-1 of Chapter 2 (Description of Proposed Action and Alternatives). Therefore, the impacts on seabirds from activities performed during Alternative 1 would be the same as for the No Action Alternative.

Pursuant to the ESA, the use of electromagnetic devices during training activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabirds.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of electromagnetic devices during training activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

The number of electromagnetic activities proposed for the Study Area under Alternative 1 each year increases from the No Action Alternative by less than one percent, as presented in Tables 2.8-2 through 2.8.5 of Chapter 2 (Description of Proposed Action and Alternatives). Under Alternative 1, kinetic energy weapon testing would be introduced in the HRC portion of the Study Area, with 200 events per year. The electromagnetic kinetic energy weapon uses electrical energy to accelerate projectiles to supersonic velocities. The kinetic energy weapon would be operated from ships, firing projectiles toward land targets.

This unique weapons system charges for approximately two minutes and discharges in less than a second. The duration of the firing event is extremely short (about 8 milliseconds [ms]), which makes it quite unlikely that a seabird would fly over at the precise moment of firing. The short duration of each firing event also means that the likelihood of affecting any animal using magnetic fields for orientation is extremely small. Further, the high magnetic field levels experienced within 80 ft. (24.4 m) of the launcher quickly dissipate and return to background levels beyond 80 ft. (24.4 m) The magnetic field levels outside of the 80 ft. (24.4 m) buffer zone would be below the most stringent guidelines for humans (i.e., people with pacemakers or active implantable medical devices). Therefore, the electromagnetic impacts would be temporary in nature and not expected to result in impacts on organisms (U.S. Department of the Navy 2009).

The increase in activities and introduction of activities would not measurably increase the probability of seabirds being exposed to electromagnetic energy as compared to the No Action Alternative. The species and groups with potential to co-occur with these activities remain the same and potential impacts would be temporary and inconsequential, as discussed above for the No Action Alternative.

California least terns could be exposed to intermittent electromagnetic stressors in nearshore areas where testing activities occur. If present in the open water areas where testing activities involving electromagnetic stressors occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be temporarily disturbed while foraging or migrating. Any temporary disorientation experienced by seabirds from electromagnetic changes caused by testing activities in the Study Area may be considered a short-term impact and would not hinder seabird navigation abilities. Repeated exposures would be limited due to the transient nature of the testing activities using electromagnetic devices and regular movement of seabirds. For reasons stated in Section 3.6.3.2.1.1 (No Action Alternative, Testing Activities), any behavioral changes are not expected to have lasting effects on the survival, growth, recruitment, or reproduction of seabird populations. No long-term or population-level impacts are expected.

Pursuant to the ESA, the use of electromagnetic devices during testing activities under Alternative 1 may affect, but are is likely to adversely affect, ESA-listed seabirds.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of electromagnetic devices during testing activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

3.6.3.2.1.3 Alternative 2

Training Activities

The number of electromagnetic activities proposed for the Study Area under Alternative 2 each year does not increase from the No Action Alternative, as presented in Table 2.8-1 of Chapter 2 (Description of Proposed Action and Alternatives). Therefore, the impacts on seabirds from activities performed during Alternative 2 would be the same as for the No Action Alternative.

Pursuant to the ESA the use of electromagnetic devices during training activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabirds.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of electromagnetic devices during training activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

The number of electromagnetic activities proposed for the Study Area under Alternative 2 each year increases less than one percent from the No Action Alternative, as presented in Tables 2.8-2 through 2.8.5 of Chapter 2 (Description of Proposed Action and Alternatives). Under Alternative 2, kinetic energy weapon testing would be introduced in the HRC portion of the Study Area, with 200 events per year. The electromagnetic kinetic energy weapon uses electrical energy to accelerate projectiles to supersonic velocities. The kinetic energy weapon would be operated from ships, firing projectiles toward land targets.

This unique weapons system charges for approximately 2 minutes and discharges in less than a second. The duration of the firing event is extremely short (about 8 ms), which makes it quite unlikely that a seabird would fly over at the precise moment of firing. The short duration of each firing event also means that the likelihood of affecting any animal using magnetic fields for orientation is extremely small. Further, the high magnetic field levels experienced within 80 ft. (24.4 m) of the launcher quickly dissipate and return to background levels beyond 80 ft. (24.4 m). The magnetic field levels outside of the 80 ft. (24.4 m) buffer zone would be below the most stringent guidelines for humans (i.e., people with pacemakers or active implantable medical devices). Therefore, the electromagnetic impacts would be temporary in nature and not expected to result in impacts on organisms (U.S. Department of the Navy 2009).

The increase in activities and introduction of activities would not measurably increase the probability of seabirds being exposed to electromagnetic energy as compared to the No Action Alternative. The species and groups with potential to co-occur with these activities remain the same and potential impacts would be temporary and inconsequential, as discussed above for the No Action Alternative.

California least terns could be exposed to intermittent electromagnetic stressors in nearshore areas where testing activities occur. If present in the open water areas where testing activities involving electromagnetic stressors occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell’s shearwater could be temporarily disturbed while foraging or migrating. Any temporary disorientation experienced by seabirds from electromagnetic changes caused by testing activities in the Study Area may be considered a short-term impact and would not hinder seabird navigation abilities. Repeated exposures would be limited due to the transient nature of the testing activities using electromagnetic devices and regular movement of seabirds. For reasons stated in Section 3.6.3.2.1.1 (No Action Alternative, Testing Activities), any behavioral changes are not expected to have lasting effects on the survival, growth, recruitment, or reproduction of seabird populations. No long-term or population-level impacts are expected.

Pursuant to the ESA, the use of electromagnetic devices during testing activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabirds.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of electromagnetic devices used during testing activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.2.2 Summary of Impacts of Energy Stressors

The impact of electromagnetic devices on seabirds is expected to be negligible based on (1) the limited geographic area in which they are used, (2) the rare chance that an individual seabird might encounter these devices in use, (3) the startle behavior of seabirds and the mobility of seabirds to temporarily leave the area when the devices are in use, and (4) the absence of physiological damage and the temporary nature of any impacts if an individual seabird encountered these devices.

The impacts of electromagnetic devices would be limited to individual cases where a seabird might become temporarily disoriented and change flight direction. Although individuals may be temporarily impacted, these behaviors would have no direct impact at the population level.

3.6.3.3 Physical Disturbance and Strike Stressors

This section describes the potential impacts to seabirds by aircraft and aerial target strikes, vessels (disturbance and strike), and military expended material strike. Aircraft include fixed-wing and rotary-wing aircraft; vessels include various sizes and classes of ships, submarines, and other boats, towed devices, unmanned surface vehicles, and unmanned underwater vehicles; military expended material includes non-explosive practice munitions, target fragments, parachutes, and other objects.

Physical disturbance and strike risks, primarily from aircraft, have the potential to impact all taxonomic groups found within the Study Area if seabirds are in the same area with aircraft, vessels, and military expended material. Impacts of physical disturbance include behavioral responses such as temporary disorientation, collision, change in flight direction, and avoidance response behavior. Physical disturbances may elicit short-term behavioral or physiological responses such as alert response, startle response, cessation of feeding, fleeing the immediate area, and a temporary increase in heart rate. These disturbances can also result in abnormal behavioral, growth, or reproductive impacts in nesting seabirds and can cause foraging and nesting seabirds to flush from or abandon their habitats and or nests. Aircraft strikes often result in bird mortalities or injuries.

Although seabirds likely hear and see approaching vessels and aircraft, they cannot avoid all collisions. Birds are known to be attracted to lights which can lead to collisions (Gehring et al. 2009; Poot et al. 2008). High-speed collisions with large objects can be fatal to birds. Training and testing activities around concentrated numbers of seabirds would cause greater disturbance and increase the potential for strikes.

3.6.3.3.1 Impacts from Aircraft and Aerial Target Strikes

Wildlife aircraft strikes are a grave concern for the Navy because they can harm aircrews. Wildlife aircraft strikes can also damage equipment, and injure or kill wildlife (Bies et al. 2006). The Naval

Aviation Safety Program Instruction, Chief of Naval Operations Instruction 3750.6R, identifies measures to evaluate and reduce or eliminate bird/aircraft strike hazards to aircraft, aircrews, and birds and requires the reporting of all strikes when damage or injuries occur as a result of a bird/aircraft strike. However, the numbers of bird deaths that occur annually from all Navy activities are insignificant from a bird population standpoint. From 2000 to 2009, the Navy Bird Aircraft Strike Hazard program recorded 5,436 bird strikes with the majority occurring during the fall period from September to November. During the 10-year period, bird strikes were greatest in 2007 with 827 strikes and lowest in 2001 with 48. Bird strike potential is greatest in foraging or resting areas, in migration corridors, and at low altitudes. For example, birds can be attracted to airports because they often provide foraging and nesting resources.

While bird strikes can occur anywhere aircraft are operated, Navy data indicate that they occur most often over land or close to shore. The potential for bird strikes to occur in offshore areas is relatively low because Navy activities are widely dispersed and above 3,000 ft. (914.4 m) (for fixed-wing aircraft) where bird densities are low. The majority of bird flight is below 3,000 ft. (914.4 m) and approximately 95 percent of bird flight during migrations occurs below 10,000 ft. (3,048 m) (U.S. Geological Survey 2006). Bird and aircraft encounters are more likely to occur during aircraft takeoffs and landings than when the aircraft is engaged in level low-altitude flight. Approximately 97 percent of aircraft-wildlife collisions occur at or near airports when aircraft are operating at or below 2,000 ft. (609.6 m). In a study that examined 38,961 bird and aircraft collisions, Dobson (2010) found that the majority (74 percent) of collisions occurred below 500 ft. (152.4 m). However, collisions have been recorded at elevations as great as 12,139 ft. (3,699.9 m) (Dobson 2010).

3.6.3.3.1.1 No Action Alternative

Training Activities

Various types of fixed-wing aircraft and helicopters are used in training throughout the Study Area, (see Tables 2.8-1 through 2.8-5). Certain portions of the Study Area, such as areas near Navy airfields, installations, and ranges are used more heavily by Navy aircraft than other portions as presented in further detail in Tables 2.8-2 to 2.8-3 in Chapter 2 (Description of Proposed Action and Alternatives). Under the No Action Alternative, approximately 10,623 activities involve the use of aircraft (Table 3.0-77). Flight altitudes for all fixed-wing activities would be above 3,000 ft. (914.4 m) mean sea level (above the typical flight level of seabirds) with the exception of sorties associated with air-to-surface bombing exercises. Typical flight altitudes during air-to-surface bombing exercises are from 500 to 5,000 ft. (152.4 to 1,524 m) above mean sea level. Most fixed-wing aircraft flight hours (greater than 90 percent) occur at distances greater than 12 nm offshore. Most of the helicopter training operations occur at low altitudes (75–100 ft. [22.9–30.5 m]), which increases the exposure of seabirds.

In general, seabird populations consist of hundreds or thousands of individuals, ranging across a large geographical area. In this context, the loss of several or even dozens of birds due to physical strikes may not constitute a population-level impact, although some species gather in large flocks. Some bird strikes and associated bird mortalities or injuries could occur as a result of aircraft and aerial target use in the Study Area under the No Action Alternative; however, population-level impacts to seabirds would not likely result from aircraft strikes. If in the immediate area where aircraft are operating at low altitudes, ESA-listed species could be impacted by aircraft disturbance and strike during migration.

Bird exposure to strike potential would be relatively brief as an aircraft quickly passes. Birds actively avoid interaction with aircraft; however, disturbances or strike of various bird species may occur from aircraft on a site-specific basis. As a standard operating procedure, aircraft avoid large flocks of birds to minimize the personnel safety risk involved with a potential bird strike. Some seabird and aircraft strikes and associated seabird mortalities or injuries could occur in the Study Area under the No Action Alternative; however, no increased risk of impacts on seabird populations would result from aircraft strikes. No long-term or population-level impacts are expected.

California least terns could be exposed to intermittent aircraft overflights and strike potential in nearshore areas where training activities occur. If present in the open water areas where training activities involving aircraft occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be briefly exposed to strike potential. However, the data that Navy has collected on bird strikes reports that no ESA-listed species have been struck in the past, so it is not likely they would be struck by aircraft or aerial targets during training activities.

Pursuant to the ESA, use of aircraft and aerial targets during training activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), use of aircraft and aerial targets during training activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under the No Action Alternative, a total of approximately 10,172 testing events are planned using fixed wing aircraft and helicopters (Table 3.0-77). These aircraft would be used in all portions of the Study Area.

In general, seabird populations consist of hundreds or thousands of individuals, ranging across a large geographical area. In this context, the loss of several or even dozens of birds due to physical strikes may not constitute a population-level impact, although some species gather in large flocks. Strikes to species listed under the ESA may have more impact because the population size has already been reduced to near or below sustainable levels.

Seabird exposure to strike potential would be relatively brief as an aircraft quickly passes. Seabirds actively avoid interaction with aircraft; however, disturbances of various seabird species may occur from aviation operations on a site-specific basis. As a standard operating procedure, aircraft avoid large flocks of birds to minimize the safety risk involved with a potential bird strike. Some seabird and aircraft strikes and associated seabird mortalities or injuries could occur in the Study Area under the No Action Alternative; however, the potential impacts from aircraft testing activities would be the same as for Training activities, albeit at a lesser degree.

California least terns could be exposed to intermittent aircraft overflights and strike potential in nearshore areas where testing activities occur. If present in the open water areas where testing activities involving aircraft occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be briefly exposed to strike potential. However, the data that Navy has collected on bird strikes reports that no ESA-listed species have been struck in the past, so it is not likely they would be struck by aircraft or aerial targets during testing activities.

Pursuant to the ESA, use of aircraft and aerial targets during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), use of aircraft and aerial targets during testing activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.3.1.2 Alternative 1

Training Activities

Under Alternative 1, the number of training activities involving aircraft in the Study Area would increase by 1,661 activities as compared to the No Action Alternative, for a total of 12,284 activities involving aircraft, potentially leading to an increase in aircraft and aerial disturbance and strikes in some portions of the Study Area, as presented in Table 2.8-1 (Description of Proposed Action and Alternatives). While bird strikes can occur anywhere aircraft are operated, Navy data indicate that they occur most often over land or close to shore. The potential for seabird strikes to occur in offshore areas is relatively low because Navy activities are widely dispersed and above 3,000 ft. (914.4 m) (for fixed-wing aircraft) where seabird densities are low. Because seabird exposure to aircraft disturbance and strikes would be relatively brief and infrequent, no major impacts on seabirds would result from aircraft strikes. Furthermore, protective measures, such as avoiding large flocks of birds to minimize the safety risk involved with a potential bird strike, minimize impacts on seabirds (Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring).

California least terns could be exposed to intermittent aircraft overflights and strike potential in nearshore areas where training activities occur. If present in the open water areas where training activities involving aircraft occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be briefly exposed to strike potential. However, the data that Navy has collected on bird strikes reports that no ESA-listed species have been struck in the past, so it is not likely they would be struck by aircraft or aerial targets during training activities.

Pursuant to the ESA, use of aircraft and aerial targets during training activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), use of aircraft and aerial targets during training activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under Alternative 1, the number of testing activities involving aircraft in the Study Area would increase by 829 activities as compared to the No Action Alternative, for a total of 11,001 activities involving aircraft, potentially leading to an increase in aircraft and aerial disturbance and strikes in some portions of the Study Area, as presented in Tables 2.8-2 through 2.8-5 (Description of Proposed Action and Alternatives). As described for the No Action Alternative, because seabird exposure to aircraft disturbance and strikes would be relatively brief and infrequent, no major impacts on seabirds would result from aircraft strikes. Furthermore, protective measures, such as avoiding large flocks of birds to minimize the safety risk involved with a potential seabird strike, minimize impacts on seabirds (Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring).

California least terns could be exposed to intermittent aircraft overflights and strike potential in nearshore areas where testing activities occur. If present in the open water areas where testing activities involving aircraft occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be briefly exposed to strike potential. However, the data that Navy has collected on bird strikes reports that no ESA-listed species have been struck in the past, so it is not likely they would be struck by aircraft or aerial targets during testing activities.

Pursuant to the ESA, use of aircraft and aerial targets during testing activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), use of aircraft and aerial targets during testing activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

3.6.3.3.1.3 Alternative 2

Training Activities

Under Alternative 2, the number of training activities involving aircraft in the Study Area would increase by 1,661 activities as compared to the No Action Alternative, for a total of 12,284 activities involving aircraft, potentially leading to an increase in aircraft and aerial disturbance and strikes in some portions of the Study Area, as presented in Table 2.8-1 (Description of Proposed Action and Alternatives). As described for the No Action Alternative, because seabird exposure to aircraft disturbance and strikes would be relatively brief and infrequent, no major impacts on seabirds would result from aircraft strikes. Furthermore, protective measures, such as avoiding large flocks of birds to minimize the safety risk involved with a potential seabird strike, minimize impacts on seabirds (Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring).

California least terns could be exposed to intermittent aircraft overflights and strike potential in nearshore areas where testing activities occur. If present in the open water areas where testing activities involving aircraft occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be briefly exposed to strike potential. However, the data that Navy has collected on bird strikes reports that no ESA-listed species have been struck in the past, so it is not likely they would be struck by aircraft or aerial targets during testing activities.

Pursuant to the ESA, use of aircraft and aerial targets during training activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), use of aircraft and aerial targets during training activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under Alternative 2, the number of testing activities involving aircraft in the Study Area would increase by 1,950 activities as compared to the No Action Alternative, for a total of 12,122 activities involving aircraft, potentially leading to an increase in aircraft and aerial disturbance and strikes in some portions of the Study Area, as presented in Tables 2.8-2 through 2.8-5 (Description of Proposed Action and Alternatives). However, as described for the No Action Alternative, because seabird exposure to aircraft disturbance and strikes would be relatively brief and infrequent, no major impacts on seabirds would result from aircraft strikes. Furthermore, protective measures, such as avoiding large flocks of birds to minimize the safety risk involved with a potential seabird strike, minimize impacts on seabirds (Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring).

California least terns could be exposed to intermittent aircraft overflights and strike potential in nearshore areas where testing activities occur. If present in the open water areas where testing activities involving aircraft occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be briefly exposed to strike potential. However, the data that Navy has collected on bird strikes reports that no ESA-listed species have been struck in the past, so it is not likely they would be struck by aircraft or aerial targets during testing activities.

Pursuant to the ESA, use of aircraft and aerial targets during testing activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), use of aircraft and aerial targets during testing activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.3.2 Impacts from Vessel and In-water Devices

Several different types of vessels (ships, submarines, boats) and in-water devices (towed devices, unmanned underwater vehicles) are used during training and testing activities throughout the Study Area, as described in Chapter 2 (Description of Proposed Action and Alternatives). Potential impacts of those activities on seabirds are applicable to everywhere in the Study Area that vessels and in-water devices are used. Training and testing activities within the Study Area involve maneuvers by various types of surface ships, boats, and submarines. The number of Navy ships and smaller vessels in the Study Area varies based on training schedules. Activities involving vessel movements occur intermittently, ranging from a few hours to a few weeks. Events involving large vessels are widely spread over the open ocean, while smaller vessels are more active and more concentrated in nearshore areas.

Vessel transit speed of various types of Navy vessels ranges from 10 to 20 kt. During training, speeds generally range from 10 to 14 kt; however, vessels can and will on occasion operate within the entire spectrum of their specific operational capabilities. It is necessary for vessels to operate at higher speeds during specific events, such as pursuing and overtaking hostile vessels, taking evasive maneuvers, and performing maintenance and performance checks, such as in ship trials. During these events, vessels may often operate at the high end of the vessel's speed capability.

In addition to vessels, mine warfare devices that are towed through the water and remotely operated vehicles used during mine neutralization training could also strike seabirds. No documented instances of seabirds being struck by towed devices have occurred in the Study Area. Additionally, based on the low altitudes and relatively slow air speeds, seabirds would be able to detect and avoid the aircraft and cables that connect the aircraft to the towed device.

Impacts would be the physiological and behavioral disturbance from a vessel. Birds respond to moving vessels in various ways. Some species, such as gulls and albatross, commonly follow vessels (Hamilton 1958; Hyrenback 2001, 2006), while other species, such as plovers and curlews, seem to avoid vessels (Borberg et al. 2005; Hyrenback 2006). There could be a slightly increased risk of impacts during the winter, or fall/spring migrations when migratory birds are concentrated in coastal areas. However, despite this concentration, most birds would still be able to avoid collision with a vessel. Vessel movements could elicit brief behavioral or physiological responses, such as alert response, startle response, or fleeing the immediate area. Such responses typically conclude as rapidly as they occur. However, the general health of individual seabirds would not be compromised.

The possibility of collision with an aircraft carrier or surface combatant vessels (or a vessel's rigging, cables, poles, or masts) could increase at night, especially during inclement weather. Birds can become disoriented at night in the presence of artificial light (Black 2005), and lighting on vessels may attract some birds (Hunter et al. 2006b), increasing the potential for harmful encounters. Lighting on boats and vessels have also contributed to bird fatalities in open-ocean environments when birds are attracted to these lights (Merkel and Johansen 2011). This could be a scenario that Navy vessels could face, especially during the migration season when migrating birds are using celestial clues during night time flight. Many seabird species are attracted to artificial lighting, particularly Procrocellariiformes. In particular, Newell's shearwater and Hawaiian petrel fledglings are particularly susceptible to light attraction, which can cause exhaustion and increase potential for collision with land-based structures (Reed et al. 1985). Other harmful seabird-vessel interactions are commonly associated with commercial fishing vessels because seabirds are attracted to concentrated food sources around these vessels (Dietrich and Melvin 2004, Melvin and Parrish 2001). However, birds following vessels would not be the case for Navy vessels.

Navy aircraft carriers, surface combatant vessels, and amphibious warfare ships are minimally lighted for tactical purposes. For vessels of this type there are two white lights that shine forward and one that shines behind the boat, these lights must be visible for at least 6 nm. There is one red light the shines port and a green one that shines starboard, and these must be visible for at least 3 nm. Solid white lighting appears more problematic for birds, especially nocturnal migrants (Gehring et al. 2009, Poot et al. 2008). Navy vessel lights are mostly solid, but sometimes may not appear solid because of the constant movement of the vessel (wave action), making vessel lighting potentially less problematic for birds in some situations.

In addition to vessels, towed devices and unmanned vehicles are also used; however, no documented instances of birds being struck by in-water devices exist. It would be anticipated that most seabird species would move away from an unmanned vehicle or a towed device.

The other type of vessel movements in the Study Area with the potential to strike a seabird are those used during amphibious landings. These amphibious warfare vessels have the potential to impact shorebirds and seabirds by disturbing or striking individual animals as well as trampling nest sites. Amphibious vessel movements could elicit short-term behavioral or physiological responses such as alert response, startle response, cessation of feeding, fleeing the immediate area, nest abandonment, and a temporary increase in heart rate. Amphibious vessels have the potential to disturb nesting or foraging shorebirds such as the ESA-listed California least tern. However, the general health of individual seabirds would not be compromised, unless a direct strike occurred. However, it is highly unlikely that a seabird would be struck in this scenario because most foraging shorebirds in the vicinity of the approaching amphibious vessel would likely be dispersed by the noise of the approaching vessel before it could come close enough to strike a seabird.

3.6.3.3.2.1 No Action Alternative, Alternative 1, and Alternative 2

<u>Training Activities</u>

As indicated in 3.6.3.3.2 (Impacts from Vessel and In-water Devices), the majority of training activities utilize some type of vessel ranging from ships to submarines. Training involving vessel movements occurs intermittently and ranges in duration from a few hours up to a few weeks. These activities are widely dispersed throughout the Study Area. Training activities involving vessels occur throughout the Study Area, but would be concentrated in the SOCAL Range Complex portion of the Study Area, followed in descending order of numbers of activities by SSTC, HRC, and the Transit Corridor. Ship movements on the ocean surface have the potential to affect seabirds by disturbing or striking individual animals. The probability of ship and seabird interactions occurring in the Study Area depends on several factors, including the presence and density of seabirds; numbers, types, and speeds of vessels; duration and spatial extent of activities; and protective measures implemented by the Navy. The number of Navy ships operating in the Study Area varies based on training schedules and can range up to 10 ships at any given time.

Vessel movements could result in short-term behavioral responses and low potential for injury/mortality from collisions, though based on the lower density of Navy vessels in pelagic waters, the generally intermittent and short duration of activities, and the high mobility of seabirds, the probability of seabird/vessel interaction is low. There would be a higher likelihood of vessel strikes over the higher productivity portions of the Study Area because of the concentration of seabirds is expected to be higher in those areas. However, even in areas of concentrated vessel use or seabird density, the probability of seabird/vessel interaction is low because of the high mobility of seabirds. Navy protective measures, which include avoidance of seabird colonies and habitats where seabirds may concentrate, would further reduce the probability of seabird/vessel collisions. The combination of these procedures, the relatively lower vessel density in pelagic waters in the Study Area, and the ability of seabirds to detect and avoid vessels reduce the probability that vessel strikes would impact seabird populations under the No Action Alternative.

Birds would not be exposed to unmanned underwater vehicles or remotely operated vehicles because they are typically used on or near the seafloor. The other in-water devices used are typically towed by a helicopter. As discussed for electromagnetic devices, it is likely that any seabirds in the vicinity of the approaching helicopter would be dispersed by the noise of the helicopter (see Section 3.6.3.1.5, Impacts from Aircraft and Vessel Noise) and move away from the in-water device before any exposure could occur.

Amphibious landings are the primary activity that could potentially impact ESA-listed seabird species, specifically California least tern. California least terns use the beaches of SSTC as a resting area and are typically found foraging in the waters near the beach. While they could be present, it is highly unlikely that a California least tern would be struck in this scenario because most foraging or resting seabirds in the vicinity of the approaching amphibious vessel would likely be dispersed by the noise of the approaching vessel before it could come close enough to strike a seabird. Therefore, amphibious assault activities would not cause any potential risk to California least tern in the Study Area. Furthermore, Naval Base Coronado has a specific Integrated Natural Resource Management Plan for addressing ESA-listed seabird species and those plans already include project avoidance and minimization actions that reduce threats from military activities to terns to a minimal level.

Pursuant to the ESA, the use of vessels and in-water devices during training activities under the No Action Alternative, Alternative 1, or Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of vessels and in-water devices during training activities under the No Action Alternative, Alternative 1 or Alternative 2 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

As indicated in Section 3.6.3.3.2 (Impacts from Vessel and In-water Devices), the majority of testing activities utilize some type of vessel ranging from ships to submarines. Testing activities involving vessels occur throughout the Study Area, but would be concentrated in the SOCAL Range Complex portion of the Study Area, followed in descending order of numbers of activities by HRC, SSTC, and the Transit Corridor. All of the Naval Sea Systems Command testing activities utilize some type of vessel ranging from ships to submarines.

The potential for interaction is greater in coastal areas than pelagic areas where Navy vessel use is less concentrated. However, even in areas of concentrated vessel use, the probability of seabird/vessel interaction is low because of the high mobility of seabirds and intermittent and temporary vessel use. Certain portions of the Study Area, such as areas near ports, naval installations, or testing locations are used more heavily by vessels than other portions of the Study Area. Ship movements on the ocean surface have the potential to affect seabirds by disturbing or striking individual seabirds. The probability of ship and seabird interactions occurring in the Study Area depends on several factors, including the presence and density of seabirds; numbers, types, and speeds of vessels; duration and spatial extent of activities; and protective measures implemented by the Navy. The number of Navy ships operating in the Study Area varies based on the testing activity and can range up to 10 vessels at any given time.

The potential for interaction is greater in coastal areas than pelagic areas where Navy vessel use is less concentrated. However, even in areas of concentrated vessel use, the probability of seabird/vessel interaction is low because of the high mobility of seabirds that they could move away from an oncoming vessel. Flushing of seabirds is expected to be greatest with fast-moving, agile vessels. Impacts from Navy vessels would be limited to short-term behavioral responses and are not expected to have long-term effects. While such flushing or other effects of vessels on individual seabirds may occur, none of these temporary effects are expected to have an adverse effect on seabirds at the population level.

The relatively lower vessel density in pelagic waters in the Study Area, and the ability of seabirds to detect and avoid vessels reduce the probability that vessel strikes would impact seabird populations under the No Action Alternative. The impacts of vessel movements would be short-term, temporary, and localized disturbances of individual seabirds in the vicinity. No increased risk of impact to seabirds would result from physical disturbance and strikes with Navy vessels. If in the immediate area where vessels or in-water devices are operating, ESA-species could be disturbed, but this would not result in adverse impacts (impacts would be limited to short-term behavioral responses and are not expected to have long-term effects). No long-term or population-level impacts are expected.

Pursuant to the ESA, the use of vessels and in-water devices during testing activities under the No Action Alternative, Alternative 1, or Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of vessels and in-water devices during testing activities under the No Action Alternative, Alternative 1, or Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.3.3 Impacts from Military Expendable Materials

Many different types of military expended materials are left at sea during training and testing activities throughout the Study Area, as described in Chapter 2 (Description of Proposed Action and Alternatives).

During these training and testing events, various items may be introduced and expended into the marine environment and are referred to as military expended materials. Chapter 2 includes quantities of military expended materials used during training and testing activities in the Study Area.

Expended materials do have the potential to strike seabirds as they travel through the air. Statistical modeling to estimate the probability of seabird and military expended material strikes is not practical. The widely dispersed area in which bombs and missiles would be expended in the Study Area annually (see Chapter 2, Description of Proposed Action and Alternatives), coupled with the often patchy distribution of seabirds (Schneider and Duffy 1985, Haney 1986, Fauchald et al. 2002), suggest that the probability of these types of ordnance striking a seabird would be low. The number of small-caliber projectiles that would be expended annually during gunnery exercises is much higher than the number of large-caliber projectiles. However, the total number of rounds expended is not a good indicator of strike probability during gunnery exercises because multiple rounds are fired at individual targets.

Human activity such as vessel movement, aircraft overflights, and target setting, could cause seabirds to flee a target area before the onset of firing, thus avoiding harm. If seabirds were in the target area, they would likely flee the area prior to the release of military expended materials or just after the initial rounds strike the target area (assuming seabirds were not struck by the initial rounds). Additionally, the force of military expended material fragments dissipates quickly once the pieces hit the water, so direct strikes on seabirds foraging below the surface would not be likely. Also, munitions would not be used in shallow/nearshore areas. Individual seabirds may be impacted, but ordnance strikes would likely have no impact on seabird populations.

The potential for seabirds to experience strikes would remain quite low based on the large area over which ordnance is used, the relatively small size of the seabirds, and the ability of seabirds to readily flee. Individual seabirds may be impacted, but ordnance strikes would likely have no impact on seabird populations.

3.6.3.3.3.1 No Action Alternative

Training Activities

Current military training in the Study Area includes firing a variety of weapons employing a variety of non-explosive training rounds and explosive rounds including bombs, missiles, naval gunshells, cannon shells, and small-, medium-, and large-caliber projectiles, as well as sonobuoys released from aircraft. The majority of material expended in the Study Area consists of non-explosive training rounds (Table 3.0-65). While gunnery exercises are a common training activity, few Sinking Exercises per year are proposed under the No Action Alternative. During a sinking exercise, aircraft, ship, and submarine crews deliver ordnance on a seaborne target, usually a clean deactivated ship, which is deliberately sunk using multiple weapon systems. Sinking exercises occur in open-ocean areas and expend target fragments that could have the potential to strike seabirds. The potential impact of military expended material to seabirds in the Study Area is dependent on the ability of seabirds to detect and avoid foreign objects through their visual and auditory sensory systems and the relatively-fast flying speeds and good maneuverability of most seabird species.

The small number of bombs that would be expended in the Study Area annually, coupled with the often patchy distribution of seabirds suggest that the probability of this type of strike for a seabird would be extremely low. The number of small-caliber projectiles that would be expended annually during gunnery exercises is much higher. However, the total number of rounds expended is not a good indicator of strike probability during gunnery exercises because multiple rounds are fired at individual targets. Given the implementation of protective measures, and the lower density of seabirds away from nesting or roosting areas, non-explosive ordnance or sonobuoys dropped from aircraft, under the No Action Alternative would have limited potential to affect seabirds.

Direct strikes from firing weapons or air-launched devices (e.g., sonobuoys, torpedoes) are a potential stressor to seabirds. Seabirds in flight, resting on the water's surface, or foraging just below the water surface would be vulnerable to a direct strike. Strikes have the potential to injure or kill seabirds in the Study Area. However, there would not be long-term population level impacts. The vast area over which training activities occur combined with the ability of seabirds to flee disturbance, would make direct strikes unlikely. Individual seabirds may be affected, but strikes would have no impact on species or populations.

If in the immediate area where military expended materials are present, ESA-listed species could be impacted by military expended material strikes. It is highly unlikely that a seabird would be struck by military expended material because most seabirds in the vicinity of the approaching aircraft or vessel, from which the military expended material is released, would likely be dispersed by the noise of the approaching aircraft or vessel before it could come close enough to strike a seabird. Therefore, activities that release military expended materials would not cause any potential strike risk to ESA-listed seabirds in the Study Area.

Pursuant to the ESA, the use of military expended materials during training activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of military expended materials during training activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under the No Action Alternative, testing activities would result in military expended material left in the Study Area, as presented in Table 2.8-2 (Description of Proposed Action and Alternatives). The potential impact of military expended material to seabirds in the Study Area is dependent on the ability of seabirds to detect and avoid foreign objects through their visual and auditory sensory systems and the relatively-fast flying speeds and good maneuverability of most seabird species.

Direct strikes from firing weapons and air-launched devices (e.g., sonobuoys, torpedoes) are a potential stressor to seabirds. Seabirds in flight, resting on the water's surface, or foraging just below the water surface would be vulnerable to a direct strike. Strikes have the potential to injure or kill seabirds in the Study Area. However, there would not be long-term population level impacts. The vast area over which testing activities occur combined with the ability of seabirds to flee disturbance, would make direct strikes unlikely. Individual seabirds may be affected, but strikes would have no impact on species or populations.

If in the immediate area where military expended materials are present, ESA-listed species could be impacted by military expended material strikes. It is highly unlikely that a seabird would be struck by military expended material because most seabirds in the vicinity of the approaching aircraft or vessel, from which the military expended material is released, would likely be dispersed by the noise of the approaching aircraft or vessel before it could come close enough to strike a seabird. Therefore, activities that release military expended materials would not cause any potential strike risk to ESA-listed seabirds in the Study Area.

Pursuant to the ESA, the use of military expended materials during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of military expended materials during testing activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.3.3.2 Alternative 1

Training Activities

The total number of military expended materials throughout the Study Area would increase under Alternative 1. Under Alternative 1, the number of bombs decreases by 522 high explosive bombs and increases by 492 non-explosive bombs as compared to the No Action Alternative, for a total of 240 high explosive bombs and 1,609 non-explosive bombs. The number of small-caliber projectiles fired would increase by 2,084,500 as compared to the No Action Alternative, for a total of 3,065,800 small-caliber rounds. The number of medium-caliber rounds would increase by 260,480 as compared to the No Action Alternative for a total of 657,180 medium-caliber rounds (636,600 non-explosive). The number of non-explosive large-caliber rounds would decrease by 16,960 as compared to the No Action Alternative, for a total of 7,440 non-explosive large-caliber projectiles expended during training events and activities. The number of missiles utilized during training activities would increase by 182 as compared to the No Action Alternative, for a total of 570 explosive missiles expended (94 non-explosive). The number of sonobuoys dropped would increase by 9,850 over the No Action Alternative, for a total of 52,100.

While the number of military expended materials increases under Alternative 1 as compared to the No Action Alternative, the potential for direct strikes remains low. The vast area over which training activities occur combined with the ability of seabirds to flee disturbance, would make direct strikes unlikely. Individual seabirds may be affected, but strikes would not be responsible for long-term population level impacts.

If in the immediate area where military expended materials are present, ESA-listed species could be impacted by military expended material strikes. It is highly unlikely that a seabird would be struck by military expended material because most seabirds in the vicinity of the approaching aircraft or vessel, from which the military expended material is released, would likely be dispersed by the noise of the approaching aircraft or vessel before it could come close enough to strike a seabird. Therefore, activities that release military expended materials would not cause any potential strike risk to ESA-listed seabirds in the Study Area.

Pursuant to the ESA, the use of military expended materials during training activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of military expended materials during training activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

The total number of military expended materials throughout the Study Area would increase under Alternative 1. Alternative 1 also introduces the use of 20,200 small-caliber projectiles. Under Alternative 1, the number of non-explosive medium-caliber rounds would increase by 74,500 as compared to the No Action Alternative for a total of 81,000 medium-caliber rounds. Alternative 1 would also increase the use of high explosive medium-caliber projectiles by 15,300 as compared to the No Action Alternative, for a total of 17,800 high explosive medium-caliber projectiles. The number of non-explosive large-caliber rounds would increase compared to the No Action Alternative, for a total of 14,120 non-explosive large-caliber projectiles expended during testing events and activities. Alternative 1 would also introduce the usage of 6,160 high explosive large-caliber projectiles. The number of high explosive missiles utilized during testing activities would increase by 85 as compared to the No Action Alternative for a total of 118 high explosive missiles expended. The number of sonobuoys dropped would increase by 5,112 over the No Action Alternative, for a total of 15,247. Alternative 1 would also increase the usage of non-explosive missiles from 78 to 206. Alternative 1 would introduce the use of 284 high explosive rockets. The number of non-explosive rockets utilized during testing activities would increase by 681 as compared to the No Action Alternative, for a total of 696 non-explosive rockets.

These increases would result in increased strike potential from ordnance, however, the vast area over which testing activities occur, combined with the ability of seabirds to flee disturbance, would make direct strikes unlikely. Individual seabirds may be affected, but ordnance strikes would have no impact on species or community populations.

If in the immediate area where military expended materials are present, ESA-listed species could be impacted by military expended material strikes. It is highly unlikely that a seabird would be struck by military expended material because most seabirds in the vicinity of the approaching aircraft or vessel, from which the military expended material is released, would likely be dispersed by the noise of the approaching aircraft or vessel before it could come close enough to strike a seabird. Therefore, activities that release military expended materials would not cause any potential strike risk to ESA-listed seabirds in the Study Area.

Pursuant to the ESA, the use of military expended materials during testing activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of military expended materials during testing activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

3.6.3.3.3.3 Alternative 2

Training Activities

The total number of military expended materials throughout the Study Area would increase under Alternative 2. Under Alternative 2, the number of bombs decreases by 522 high explosive bombs and increases by 492 non-explosive bombs as compared to the No Action Alternative, for a total of 240 high explosive bombs and 1,609 non-explosive bombs. The number of small-caliber projectiles fired would increase by 2,084,500 as compared to the No Action Alternative, for a total of 3,065,800 small-caliber rounds. The number of medium-caliber rounds would increase by 260,480 as compared to the No Action Alternative for a total of 657,180 medium-caliber rounds (636,600 non-explosive). The number of non-explosive large-caliber rounds would decrease by 16,960 as compared to the No Action Alternative, for a total of 7,440 non-explosive large-caliber projectiles expended during training events and activities.

The number of missiles utilized during training activities would increase by 182 as compared to the No Action Alternative for a total of 570 explosive missiles expended (94 non-explosive). The number of sonobuoys dropped would increase by 9,850 over the No Action Alternative, for a total of 52,100.

These increases would result in increased strike potential from ordnance, however, the vast area over which testing activities occur, combined with the ability of seabirds to flee disturbance, would make direct strikes unlikely. Individual seabirds may be affected, but ordnance strikes would have no impact on species or community populations.

If in the immediate area where military expended materials are present, ESA-listed species could be impacted by military expended material strikes. It is highly unlikely that a seabird would be struck by military expended material because most seabirds in the vicinity of the approaching aircraft or vessel, from which the military expended material is released, would likely be dispersed by the noise of the approaching aircraft or vessel before it could come close enough to strike a seabird. Therefore, activities that release military expended materials would not cause any potential strike risk to ESA-listed seabirds in the Study Area.

Pursuant to the ESA, the use of military expended materials during training activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of military expended materials during training activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

The total number of military expended materials throughout the Study Area would increase under Alternative 2. Alternative 2 would introduce the use of 8,250 small-caliber projectiles. The number of non-explosive medium-caliber rounds would increase by 78,500 as compared to the No Action Alternative for a total of 85,000 medium-caliber rounds. Alternative 2 would also increase the use of high explosive medium-caliber projectiles by 17,500 as compared to the No Action Alternative, for a total of 20,000 high explosive medium-caliber projectiles. The number of non-explosive large-caliber rounds would increase by 5,700 as compared to the No Action Alternative, which utilized zero non-explosive large-caliber projectiles. The number of high explosive missiles utilized during testing activities would increase by 93 as compared to the No Action Alternative for a total of 126 high explosive missiles expended. The number of sonobuoys dropped would increase by 6,496 over the No Action Alternative, for a total of 16,631. Alternative 2 would increase the usage of non-explosive missiles from 78 to 218. Alternative 2 would introduce the use of 297 high explosive rockets and increase the number of non-explosive rockets utilized during testing activities by 766 as compared to the No Action Alternative, for a total of 781 non-explosive rockets.

There is the potential for individual seabirds to be injured or killed by direct strikes. However, there would not be long-term population level impacts. The vast area over which testing activities occur and implementation of Navy resource protection measures, combined with the small size and ability of seabirds to flee disturbance, would make direct strikes unlikely. Individual seabirds may be affected, but ordnance strikes would have no impact on species or community populations.

If in the immediate area where military expended materials are present, ESA-listed species could be impacted by military expended material strikes. It is highly unlikely that a seabird would be struck by military expended material because most seabirds in the vicinity of the approaching aircraft or vessel, from which the military expended material is released, would likely be dispersed by the noise of the approaching aircraft or vessel before it could come close enough to strike a seabird. Therefore, activities that release military expended materials would not cause any potential strike risk to ESA-listed seabirds in the Study Area.

Pursuant to the ESA, the use of military expended materials during testing activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of military expended materials during testing activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.3.4 Summary of Impacts of Physical Stressors

Three physical disturbance or strike sub-stressors were identified and analyzed that have potential to affect seabirds: aircraft or aerial target strikes, vessel and in-water device strikes, and military expended materials. While bird strikes can occur anywhere aircraft are operated, Navy data indicate that they occur most often over land or close to shore. The potential for seabird strikes to occur in offshore areas is relatively low because (1) activities are widely dispersed, (2) seabird densities are low, (3) the seabirds are small and have the ability to flee disturbance, and (4) Navy protective measures include avoidance of seabird colonies and habitats where seabirds may concentrate.

Vessel movements could result in short-term behavioral responses and potential for injury/mortality from collisions. However, the probability of seabird/vessel collisions is extremely low based on (1) the low Navy vessel density, (2) the patchy distribution of seabirds throughout the Study Area, and (3) the implementation of Navy protective measures, which include avoidance of seabird colonies and habitats where seabirds may concentrate further reducing the probability of seabird/vessel collisions.

There is the potential for individual seabirds to be injured or killed by ordnance. However, there would not be long-term population level impacts. Individual seabirds may be affected, but ordnance strikes would have no impact on species or populations due to (1) the vast area over which training and testing activities occur, (2) implementation of Navy resource protection measures as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring), and (3) the small size of seabirds and their ability to flee disturbance.

3.6.3.4 Ingestion Stressors

This section analyzes the potential impacts of the various types of expended materials used by the Navy during training and testing activities within the Study Area. Birds could potentially ingest expended materials used by the Navy during training and testing activities within the Study Area. The Navy expends the following types of materials that could become ingestion stressors for seabirds during training and testing in the Study Area: chaff and flare endcaps/pistons. Ingestion of expended materials by seabirds could occur in all large marine ecosystems and open ocean areas and would occur either at the surface or just below the surface portion of the water column, depending on the size and buoyancy of the expended object and the feeding behavior of the seabirds. Floating material of ingestible size could be eaten by seabirds that feed at or near the water surface, while materials that sink pose a potential risk to diving seabirds that feed just below the water's surface. Some items, such as parachutes or sonobuoys are too large to be ingested and will not be discussed further. Also, parachutes sink rapidly to the seafloor.

Foraging depths of most diving seabirds are generally restricted to shallow depths, so it is highly unlikely that benthic, nearshore, or intertidal foraging would occur in areas of munitions use, and these seabirds would not encounter any type of munitions or fragments from munitions in nearshore or intertidal areas. Ingestion of military expended material from munitions is not expected to occur because the solid metal and heavy plastic objects from these ordnances sink rapidly to the seafloor, beyond the foraging depth range of most seabirds. Therefore, no impact of ingestion of military expended material from munitions would result for seabirds. As a result, the analysis in this section includes the potential ingestion of military expended materials other than munitions, all of which are expended away from nearshore habitats and close to the water surface.

A variety of ingestible materials may be released into the marine environment by Navy training and testing activities. Birds of all sizes and species are known to ingest a wide variety of items, which they might mistake for prey. For example, 21 of 38 seabird species (55 percent) collected off the coast of North Carolina from 1975 to 1989 contained plastic particles (Moser and Lee 1992). The mean particle sizes of ingested plastic were positively correlated with the birds' size though the mean mass of plastic found in the stomachs and gizzards of 21 species was below 3 grams (g) (0.11 oz.).

Plastic is often mistaken for prey and the incidence of plastic ingestion appears to be related to a species' feeding mode and diet. Seabirds that feed by pursuit-diving, surface-seizing, and dipping tend to ingest plastic, while those that feed by plunging or piracy typically do not ingest plastic. Birds of the family Procellariidae, which include petrels and shearwaters, tend to accumulate more plastic than do other species. Some seabirds, including gulls and terns, regularly regurgitate indigestible parts of their food items such as shell and fish bones. However, most procellariiforms have small gizzards and an anatomical constriction between the gizzard and stomach that make it difficult to regurgitate solid material such as plastic (Azzarello and Van Vleet 1987, Pierce et al. 2004). Two species of albatross (Diomedeidae) have also been reported to ingest plastic while feeding at sea. While such studies have not conclusively shown that plastic ingestion is a significant source of direct mortality, it may be a contributing factor to other causes of albatross mortality (Naughton et al. 2007).

Moser and Lee (1992) found no evidence that seabird health was affected by the presence of plastic, but other studies have documented adverse consequences of plastic ingestion. As summarized by Pierce et al. (2004) and Azzarello and Van Vleet (1987), documented consequences of plastic ingestion by seabirds include blockage of the intestines and ulceration of the stomach, reduction in the functional volume of the gizzard leading to a reduction of digestive capability, and distention of the gizzard leading to a reduction in hunger. Studies have found negative correlations between body weight and plastic load, as well as body fat, a measure of energy reserves, and the number of pieces of plastic in a seabird's stomach (Auman et al. 1997, Ryan 1987, Sievert and Sileo 1993). Other possible concerns that have been identified include toxic plastic additives and toxic contaminants that could be adsorbed to the plastic from ambient seawater. Pierce et al. (2004) described a case where plastic ingestion caused seabird mortality from starvation of a member of family Procellariidae. Dissection of an adult greater shearwater gizzard revealed that a 1.5 in. (3.81 centimeters [cm]) by 0.5 in. (1.27 cm) fragment of plastic blocked the pylorus, obstructed the passage of food, and resulted in death from starvation.

Species such as storm-petrels, albatrosses, and shearwaters that forage by picking prey from the surface may have a greater potential to ingest any floating plastic debris. Ingestion of plastic military expended material by any species from the taxonomic groups found within the Study Area (Table 3.6-2) has the potential to impact individual seabirds. The risk of plastic ingestion and impaction in chicks of many species of seabirds may be different from the risks to adults. Albatross chicks appear to be at greater risk than adults, because of their high rates of ingestion and apparent low frequency of regurgitative casting of indigestible material. Fry et al. (1987) demonstrated that a very high proportion of chicks of albatrosses breeding in the North Western Hawaiian Islands ingest plastics during the pre-fledging period when they are dependent upon food brought to the breeding colony by parents. Floating plastic items are ingested by adult albatrosses and regurgitated to chicks along with normal food items. Large amounts of plastic appeared to cause impaction of the upper GI tract and interfere with passage of food through the digestive system. The sub-lethal effects of plastic impaction and minor ulcerations may contribute to reduced resistance to disease and lowered post-fledging survival. These results suggest that plastics appear to present risks only when they are consumed in sufficient quantity to cause physical obstruction or ulcerations of birds' stomachs.

The distribution of floating expended items would be irregular in both space and time, as training activities do not occur in the same place each time. The random distribution of items across the large Study Area yields very low probabilities that seabirds will encounter a floating item. However, when a seabird does encounter a floating item of ingestible size, an ingestion risk may exist. Although most military expended material components are expected to sink to the sea floor and spend limited periods within the water column, some items remain buoyant for an extended period. Expended training material, such as missile and target components that float, may be encountered by seabirds in the waters of the Study Area, increasing the potential for ingestion of smaller components.

3.6.3.4.1 Chaff

Based on the dispersion characteristics of chaff, large areas of air space and open water within the Study Area would be exposed to chaff, but the chaff concentrations would be very low. A general discussion of chaff as an ingestion stressor is presented in Section 3.0.5.3.5 (Ingestion Stressors). It is unlikely that chaff would be selectively ingested (U.S. Department of the Air Force 1997). Ingestion of chaff fibers is not expected to cause physical damage to a bird's digestive tract based on the small size (ranging in lengths of 0.25 to 3 in. [0.64 to 7.6 cm] with a diameter of about 40 micrometers [μm] [0.001574 in.]) and flexible nature of the fibers and the small quantity that could reasonably be ingested. In addition, concentrations of chaff fibers that could reasonably be ingested are not expected to be toxic to seabirds. Scheuhammer (Scheuhammer 1987) reviewed the metabolism and toxicology of aluminum in birds and mammals and found that intestinal adsorption of orally ingested aluminum salts was very poor, and the small amount adsorbed was almost completely removed from the body by excretion. Dietary aluminum normally has small effects on healthy birds and mammals, and often high concentrations (greater than 0.016 oz./lb. [~1,000 mg/kg]) are needed to induce detrimental effects (Nybo 1996). It is highly unlikely that a seabird would ingest a toxic dose of chaff based on the anticipated environmental concentration of chaff for a worst-case scenario of 360 chaff cartridges simultaneously released at a single drop point (1.8 fibers/square feet [0.2 fibers/square meter]).

3.6.3.4.2 Flares

Ingestion of flare end caps 1.3 in. (3.3 cm) in diameter and 0.13 in. (0.33 cm) thick (U.S. Department of the Air Force 1997) by birds may result in gastrointestinal obstruction or reproductive complications. If a seabird were to ingest a plastic end cap or piston, the response would vary based on the species and individual seabird. The responses could range from none, to sublethal (reduced energy reserves), to lethal (digestive tract blockage leading to starvation). Ingestion of end caps and pistons by species that regularly regurgitate indigestible items would likely have no adverse impacts. However, end caps and pistons are similar in size to those plastic pieces described above that caused digestive tract blockages and eventual starvation. Therefore, ingestion of plastic end caps and pistons could be lethal to some individuals of some species of seabirds. Species with small gizzards and anatomical constrictions that make it difficult to regurgitate solid material would likely be most susceptible to blockage (such as Procellariiformes). Based on available information, it is not possible to accurately estimate actual ingestion rates or responses of individual seabirds.

3.6.3.4.2.1 No Action Alternative

Training Activities

Current Navy training activities in the Study Area include firing a variety of weapons. As listed in Chapter 2 (Description of Proposed Action and Alternatives), these weapons employ a variety of non-explosive and explosive training rounds, including bombs, missiles, naval gunshells, cannon shells, chaff or flares and small-caliber ammunition. These materials are used in the open ocean away from shore. These activities account for the majority of naval shells and rounds used in the Study Area. Expended materials resulting from ordnance use include remnants and shrapnel from explosive rounds and non-explosive training rounds. These solid materials, many of which have a high metal content, quickly drop through the water column to the sea floor. Ingestion of expended ordnance would not occur in the water column because ordnance-related materials quickly sink.

Ordnance related materials would sink in relatively deep waters, would not present an ingestion risk to seabirds, and therefore, would likely have a negligible impact. However, seabirds could be exposed to some materials such as chaff fibers used during air combat maneuver, electronic warfare operations, or chaff exercises (Tables 2.8-2 through 2.8-5) in the air or at the sea surface through direct contact or inhalation. Seabirds could also ingest some types of expended materials if the materials float on the sea surface.

Other expended materials that could be ingested by seabirds include small plastic end caps and pistons associated with chaff and self-protection flares. The chaff end cap and piston are both round and are 1.3 in. (3.3 cm) in diameter and 0.13 in. (0.33 cm) thick (U.S. Department of the Navy 2011). This plastic expended material sinks in saltwater, which reduces the likelihood of ingestion.

Birds would have the potential to ingest military expended material. However, the concentration of military expended material in the Study Area is low and seabirds are patchily distributed (Schneider and Duffy 1985, Haney 1986, Fauchald et al. 2002). As discussed in Chapter 2 (Description of Proposed Action and Alternatives) and presented in Table 3.0-85, the highest density of chaff and flare end caps/pistons would be expended in the SOCAL Range Complex portion of the Study Area. Assuming that all end caps and pistons expended in the SOCAL Range Complex potion of the Study Area would be evenly distributed, the relative end-cap and piston concentration would be very low (0.17 pieces/square nautical miles [nm^2]/year, based on an area of 120,000 nm^2 and 20,950 end caps/pistons per year). The overall likelihood that seabirds would be impacted by ingestion of military expended material in the Study Area under the No Action Alternative is negligible.

Pursuant to the ESA, the potential for ingestion of military expended materials other than munitions from training activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from ingestion of military expended materials from training activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Current Navy testing activities in the Study Area include firing a variety of weapons. As listed in Chapter 2 (Description of Proposed Action and Alternatives), these weapons employ a variety of non-explosive and explosive rounds, including missiles, naval gunshells, cannon shells, and small-caliber ammunition. These materials are used in the open ocean away from shore. These activities account for the majority of naval shells and rounds used in the Study Area. Expended materials resulting from ordnance use include remnants and shrapnel from explosive rounds and non-explosive rounds. These solid materials, many of which have a high metal content, quickly drop through the water column to the sea floor. Ingestion of expended ordnance does not occur in the water column because ordnance-related materials quickly sink. Under the No Action Alternative, ordnance related materials would sink in relatively deep waters, would not present a low ingestion risk to seabirds. However, seabirds could ingest some types of expended materials if the materials float on the sea surface. No flares (plastic end caps or pistons) or chaff is utilized under the No Action Alternative, therefore the ingestion risk of expended materials from testing activities is very low.

Pursuant to the ESA, ingestion of military expended materials from testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from ingestion of military expended materials from testing activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.4.2.2 Alternative 1

Training Activities

Under Alternative 1, an overall increase of military expended material would be expended in the Study Area from the No Action Alternative, as presented in Table 3.0-85. Of the expended materials that could be ingested (chaff canisters, flares, and plastic end caps), there is an increase of 2,400 events that could result in chaff from the No Action Alternative. Therefore the ingestion risk is slightly greater than for the No Action Alternative. As discussed in Chapter 2 (Description of Proposed Action and Alternatives) and Section 3.6.3.4.2.1 (No Action Alternative), the highest density of chaff and flare end caps/pistons would be expended in the SOCAL Range Complex portion of the Study Area. The concentration of military expended material in the Study Area is low and seabirds are patchily distributed. The overall likelihood that seabirds would be impacted by ingestion of military expended material in the Study Area under Alternative 1 is negligible. If foraging in an area where military expended material are present seabirds could potentially be impacted by ingestion of military expended material, but this would not result in impacts on populations of these ESA-listed species.

Pursuant to the ESA, ingestion of military expended materials from training activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from ingestion of military expended materials from training activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under Alternative 1, the number of expended materials that could be ingested (chaff canisters, flares, and plastic end caps) would increase by 504 from the No Action Alternative (where none were used). The chaff end cap and piston are both round and are 1.3 in. (3.3 cm) in diameter and 0.13 in. (0.33 cm) thick (U.S. Department of the Navy 2011). This plastic expended material sinks in saltwater, which reduces the likelihood of ingestion.

Birds would have the potential to ingest military expended material. However, the concentration of military expended material in the Study Area is low and seabirds are patchily distributed. The overall likelihood that seabirds would be impacted by ingestion of military expended material in the Study Area under Alternative 1 is low. Assuming that all end caps and pistons expended throughout the entire Study Area would be evenly distributed, the relative end-cap and piston concentration would be extremely low (0.001 pieces/nm^2/year, based on an area of 355,000 nm^2 and 504 end caps/pistons per year). The concentration of military expended material in the Study Area is low and seabirds are patchily distributed. The overall likelihood that seabirds would be impacted by ingestion of military expended material in the Study Area under Alternative 1 is negligible. If foraging in an area where military expended material are present seabirds could potentially be impacted by ingestion of military expended material, but this would not result in impacts on populations of these ESA-listed species.

Pursuant to ESA, the ingestion of military expended materials from testing activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from ingestion of military expended materials from testing activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

3.6.3.4.2.3 Alternative 2

Training Activities

Under Alternative 2, an overall increase of military expended material would be expended in the Study Area from the No Action Alternative, as presented in Table 3.0-85. Of the expended materials that could be ingested (chaff canisters, flares, and plastic end caps), there is an increase of 2,400 events that could result in chaff from the No Action Alternative. Therefore the ingestion risk is slightly greater than for the No Action Alternative. The concentration of military expended material in the Study Area is low and seabirds are patchily distributed. Therefore, the overall likelihood that seabirds would be impacted by ingestion of military expended material in the Study Area under Alternative 2 is negligible. If foraging in an area where military expended material are present seabirds could potentially be impacted by ingestion of military expended material, but this would not result in impacts on populations of these ESA-listed species.

Pursuant to the ESA, ingestion of military expended materials from training activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from ingestion of military expended materials from training activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under Alternative 2, the number of expended materials that could be ingested (chaff canisters, flares, and plastic end caps), would increase by 554 from the No Action Alternative (where none were used). The chaff end cap and piston are both round and are 1.3 in. (3.3 cm) in diameter and 0.13 in. (0.33 cm) thick (U.S. Department of the Navy 2011). This plastic expended material sinks in saltwater, which reduces the likelihood of ingestion.

Birds would have the potential to ingest military expended material. However, the concentration of military expended material in the Study Area is low and seabirds are patchily distributed. The overall likelihood that seabirds would be impacted by ingestion of military expended material in the Study Area under Alternative 1 is low. Assuming that all end caps and pistons expended throughout the entire Study Area would be evenly distributed, the relative end-cap and piston concentration would be extremely low (0.001 pieces/nm^2/year, based on an area of 355,000 nm^2 and 554 end caps/pistons per year). The concentration of military expended material in the Study Area is low and seabirds are patchily distributed. Therefore, the overall likelihood that seabirds would be impacted by ingestion of military expended material in the Study Area under Alternative 2 is negligible. If foraging in an area where military expended material are present seabirds could potentially be impacted by ingestion of military expended material, but this would not result in impacts on populations of these ESA-listed species.

Pursuant to the ESA, ingestion of military expended materials from testing activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from ingestion of military expended materials from testing activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.4.3 Summary of Impacts of Ingestion Stressors

It is possible that persistent expended materials could be accidentally ingested by seabirds while they were foraging for natural prey items, though the probability of this event is low as (1) foraging depths of diving seabirds is generally restricted to the surface of the water or shallow depths, (2) the material is unlikely to be mistaken for prey, and (3) the material remains at or near the sea surface for a short length of time.

Based on available information, it is not possible to accurately estimate actual ingestion rates or responses of individual seabirds. Nonetheless, the number of end caps or pistons ingested by seabirds is expected to be very low and only an extremely small percentage of the total would be potentially available to seabirds due to their relatively low concentration throughout the Study Area. Anatomical characteristics of species within family Procellariidae may elevate the risk of plastic ingestion relative to other species or families; however, exposure to species of family Procellariidae would still remain low. Plastic ingestion under the No Action Alternative, Alternative 1, or Alternative 2 would not result in a significant adverse impact on seabird populations. Sublethal and lethal impacts, if they occur, would be limited to a few individual seabirds.

3.6.3.5 Secondary Stressors

The potential of water and air quality stressors associated with training and testing activities to indirectly affect seabirds was analyzed. The assessment of potential water and air quality stressors refers to previous sections in this EIS/OEIS (Section 3.1, Sediments and Water Quality, and Section 3.2, Air Quality), and addresses specific activities in local environments that may affect seabird habitats. At-sea activities that may impact water and air include general emissions.

As noted in Section 3.1.3 (Sediments and Water Quality, Environmental Consequences), implementation of the No Action Alternative, Alternative 1, or Alternative 2 would not adversely affect water or sediment quality. Any physical impacts on seabird habitats would be temporary and local because training activities would occur infrequently. Impacts from activities would not be expected to adversely impact seabirds or seabird habitats.

Indirect impacts on water or air quality under the No Action Alternative, Alternative 1, or Alternative 2 would have no effect on ESA-listed seabird species due to: (1) the temporary nature of impacts on water or air quality, (2) the distribution of temporary water or air quality impacts, (3) the wide distribution of seabirds in the Study Area, and (4) the dispersed spatial and temporal nature of the training and testing activities that may have temporary water or air quality impacts. No long-term or population-level impacts are expected.

Pursuant to the ESA, secondary stressors from training or testing activities under the No Action Alternative, Alternative 1, or Alternative 2 would have no effect on ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from secondary stressors from training or testing activities under the No Action Alternative, Alternative 1, or Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.4 Summary of Potential Impacts (Combined Impacts of All Stressors) on Seabirds

This section evaluates the potential for combined impacts of all the stressors from the Proposed Action. The analysis and conclusions for the potential impacts from each of the individual stressors are discussed in the analyses of each stressor in the sections above. There are generally two ways that a seabird could be exposed to multiple stressors. The first would be if a seabird were exposed to multiple sources of stress from a single activity or activity (e.g., an amphibious landing activity may include an amphibious vessel that would introduce potential acoustic and physical strike stressors). The potential for a combination of these impacts from a single activity would depend on the range of effects to each of the stressors and the response or lack of response to that stressor. Most of the activities as described in the Proposed Action involve multiple stressors; therefore, it is likely that if a seabird were within the potential impact range of those activities, they may be impacted by multiple stressors simultaneously. This would be more likely to occur during large-scale exercises or activities that span a period of days or weeks (such as a sinking exercise or composite training unit exercise).

Secondly, an individual seabird could be exposed to a combination of stressors from multiple activities over the course of its life. This is most likely to occur in areas where testing and training activities are more concentrated (e.g., near ports, testing ranges, and routine activity locations) and in areas that individual seabirds frequent because it is within the animal's home range, migratory route, breeding area, or foraging area. Except for in the few concentrated areas mentioned above, combinations are unlikely to occur because training and testing activities are generally separated in space and time in such a way that it would be very unlikely that any individual seabirds would be exposed to stressors from multiple activities. However, animals with a small home range intersecting an area of concentrated Navy activity have elevated exposure risks relative to animals that simply transit the area through a migratory route. The majority of the proposed training and testing activities occur over a small spatial scale relative to the entire Study Area, have few participants, and are of a short duration (the order of a few hours or less).

Multiple stressors may also have synergistic effects. For example, seabirds that experience temporary hearing loss or injury from acoustic stressors could be more susceptible to physical strike and disturbance stressors via a decreased ability to detect and avoid threats. Birds that experience behavioral and physiological consequences of ingestion stressors could be more susceptible to physical strike stressors via malnourishment and disorientation. These interactions are speculative, and without data on the combination of multiple Navy stressors, the synergistic impacts from the combination of Navy stressors on seabirds are difficult to predict.

Although potential impacts to certain seabird species from the Proposed Action could include injury or mortality, impacts are not expected to decrease the overall fitness or result in long-term population-level impacts of any given population. In cases where potential impacts rise to the level that warrants mitigation, mitigation measures designed to reduce the potential impacts are discussed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring). The potential impacts anticipated from the Proposed Action are summarized below in Endangered Species Act Determinations (3.6.5) and Migratory Bird Act Determinations (3.6.6) with respect to each regulation applicable to seabirds.

3.6.5 Endangered Species Act Determinations

Table 3.6-6 summarizes the ESA determinations for each substressor analyzed.

3.6.6 Migratory Bird Act Determinations

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the stressors introduced during training and testing activities would not result in a significant adverse effect on migratory bird populations.

Table 3.6-6: Summary of Endangered Species Act Effects Determinations for Birds, for the Preferred Alternative

Navy Activities and Stressors		California least tern	Hawaiian petrel	Short-tailed albatross	Marbled murrelet	Newell's shearwater
Acoustic Stressors						
Sonar and other active sources	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Explosives	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Pile Driving	Training Activities	May affect, not likely to adversely affect	No effect	No effect	No effect	No effect
	Testing Activities	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Weapons Firing, Launch, and Impact Noise	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Aircraft And Vessel Noise	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Energy Stressors						
Electromagnetic devices	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Physical Disturbance and Strike Stressors						
Aircraft and Aerial Target	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect

Table 3.6 6: Summary of Endangered Species Act Effects Determinations for Birds, for the Preferred Alternative (continued)

Navy Activities and Stressors		California least tern	Hawaiian petrel	Short-tailed albatross	Marbled murrelet	Newell's shearwater
Physical Disturbance and Strike Stressors (continued)						
Vessels and in-water devices	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Military expended materials	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Ingestion Stressors						
Military expended materials other than munitions	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Secondary Stressors						
Secondary Stressors	Training Activities	No effect	No effect	No effect	No effect	No effect
	Testing Activities	No effect	No effect	No effect	No effect	No effect

This Page Intentionally Left Blank

REFERENCES

Aebischer, N. J., Coulson, J. C. & Colebrook, J. M. (1990). Parallel long-term trends acrows four marine trophic levels and weather. *Nature, 347*(6295), 753–755.

Ainley, D. G., Allen, S. G. & Spear, L. B. (1995). Offshore occurrence patterns of marbled murrelets in central California. In C. J. Ralph, G. L. Hunt, Jr., M. G. Raphael and J. F. Piatt (Eds.), *Ecology and Conservation of the Marbled Murrelet*. (General Technical Report PSW-GTR-152, pp. 361-369). Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.

Ainley, D. G., Thomas, C. T. & Reynolds, M. H. (1997). Townsend's and Newell's Shearwater (*Puffinus auricularis*). [Electronic Article]. *The Birds of North America Online*(297). doi: 10.2173/bna.297

Akesson, S. & Hedenstrom, A. (2007). How migrants get there: Migratory performance and orientation. [electronic version]. Bioscience, 57(2), 123–133.

American Ornithologists' Union. (1998). *The AOU Check-List of North American Birds* (7th ed., pp. 829). Washington, DC: American Ornithologists' Union. Retrieved from http://www.aou.org/checklist/north/print.php.

Anderson, D. W., Henny, C. J., Godinez-Reyes, C., Gress, F., Palacios, E. L., Santos del Prado, K. & Bredy, J. (2007). *Size of the California Brown Pelican Metapopulation during a non-El Niño year*. (Open-File Report 2007-1299, pp. 35). Reston, VA: U.S. Geological Survey.

Atwood, J. L. & Minsky, D. E. (1983). Least tern foraging ecology at three major california breeding colonies. *Western Birds, 14*(2), 57–71.

Auman, H., Ludwig, J., Giesy, J. & Colborn, T. (1997). Plastic ingestion by Laysan Albatross chicks on Sand Island, Midway Atoll, in 1994 and 1995 *Chapter Twenty Albatross Biology and Conservation*.

Azzarello, M. & Van Vleet, E. (1987, May). Marine birds and plastic pollution. *Marine Ecology - Progress Series, 37*, 295–303.

Bearzi, M., Saylan, C. A. & Feenstra, J. (2009). Seabird observations during cetacean surveys in Santa Monica Bay, California. *Bulletin of Southern California Academy of Sciences, 108*(2), 63–69.

Beason, R. (2004). What Can Birds Hear?, *Wildlife Damage Management, Internet Center for USDA National Wildlife Research Center - Staff Publications* (pp. 6). University of Nebraska - Lincoln.

Beuter, K. J., Weiss, R. & Frankfurt, B. (1986, May). Properties of the auditory system in birds and the effectiveness of acoustic scaring signals. Presented at the Bird Strike Committee Europe (BSCE), 18th Meeting Part I, Copenhagen, Denmark.

Bies, L., Balzer, T. B. & Blystone, W. (2006). Pocosin Lakes National Wildlife Refuge: Can the Military and Migratory Birds Mix? [Electronic version]. *Wildlife Society Bulletin 34*, 502–503

Bureau of Land Management and the U.S. Fish and Wildlife Service. (2010). Memorandum of Understanding between the U.S. Department of the Interior Bureau of Land Management and the U.S. Fish and Wildlife Service. BLM MOU WO-230-2010-04.

Birding Hawaii. (2004). *Annotated list of Hawai'i's breeding birds*. [Web Page]. Retrieved from http://www.birdinghawaii.co.uk/Annotatedlist2.htm, 22 September 2005.

BirdLife International. (2009). *Sterna antillarum*. In *IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3*. Retrieved from www.iucnredlist.org, 10 September 2010.

BirdLife International. (2010). *Data Zone*. [Web Page]. Retrieved from http://www.birdlife.org/datazone/index.html, 10 June 2010.

Black, A. (2005). Short Note Light induced seabird mortality on vessels operating in the Southern Ocean: incidents and mitigation measures. *Antarctic Science, 17*(1), 67–68. 10.1017/S0954102005002439

Borberg, J., Ballance, L., Pitman, R. & Ainley, D. (2005). A Test for Bias Attributable to Seabird Avoidance of Ships During Surveys Conducted in the Tropical Pacific. *Marine Ornithology, 33*, 173–179.

Bowles, A. E., Awbrey, F. T. & Jehl, J. R. (1991). The effect of high-amplitude impulsive noise on hatching success: a reanalysis of the Sooty Tern incident S. b. N. a. S. B. I. Technology (Ed.). (HSD-TP-91-0006). Wright Patterson Airforce Base, Ohio.

Brand, A. R. and P. P. Kellogg. (1939). Auditory responses of starlings, English Sparrows and domestic pigeons. Wilson Bull., 51: 38–41

Briggs, K. T., Tyler, W. M. B., Lewis, D. B. & Carlson, D. R. (1987). Bird Communities at Sea off California: 1975 to 1983 F. A. Pitelka (Ed.). (Studies in Avian Biology No. 11, pp. 74). Santa Cruz, CA: Institute of Marine Sciences, University of California.

Brown, J. W. & Harshman, J. (2008). *Pelecaniformes* Version 27 June 2008 (under construction). Retrieved from http://tolweb.org/Pelecaniformes/57152/2008.06.27 *in* The Tree of Life Web Project, http://tolweb.org/

Burger, A. E. (1995). Marine distribution, abundance, and habitats of Marbled murrelets in British Columbia. In C. J. Ralph, G. L. Hunt, Jr., M. G. Raphael and J. F. Piatt. (Eds.), *Ecology and Conservation of the Marbled Murrelet*. (General Technical Report PSW-GTR-152, pp. 295–312). Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.

Burger, A. E. (2001). Diving Depths of Shearwaters. *The Auk, 118*(3), 755–759. Retrieved from http://www.jstor.org/stable/4089940

Burger, A. E. (2002). *Conservation Assessment of Marbled Murrelets in British Columbia, a Review of the Biology, Populations, Habitat Associations and Conservation*. (Technical Report Series No. 387, pp. 168). Pacific and Yukon Region, BC: Canadian Wildlife Service, Environmental Conservation Branch.

Burger, A.E., C. L. Hitchcock, G. K. Davoren. (2004). Spatial aggregations of seabirds and their prey on the continental shelf off SW Vancouver Island. Marine Ecology Progress Series, 283: 279–292

Burkett, E. E., Rojek, N. A., Henry, A. E., Fluharty, M. J., Comrack, L., Kelly, P. R., Fien, K. M. (2003). *Status review of Xantus's Murrelet (*Synthliboramphus*) in California*. (Status Report 2003-01, pp. 99 + appendices) California Department of Fish and Game, Habitat Conservation Planning Branch.

California Department of Fish and Game. (2010). *State and Federally listed Endangered and Threatened Animals of California*. (pp. 13). Sacramento, CA: California Natural Resources Agency, Department of Fish and Game, Biogeographic Data Branch.

California Department of Transportation. (2009). Final Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish.

Carter, H. R. & Kuletz, K. J. (1995). Mortality of Marbled murrelets due to oil pollution in North America. In C. J. Ralph, G. L. Hunt, Jr., M. G. Raphael and J. F. Piatt (Eds.), *Ecology and Conservation of the Marbled Murrelet*. (General Technical Report PSW-GTR-152, pp. 261–269). Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.

Carter, H. R., Sealy, S. G., Burkett, E. E. & Piatt, J. F. (2005). Biology and conservation of Xantus's Murrelet: discovery, taxonomy, and distribution. *Marine Ornithology, 33*, 81–87.

Chesser, R.T., Banks, R.C., Barker, F.K., Cicero, C., Dunn, J.L., Kratter, A.W., Lovette, I.J., Rasmussen, P.C., Remsen Jr., J.V., Rising, J.D., Stotz, D.F. & Winker K. (2012). Fifty-third Supplement to the American Ornithologists' Union Check-list of North American Birds. *The Auk, 129(*3), 573–588.

Church, J. A. & White, N. J. (2006). A 20th century acceleration in global sea-level rise. *Geophysical Research Letters, 33*(L01602), 1–4. doi: 10.1029/2005GL024826

Clavero, M., Brotons, L., Pons, P. & Sol, D. (2009). Prominent role of invasive species in avian biodiversity loss. *Biological Conservation, 142*(10), 2043–2049. doi: 10.1016/j.biocon.2009.03.034

Committee on the Status of Endangered Wildlife in Canada. (2003). *COSEWIC Assessment and Status Report on the Short-tailed Albatross* Phoebastrie albatrus *in Canada*. (pp. vi+25). Ottawa, Ontario: Committee on the Status of Endangered Wildlife in Canada. Available from www.sararegistry.gc.ca/status/status_e.cfm

Congdon, B. C., Erwin, C. A., Peck, D. R., Baker, G. B., Double, M. C. & O'Neill, P. (2007). Vulnerability of seabirds on the Great Barrier Reef to climate change. In J. E. Johnson and P. A. Marshall (Eds.), *Climate Change and the Great Barrier Reef: A Vulnerability Assessment* (pp. 427–463). Townsville, Australia: Great Barrier Reef Marine Park Authority and Australian Greenhouse Office.

Damon, E.G., D.R. Richmond, E.R. Fletcher, and R.K. Jones. (1974). The tolerance of birds to airblast. Final Report prepared for Defense Nuclear Agency, July.

Davis, R. W., Evans, W. E., Wursig, B. & eds. (2000). Cetaceans, Sea Turtles and Seabirds in the Northern Gulf of Mexico: Distribution, Abundance and Habitat Associations. Volume I: Executive Summary. New Orleans, Louisiana.

Day, R. H. & Cooper, B. A. (1995). Patterns of movement of Dark-rumped petrels and Newell's shearwaters on Kauai. *The Condor, 97*, 1011–1027.

Day, R. H., Cooper, B. A. & Blaha, R. J. (2003). Movement patterns of Hawaiian petrels and Newell's shearwaters on the island of Hawai'i. *Pacific Science, 57*(2), 147–159.

Day, R. H. & Nigro, D. A. (2000). Feeding ecology of Kittlitz's and marbled murrelets in Prince William Sound, Alaska. *Waterbirds, 23*(1), 1–14.

Dearborn, D. C., Anders, A. D. & Parker, P. G. (2001). Sexual dimorphism, extrapair fertilizations, and operational sex ratio in great frigatebirds (*Fregata minor*). *Behavioral Ecology, 12*(6), 746-752. doi:10.1093/beheco/12.6.746

Dietrich, K. & Melvin, E. (2004). *Annotated Bibliography: Seabird Interactions with Trawl Fishing Operations and Cooperative Research*. (pp. 4) Washington Sea Grant Program, University of Washington.

Dobson, A. (2010). Bird Report. [Electronic newsletter]. Bermuda Audubon Society Newsletter, 21(1). Retrieved from http://www.audubon.bm/Newsletters.htm

Dooling, R. J., Lohr, B., & Dent, M. L. (2000). Hearing in birds and reptiles. In R. J. Dooling, R. R. Fay, & A. N. Popper (Eds.), Comparative hearing in birds and reptiles (Vol. 13, pp. 308–359). New York: Springer-Verlag.

Dooling, R. J. and S. C. Therrien (2012). Hearing in Birds: What Changes from Air to Water. The Effects of Noise Oil Aquatic Life. Advances in Experimental Medicine and Biology. A. N. P. a. A. H. (eds.), Springer Science+Business Media, LLC 2012.Drost, C. A. & Lewis, D. B. (1995). Xantus's Murrelet (Synthliboramphus hypoleucus). [Electronic Article]. The Birds of North America Online(164). doi: 10.2173/bna.164.

Elphick, C., Dunning, J. B., Jr. & Sibley, D. A. (Eds.). (2001). *National Audubon Society: The Sibley Guide to Bird Life and Behavior* (pp. 587). New York, NY: Chanticleer Press.

Enticott, J. & Tipling, D. (1997). *Seabirds of the World: The Complete Reference* (1st ed., pp. 234). Mechanicsburg, PA: Stackpole Books.

Erickson, R. A., Hamilton, R. A., Howell, S. N. G., Pyle, P. & Patten, M. A. (1995). First record of the Marbled murrelet and third record of the Ancient murrelet for Mexico. *Western Birds, 26*, 39–45.

Ericson, P. G. P., Envall, I., Irestedt, M. & Norman, J. A. (2003). Inter-familial relationships of the shorebirds (Aves: Charadriiformes) based on nuclear DNA sequence data. *BMC Evolutionary Biology, 3*(16), 1-14. Retrieved from http://www.biomedcentral.com/1471-2148/3/16

Eriksson, M. O. G. (1985). Prey detectability for fish-eating birds in relation to fish density and water transparency *Ornis Scandinavica, 16*, 1–7.

Fain, M. G. & Houde, P. (2007). Multilocus perspectives on the monophyly and phylogeny of the order Charadriiformes (Aves). *BMC Evolutionary Biology, 7*(35), 1–17. doi: 10.1186/1471-2148-7-35.

Fauchald, P., Erikstad, K. E. & Systad, G. H. (2002). Seabirds and marine oil incidents: is it possible to predict the spatial distribution of pelagic seabirds? [Electronic Version]. Journal of Applied Ecology, 39(2), 349–360.

Fisher, H. I. (1971). Experiments in homing in Laysan Albatrosses, Diomedea immutabilis. The Condor, 73(4), 389–400.

Gehring, J., Kerlinger, P. & Manville, A. M. (2009). Communication towers, lights, and birds: successful methods of reducing the frequency of avian collisions. *Ecological Applications, 19*(2), 505–514. 10.1890/07-1708.1.

Gilman, E. L. & Ellison, J. (2009). Relative sea-level rise tipping points for coastal ecosystems. In P. Leadley, H. Pereira, R. Alkemade, V. Proenca, J. Scharlemann and M. Walpole (Eds.), *Biodiversity Scenarios Synthesis for the Global Biodiversity Outlook 3: Projections of 21st Century Change in Biodiversity and Associated Ecosystem Services* (pp. 42–57). Montreal, Canada: Convention on Biological Diversity.

Gilman, E. L., Ellison, J., Duke, N. C. & Field, C. (2008). Threats to mangroves from climate change and adaptation options: A review. *Aquatic Botany, 89*(2), 237–250. doi: 10.1016/j.aquabot.2007.12.009.

Grenier, J. J. & Nelson, S. K. (1995). Marbled Murrelet habitat associations in Oregon. In C. J. Ralph, G. L. Hunt, Jr., M. G. Raphael and J. F. Piatt (Eds.), *Ecology and Conservation of the Marbled Murrelet*. (General Technical Report PSW-GTR-152, pp. 191–204). Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.

Hamer, T. E. & Nelson, S. K. (1995). Nesting chronology of the marbled murrelet. In C. J. Ralph, G. L. Hunt, Jr., M. G. Raphael and J. F. Piatt (Eds.), *Ecology and Conservation of the Marbled Murrelet*. (General Technical Report PSW-GTR-152, pp. 49–56) Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.

Hamilton, W. (1958, May). Pelagic Birds Observed on a North Pacific Crossing. *The Condor, 60*, 159–164.

Haney, J. C. (1986). Seabird Patchiness in Tropical Oceanic Waters: The Influence of Sargassum "Reefs". *The Auk, 103*, 141–151.

Haftorn, S., Mehlum, F. & Bech, C. (1988). Navigation to nest site in the snow petrel (Pagodroma nivea). The Condor, 90(2), 484–486.

Hanowski, J. M., Blake, J. G., Niemi, G. J. & Collins, P. T. (1993). Effects of extremely low electromagnetic field on breeding and migrating birds. American Midland Naturalist, 129(1), 96–115.

Harrison, P. (1983). *Seabirds, an Identification Guide* (pp. 445). Boston, MA: Houghton Mifflin Company.

Hashino, E., Sokabe, M. & Miyamoto, K. (1988). Frequency specific susceptibility to acoustic trauma in the budgerigar (*Melopsittacus undulatus*). *Journal of the Acoustical Society of America, 83*(6), 2450–2453.

Hertel, F. & Ballance, L. T. (1999). Wing ecomorphology of seabirds from Johnston Atoll. [Electronic Version]. *The Condor, 101*(3), 549–556.

Hitipeuw, C., Dutton, P. H., Benson, S., Thebu, J. & Bakarbessy, J. (2007). Population status and internesting movement of leatherback turtles, *Dermochelys coriacea*, nesting on the northwest coast of Papua, Indonesia. *Chelonian Conservation and Biology, 6*(1), 28–36.

Hunt, G. L., Jr. & Butler, J. L. (1980). Reproductive ecology of Western gulls and Xantus' murrelets with respect to food resources in the Southern California Bight. *CalCOFI Reports, XXI*, 62–67.

Hunter, W. C., Golder, W., Melvin, S. & Wheeler, J. (2006a). Southeast United States Regional Waterbird Conservation Plan North American Bird Conservation Initiative (Ed.).

Hunter, W. C., Golder, W., Melvin, S. & Wheeler, J. (2006b). *Southeast United States Regional Waterbird Conservation Plan*. (pp. 134) North American Bird Conservation Initiative. Available from United States Geological Service website: http://www.pwrc.usgs.gov/nacwcp/pdfs/regional/seusplanfinal906.pdf

Hyrenback, K. (2001). Albatross response to survey vessels: implications for studies of the distribution, abundance, and prey consumption of seabird populations. *Marine Ecology Progress Series, 212*, 283–295.

Hyrenback, K. (2006). Waterbird monitoring Techniques Workshop, *IV North American Ornithological Conference* (pp. 34). Veracruz, Mexico.

International Union for Conservation of Nature and Natural Resources. (2010). *The IUCN Red List of Threatened Species Version 2010.1*. [Web Page] International Union for Conservation of Nature and Natural Resources. Retrieved from http://www.iucnredlist.org/, 25 June 2010.

International Union for the Conservation of Nature. (2010a). *Brachyramphus marmoratus*. In *IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3*. Retrieved from www.iucnredlist.org, 10 September 2010.

International Union for the Conservation of Nature (2010b). *Oceanodroma castro*. In *IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3*. Retrieved from www.iucnredlist.org, 10 September 2010.

International Union for the Conservation of Nature. (2010c). *Phoebastria albatrus*. In *IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3*. Retrieved from www.iucnredlist.org, 10 September 2010.

International Union for the Conservation of Nature. (2010d). *Pterodroma sandwichensis*. In *IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3*. Retrieved from www.iucnredlist.org, 09 September 2010.

International Union for the Conservation of Nature. (2010e). *Puffinus newelli*. In *IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3*. Retrieved from www.iucnredlist.org, 09 September 2010.

International Union for the Conservation of Nature. (2010f). *Synthliboramphus hypoleucus*. In *IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3*. Retrieved from www.iucnredlist.org, 10 September 2010.

Jessup, D. A., Miller, M. A., Ryan, J. P., Nevins, H. M., Kerkering, H. A., Mekebri, A., Kudela, R. M. (2009). Mass stranding of marine birds caused by a surfactant-producing red tide. [Electronic version]. *PLoS ONE, 4*(2), e4550. doi: 10.1371/journal.pone.0004550

Jones, I. L. (2001). Auks C. Elphick, J. Dunning, J.B. and D. A. Sibley (Eds.), The Sibley Guide to Bird Life and Behavior (pp. 309–318). New York: Alfred A. Knopf, Inc.

Karnovsky, N. J., Spear, L. B., Carter, H. R., Ainley, D. G., Amey, K. D., Ballance, L. T., . . . Tynan, C. T. (2005). At-sea distribution, abundance and habitat affinities of Xantus's Murrelets. Marine Ornithology, 33, 89–104.

Larkin, R. P., Pater, L. L. & Tazik, D. J. (1996). Effects of military noise on wildlife: A literature review (pp. 1–107).

Larkin, R. P. & Sutherland, P. J. (1977, February). Migrating birds respond to Project Seafarer's electromagnetic field. [electronic version]. Science, 195(4280), 777–779. Retrieved from http://www.jstor.org/stable/1743979

Lincoln, F. C., Peterson, S. R. & Zimmerman, J. L. (1998). Migration of birds. U.S. Department of the Interior and U.S. Fish and Wildlife Service (Eds.). (Vol. Circular 16). Washington, D.C.

Marschalek, D. A. (2008). *California Least Tern Breeding Survey, 2007 Season*. (Nongame Wildlife Program Report 2008-01, pp. 24+ app.). Sacramento, CA: California Department of Fish and Game, Wildlife Branch.

Manci, K. M., D. N. Gladwin, R. Villella and M. G. Cavendish (1988). *Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: A Literature Synthesis*. Ft. Collins, CO, U. S. Fish and Wildlife Service, National Ecology Research Center**:** 88.

Massey, B. W. & Fancher, J. M. (1989). Renesting by California Least terns. *Journal of Field Ornithology, 60*(3), 350–357.

McCaskie, G. & Garrett, K. L. (2001). Southern Pacific coast. *North American Birds, 55*(2), 226–230.

McCaskie, G. & Garrett, K. L. (2002). Southern Pacific coast. *North American Birds, 56*(2), 222–226.

Melvin, E. & Parrish, J. (2001). Seabird Bycatch: Trends, Roadblocks, and Solutions, February 26–27. Presented at the Annual Meeting of the Pacific Seabird Group, Blaine, Washington.

Melvin, E.F., J. K. Parrish, and L.L. Conquest. (1999). Novel tools to reduce seabird bycatch in coastal gillnet fisheries. Conservation Biology 13: 1386–1397.

Melvin, E. F., Parrish, J. K., Dietrich, K. S. & Hamel, O. S. (2001). Solutions to seabird bycatch in Alaska's demersal longline fisheries. Washington Sea Grant Program.

Merkel, F. R. & Johansen, K. L. (2011). Light-induced bird strikes on vessels in Southwest Greenland. Marine Pollution Bulletin, 62(11), 2330–2336.

Miller, S. L. & Ralph, C. J. (1995). Relationship of Marbled murrelets with habitat characteristics at inland sites in California. In C. J. Ralph, G. L. Hunt, Jr., M. G. Raphael and J. F. Piatt (Eds.), *Ecology and Conservation of the Marbled Murrelet*. (General Technical Report PSW-GTR-152, pp. 205–214). Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.

Mitchell, C., Ogura, C., Meadows, D. W., Kane, A., Strommer, L., Fretz, S., . . . McClung, A. (2005). Seabirds: Ake ake or Band-rumped Storm-petrel Oceandroma castro. In Hawaii's Comprehensive Wildlife Conservation Strategy [Electronic Fact Sheet]. Honolulu, HI: Department of Land and Natural Resources. Available from http://www.state.hi.us/dlnr/dofaw/cwcs/Conservation_need.htm

Moser, M. & Lee, D. (1992). A Fourteen-Year Survey of Plastic Ingestion by Western North Atlantic Seabirds. *Colonial Waterbirds, 15*(1), 83-94.

Mullane, R. & Suzuki, D. (1997). *Beach Management Plan for Maui*. (pp. 71) County of Maui, State of Hawaii. Prepared by University of Hawaii Sea Grant Extension Service and County of Maui Planning Department.

Naslund, N. L. (1993). Why do marbled murrelets attend old-growth forest nesting areas year-round? *The Auk, 110*(3), 594–602.

National Park Service. (1994). Report on Effects of Aircraft Overflights on the National Park System. Prepared for Report to Congress.

NatureServe. (2004, Last updated November 2004). *Comprehensive report:* Phoebastria albatrus - *(Pallas, 1769): Short-tailed albatross*. [Web Page]. Retrieved from http://www.natureserve.org, 23 November 2004.

Naughton, M., Romano, M. & Zimmerman, T. (2007). A Conservation Action Plan for Black-footed Albatross (*Phoebastria nigripes*) and Laysan Albatross (*P. immutabilis*) Version 1.0.

Necker, R. (1983). Effects of temperature on afferent synaptic transmission in the dorsal horn of the spinal cord of pigeons. *J. Therm. Biol (*8), 15-18.

Nelson, S. K. (1997). Marbled Murrelet (*Brachyramphus marmoratus*). [Electronic Article]. *The Birds of North America Online*(276). doi: 10.2173/bna.276

North American Bird Conservation Initiative, U.S. Committee. (2010). *The State of the Birds 2010 Report on Climate Change, United States of America* [Electronic Version]. (pp. 32). Washington, DC: U.S. Department of the Interior. Available from http://www.stateofthebirds.org/

Nybo, S. (1996). Effects of Dietary Aluminum on Chicks *Gallus gallus domesticus* with Different Dientary Intake of Calcium and Phosphorus. [electronic version]. *Archives of Environmental Contamination and Toxicology, 31*, 177-183.

Onley, D. & Scofield, P. (2007). *Albatrosses, Petrels and Shearwaters of the World* (pp. 256). Princeton, NJ: Princeton University Press.

Pater, L.L., T.G. Grubb, Delaney, D.K. (2009). Recommendations for Improved Assessment of Noise Impacts on Wildlife. Journal of Wildlife Management, 73(5): 788-795.

Piatt, J. F., Kuletz, K. J., Burger, A. E., Hatch, S. A., Friesen, V. L., Birt, T. P., Bixler, K. S. (2007). *Status Review of the Marbled Murrelet (*Brachyramphus marmoratus*) in Alaska and British Columbia*. (Open-File Report 2006-1387, pp. 258). Reston, VA: U.S. Geological Survey.

Piatt, J. F. & Naslund, N. L. (1995). Abundance, distribution, and population status of Marbled Murrelets in Alaska. In C. J. Ralph, G. L. Hunt, Jr., M. G. Raphael and J. F. Piatt (Eds.), *Ecology and Conservation of the Marbled Murrelet*. (General Technical Report PSW-GTR-152, pp. 285-294). Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.

Piatt, J. F., Wetzel, J., Bell, K., DeGange, A. R., Balogh, G. R., Drew, G. S., Byrd, G. V. (2006). Predictable hotspots and foraging habitat of the endangered short-tailed albatross (*Phoebastria albatrus*) in the North Pacific: Implications for conservation. *Deep-Sea Research II, 53*(3-4), 387-398. doi:10.1016/j.dsr2.2006.01.008

Pierce, K., Harris, R., Larned, L. & Pokras, M. (2004). Obstruction and Starvation Associated with Plastic Ingestion in a Northern Gannet *Morus Bassanus* and a Greater Shearwater *Puffinus Gravis*. [electronic version]. *Marine Ornithology, 32*, 187-189.

Plumpton, D. (2006). Review of Studies Related to Aircraft Noise Disturbance of Waterfowl A Technical Report in Support of the Supplemental Environmental Impact Statement (SEIS) for Introduction of F/A-18 E/F (Super Hornet) Aircraft to the East Coast of the United States. (pp. 93). Prepared for U.S. Department of the Navy.

Poot, H., Ens, B. J., de Vries, H., Donners, M. A. H., Wernand, M. R. & Marquenie, J. M. (2008). Green Light for Nocturnally Migrating Birds. *Ecology and Society, 13*(2). 47

Ralph, C. J. & Miller, S. L. (1995). Offshore population estimates of Marbled murrelets in California. In C. J. Ralph, G. L. Hunt, Jr., M. G. Raphael and J. F. Piatt (Eds.), *Ecology and Conservation of the Marbled Murrelet*. (General Technical Report PSW-GTR-152, pp. 353-360). Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.

Ramos, J., Monteiro, L., Sola, E. & Moniz, Z. (1997). Characteristics and competition for nest cavities in burrowing procellariiformes. *The Condor, 99*, 634-641.

Raphael, M. G., Baldwin, J., Falxa, G. A., Huff, M. H., Lance, M., Miller, S. L., Thompson, C. (2007). *Regional Population Monitoring of the Marbled Murrelet: Field and analytical methods*. (General Technical Report PNW-GTR-716, pp. 70). Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Reed, J., Sincock, J. & Hailman, J. (1985, April). Light Attraction in Endangered Procellariiform Birds: Reduction by Shielding Upward Radiation. *The Auk 102*, 377-383.

Reynolds, M. H. & Ritchotte, G. L. (1997). Evidence of Newell's Shearwater breeding in Puna District, Hawaii. *Journal of Field Ornithology, 68*(1), 26-32.

Roberson, D. (2000, Last updated May 2000). *California short-tailed albatrosses. A summary at the turn of the 21st Century*. [Web Page] Creagrus at Montereay Bay. Retrieved from http://www.montereybay.com/creagrus/CA_STAL.html

Ronconi, R. A., Ryan, P. G. & Ropert-Coudert, Y. (2010). Diving of Great Shearwaters (Puffinus gravis) in Cold and Warm Water Regions of the South Atlantic Ocean. *Plos One, 5*(11). e15508.

Ryals, B. M., Dooling, R. J., Westbrook, E., Dent, M. L., MacKenzie, A. & Larsen, O. N. (1999). Avian species differences in susceptibility to noise exposure. *Hearing Research, 131*, 71-88.

Ryals, B. M., Stalford, M. D., Lambert, P. R. & Westbrook, E. W. (1995). Recovery of noise-induced changes in the dark cells of the quail tegmentum vasculosum. *Hearing Research, 83*, 51-61.

Ryan, P. (1987, January). The Effects of Ingested Plastic on Seabirds: Correlations between Plastic Load and Body Condition. *Environmental Pollution, 46*, 119-125.

Saunders, J. & Dooling, R. (1974). Noise-Induced Threshold Shift in the Parakeet (*Melopsittacus undulatus*). *Proc Natl Acad Sci U S A, 71*(5), 1962-1965.

Scheuhammer, A. (1987, February). The Chronic Toxicity of Aluminium, Cadmium, Mercury, and Lead in Birds: A Review. *Environmental Pollution, 46*, 263-295.

Schneider, D. C. & Duffy, D. C. (1985). Scale-dependent variability in seabird abundance. Marine Ecology Progress Series, 25, 211-218.

Schreiber, R. W. & Chovan, J. L. (1986). Roosting by pelagic seabirds: Energetic, populational, and social considerations. [Electronic Version]. *The Condor, 88*(4), 487-492.

Sibley, D. A. (2000). *National Audubon Society: The Sibley Guide to Birds* (9th ed., pp. 544). New York, NY: Chanticleer Press.

Sibley, D. A. (2007). *National Audubon Society: The Sibley Guide to Birds* (Printed Book, 9th ed., pp. 544). New York, NY: Chanticleer Press.

Sidle, J. G., D. E. Carlson, E. M. Kirsh, and J. J. Dinan. (1992). Flooding: mortality and habitat renewal for least terns and piping plovers. Colonial Waterbirds 15:132-136.

Siegel-Causey, D. & Kharitonov, S. P. (1990). The Evolution of Coloniality. In D. M. Power (Ed.), *Current Ornithology* (Printed Book, Vol. 7, pp. 285-330). New York, NY: Plenum Press.

Sievert, P. & Sileo, L. (1993). The effects of ingested plastic on growth and survival of albatross chicks. *National Wildlife Health Research Center*.

Solomon, S., Qin, D., Manning, M., Alley, R. B., Berntsen, T., Bindoff, N. L., Wratt, D. (2007). Technical summary. In S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor and H. L. Miller (Eds.), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. (pp. 74). Cambridge, United Kingdom and New York, NY: Cambridge University Press. Available from http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-ts.pdf

Spear, L. B. & Ainley, D. G. (1998). Morphological differences relative to ecological segregation in petrels (Family: Procellariidae) of the Southern Ocean and Tropical Pacific. *The Auk, 115*(4), 1017-1033.

Spear, L. B., Ainley, D. G., Nur, N. & Howell, S. N. G. (1995). Population size and factors affecting at-sea distributions of four endangered procellariids in the tropical Pacific. *The Condor, 97*(3), 613-638.

Spear, L. B., Ainley, D. G. & Pyle, P. (1999). Seabirds in Southeastern Hawaiian waters. *Western Birds, 30*(1), 1-32.

Strong, C. S., Keitt, B. S., McIver, W. R., Palmer, C. J. & Gaffney, I. (1995). Distribution and population estimates of marbled murrelets at sea in Oregona during the summers of 1992 and 1993. In C. J. Ralph, G. L. Hunt, Jr., M. G. Raphael and J. F. Piatt (Eds.), *Ecology and Conservation of the Marbled*

Murrelet. (General Technical Report PSW-GTR-152, pp. 339-352). Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.

Thiessen, G. J. (1958, November). Threshold of hearing of a ring-billed gull. Journal of the Acoustical Society of America, 30(11).

Therrien, S. C., Carr, C. E., Dooling, R. J., Popper, A. N., Therrien, R. E. & Wells-Berlin, A. M. (2011, May). Training diving ducks for behavioral audiograms *Animal Bioacoustics: General Topics in Passive Acoustic Monitoring of Animals II*. Presented at the 161st Meeting: Acoustical Society of America.

Thompson, B. C., Jackson, J. A., Burger, J., Hill, L. A., Kirsch, E. M. & Atwood, J. L. (1997). Least tern *Sterna antillarum*. [Electronic Article]. *The Birds of North America Online*(290). doi: 10.2173/bna.290

Tickell, W. L. N. (2000). *Albatrosses* (pp. 448). New Haven, CT: Yale University Press.

U.S. Air Force. (1997). Environmental Effects of Self-Protection Chaff and Flares. (pp. 241).

U.S. Bureau of Land Management and U.S. Fish and Wildlife Service. (2010). Memorandum of Understanding between the U.S. Department of the Interior Bureau of Land Management and the U.S. Fish and Wildlife Service To Promote the Conservation of Migratory Birds.

U.S. Department of the Navy - Southwest Division. (2001). San Clemente Island Integrated Natural Resources Management Plan [Draft Final]. (pp. 926). San Diego, CA. Prepared by Tierra Data Systems.

U.S. Department of the Navy. (2002). *Naval Base Coronado Integrated Natural Resources Management Plan*. San Diego, CA. Prepared by Tierra Data Systems. Prepared for U.S. Department of the Navy, Navy Region Southwest Natural Resources Office.

U.S. Department of the Navy. (2009). Environmental Assessment for Construction & Operation of Electromagnetic Railgun MILCON P-306. (pp. 366). Naval Support Facility Dahlgren, Virginia: Research, Development, Test, and Evaluation Facility.

U.S. Department of the Navy. (2011). Gulf of Alaska Environmental Impact Statement. Prepared by U.S. Pacific Fleet.

U.S. Fish and Wildlife Service. (1983). *Hawaiian Dark-rumped Petrel and Newell's Manx Shearwater Recovery Plan*. (pp. 57). Portland, OR: U.S. Fish and Wildlife Service.

U.S. Fish and Wildlife Service. (1985). *Recovery Plan for the California Least Tern,* Sterna antillarum browni. (pp. 112). Portland, OR: U.S. Fish and Wildlife Service.

U.S. Fish and Wildlife Service. (1990). Recovery plan for the interior population of the least tern (Sterna antillarum). U.S. Fish and Wildlife Service, Twin Cities, Minnesota. 90 pp.

U.S. Fish and Wildlife Service. (1992). Endangered and threatened wildlife and plants; determination of threatened status for the Washington, Oregon, and California population of the Marbled murrelet. [Final Rule]. *Federal Register, 57*(191), 45328–45337.

U.S. Fish and Wildlife Service. (1997). *Recovery Plan for the Threatened Marbled Murrelet (*Brachyramphus marmoratus*) in Washington, Oregon, and California*. (pp. 203). Portland, Oregon: U.S. Fish and Wildlife Service.

U.S. Fish and Wildlife Service. (2000). Endangered and threatened wildlife and plants; final rule to list the short-tailed albatross as endangered in the United States. [Final Rule]. *Federal Register, 65*(147), 46643–46654.

U.S. Fish and Wildlife Service. (2001). *Short-tailed Albatross (*Phoebastria albatrus*) Threatened and Endangered Species*. (pp. 2). Fairbanks, AK: U.S. Fish and Wildlife Service.

U.S. Fish and Wildlife Service. (2003, Last updated 02 May 2003). *Hawaiian Islands Birds and Draft Scores (May 2003)*. [Data] U.S. Fish and Wildlife Service, Migratory Birds and Habitat Programs, Pacific Region

U.S. Fish and Wildlife Service. (2004). *Species Assessment and Listing Priority Assignment form:* Oceanodroma castro. (pp. 24). Available from http://ecos.fws.gov/docs/candforms_pdf/r1/B08V_V01.pdf

U.S. Fish and Wildlife Service. (2005a). *Hawaiian dark-rumped petrel,* Pterodroma phaeopygia sandwichensis. [Fact Sheet]. Retrieved from http://ecos.fws.gov/docs/life_histories/B00N.html, 20 September 2005.

U.S. Fish and Wildlife Service. (2005b). *Regional Seabird Conservation Plan, Pacific Region*. (pp. 264). Portland, OR: U.S. Fish and Wildlife Service, Migratory Birds and Habitat Programs, Pacific Region.

U.S. Fish and Wildlife Service. (2005c). *Short-tailed Albatross Draft Recovery Plan*. (pp. 62). Anchorage, AK.

U.S. Fish and Wildlife Service. (2006). *California Least Tern (*Sternula antillarum browni*) 5-year Review. Summary and Evaluation*. (pp. 35). Carlsbad, CA: U.S. Fish and Wildlife Service Carlsbad Fish and Wildlife Office.

U.S. Fish and Wildlife Service. (2007). Species Assessment and Listing Priority Assignment Form: Synthliboramphus hypoleucus. (pp. 26). Washington, DC: U.S. Fish and Wildlife.

U.S. Fish and Wildlife Service. (2008a). *Birds of Conservation Concern 2008*. (pp. 85). Arlington, VA: U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management. Available from http://www.fws.gov/migratorybirds/

U.S. Fish and Wildlife Service. (2008b). *Short-tailed Albatross Recovery Plan*. (pp. 105). Anchorage, AK.

U.S. Fish and Wildlife Service. (2010a, Last updated May 2010). *Endangered Species Program: Species Information*. [Web Page]. Retrieved from http://www.fws.gov/endangered/wildlife.html, 24 June 2010.

U.S. Fish and Wildlife Service. (2010b, Last updated October 2007). *Species Account: California least tern (*Sternula antillarum browni*)*. [Fact Sheet]. Retrieved from http://fws.gov/sacramento/es/animal_spp_acct/acctbird.htm, 12 May 2010.

United States Geological Survey. (2006, Last updated August 2006). *Migration of Birds: Routes of Migration*. In *Northern Prairie Wildlife Research Center*. [Web Page]. Retrieved from http://www.npwrc.usgs.gov/resource/birds/migratio/routes.htm, 05/29/2010.

Vandenbosch, R. (2000). Effects of ENSO and PDO events on seabird populations as revealed by Christmas bird count data. *Waterbirds, 23*(3), 416–422.

Wever, E. G., Herman, P. N., Simmons, J. A. & Hertzler, D. R. (1969). Hearing in the blackfooted penguin (*Spheniscus demersus*), as represented by the cochlear potentials. *Proceedings of the National Academy of Sciences USA, 63*, 676–680.

Wiltschko, R., Denzau, S., Gehring, D., Thalau, P. & Wiltschko, W. (2011). Magnetic orientation of migratory robins, Erithacus rubecula, under long-wavelength light. Journal of Experimental Biology, 214(18), 3096-3101. 10.1242/jeb.059212

Wiltschko, W. & Wiltschko, R. (2005). Magnetic orientation and magnetoreception in birds and other animals. Journal of Comparative Physiology, 191, 675-693. doi: 10.1007/s00359-005-0627-7

Whitworth, D.L., Takekawa, J.Y., Carter, H.R.,Newman, S.H., Keeney, T.W. and Kelly, P.R. (2000). At-sea distribution of Xantus' Murrelets (Synthliboramphus hypoleucus)in the Southern California Bight. Ibis 142: 268–279.

Whitworth, D. L., Koepke, J. S., Carter, H. R., Gress, F. & Fangman, S. (2005). Nest Monitoring of Xantus's Murrelets (Synthliboramphus hypoleucus) at Anacapa Island, California: 2005 Annual Report [Unpublished Report]. (pp. 24). Davis, CA: California of Environmental Studies. Prepared for The American Trader Trustee Council and Channel Islands National Park.

Wolf, S., Phillips, C., Zepeda-Dominguez, J. A., Albores-Barajas, Y. & Martin, P. (2005). Breeding biology of Xantus's murrelet at the San Benito Islands, Baja California, Mexico. Marine Ornithology, 33, 123–129.

Yelverton, J., Richmond, D. & Fletcher E. (1973). Safe Distances from Underwater Explosions for Mammals and Birds. Prepared for Director Defense Nuclear Agency.

This Page Intentionally Left Blank

3.7 Marine Vegetation

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

There are no figures in this section.

This Page Intentionally Left Blank

3.7 Marine Vegetation

MARINE VEGETATION SYNOPSIS

The United States Department of the Navy considered all potential stressors, and the following have been analyzed for marine vegetation:

- Acoustic (underwater explosives)
- Physical disturbance and strike (vessels and in-water devices, military expended materials, seafloor devices)
- Secondary

Preferred Alternative

- No Endangered Species Act listed marine vegetation species are found in the Hawaii-Southern California Training and Testing Study Area.
- Acoustics: Explosives could affect marine vegetation by destroying individual plants or damaging parts of plants. The impacts of these stressors are not expected to result in detectable changes in growth, survival, or propagation, and are not expected to result in population-level impacts on marine plant species.
- Physical Disturbance and Strike: Physical disturbance and strikes could affect marine vegetation by destroying individual plants or damaging parts of plants. The impacts of these stressors are not expected to result in detectable changes in growth, survival, or propagation, and are not expected to result in population-level impacts on marine plant species.
- Secondary: Secondary stressors are not expected to result in detectable changes in growth, survival, propagation, or population-level impacts because changes in sediment and water quality or air quality are not likely to be detectable.
- Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of explosives and other impulsive sources, vessel movement, in-water devices, military expended materials, and seafloor devices during training and testing activities may have an adverse effect on Essential Fish Habitat by reducing the quality and quantity of marine vegetation that constitutes Essential Fish Habitat or Habitat Areas of Particular Concern.

3.7.1 Introduction

This section analyzes potential impacts on marine vegetation found in the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area). Marine vegetation, including marine algae and flowering plants, are found throughout the Study Area. United States (U.S.) Department of the Navy (Navy) training and testing activities are evaluated for their potential impacts on species designated under the Endangered Species Act (ESA) and for their impacts on six major taxonomic groups of marine vegetation, as appropriate (Table 3.7-1). Marine vegetation, including marine algae and flowering plants, is found throughout the Study Area. Marine vegetation species designated as Essential Fish Habitat under the Magnuson-Stevens Fishery Conservation and Management Act are described in the Essential Fish Habitat Assessment (U.S. Department of the Navy 2012), and conclusions from the Essential Fish Habitat Assessment are summarized in each substressor section. No ESA-listed species are found in the Study Area. Marine vegetation species designated as Essential Fish Habitat are discussed in Section 3.9 (Fish).

The distribution and condition of offshore abiotic (non-living) substrates associated with attached macroalgae and the impact of stressors on those substrates are described in Section 3.3 (Marine Habitats). Additional information on the biology, life history, and conservation of marine vegetation can be found on the websites of the following agencies and groups:

- National Marine Fisheries Service (NMFS), Office of Protected Resources (including ESA-listed species distribution maps)
- Conservation International
- Algaebase
- National Resources Conservation Service
- National Museum of Natural History

To cover all marine vegetation types that are representative of the Study Area, the major taxonomic groups are discussed in Section 3.7.2 (Affected Environment). The major taxonomic groups consist of five groups of marine algae and one group of flowering plants (Table 3.7-1).

Table 3.7-1: Major Taxonomic Groups of Marine Vegetation in the Study Area

Marine Vegetation Groups[1]		Vertical Distribution in the Study Area[2]	
Common Name (Taxonomic Group)	**Description**	**Open Ocean**	**Coastal Waters**
Dinoflagellates (phylum Dinophyta)	Most are photosynthetic single-celled algae that have two whip-like appendages (flagella); Some live inside other organisms. Some produce toxins that can result in red tides or ciguatera poisoning.	Sea surface	Sea surface
Blue-green algae (phylum Cyanobacteria)	Many form mats that attach to reefs and produce nutrients for other marine species through nitrogen fixation.	Sea surface	Seafloor
Green algae (phylum Chlorophyta)	Marine species occur as unicellular algae, filaments, and large seaweeds.	None	Sea surface, seafloor
Diatoms, brown and golden-brown algae (phylum Heterokontophyta)	Single-celled algae that form the base of the marine food web; brown and golden-brown algae are large multi-celled seaweeds that form extensive canopies, providing habitat and food for many marine species.	Sea surface	Sea surface, seafloor
Red algae (phylum Rhodophyta)	Single-celled algae and multi-celled large seaweeds; some form calcium deposits.	Sea surface	Seafloor
Seagrass, cordgrass, and mangroves (phylum Spermatophyta)	Flowering plants, which are adapted to salty marine environments in mudflats, marshes, intertidal and subtidal coastal waters, providing habitat and food for many marine species.	None	Seafloor

[1] Species groups are based on the Catalogue of Life (Bisby et al. 2010).
[2] Presence in the Study Area includes open ocean areas (North Pacific Subtropical Gyre and North Pacific Transition Zone) and coastal waters of two Large Marine Ecosystems (California Current and Insular Pacific-Hawaiian). "None" indicates absence of the taxonomic group within the Study Area portion (see map of the Study Area in Figure 3.0-1).

3.7.2 AFFECTED ENVIRONMENT

Factors that influence the distribution and abundance of vegetation in the large marine ecosystems and open ocean areas of the Study Area are the availability of light and nutrients, water quality, water clarity, salinity level, seafloor type (important for rooted or attached vegetation), currents, tidal schedule, and temperature (Green and Short 2003). Marine ecosystems in the Study Area depend almost entirely on the energy produced by photosynthesis of marine plants and algae, which is the transformation of the sun's energy into chemical energy, as well as oxygen-producing bacteria (Castro and Huber 2000). In surface waters of the open ocean and coastal waters, as well as within the portion of the water column illuminated by sunlight, marine algae and flowering plants provide oxygen, food, and habitat for many organisms (Dawes 1998).

Marine vegetation along the California coast is represented by more than 700 varieties of seaweeds (such as corallines and other red algae, brown algae including kelp, and green algae), seagrasses (Leet et al. 2001; Wyllie-Echeverria and Ackerman 2003), and canopy-forming kelp species (Wilson 2002). Extensive mats of red algae provide habitat in areas of exposed sediment along the California coast (Adams et al. 2004; U.S. Department of the Navy and San Diego Unified Port District 2011). Although historically important, large-scale harvesting of kelp beds no longer occurs along the California coast. Small-scale commercial operations, however, continue to harvest kelp, primarily for abalone feed (Wilson 2002). The canopy coverage of kelp beds varies under changing oceanographic conditions, and is also influenced by the level of harvesting and coastal pollution (Wilson 2002).

Red coralline algae and green calcareous (calcium-containing) algae (*Halimeda* species) secrete calcareous skeletons that bind sediments in coral reefs in Hawaii (Spalding et al. 2003). In the Northwestern Hawaiian Islands, beyond the coral reef habitat, algal meadows dominate the terraces and banks at depths of 98–131 feet (ft.) (30–40 meters [m]). There are approximately 1,740 square miles ($mi.^2$) (4,507 square kilometers [km^2]) of this type of substrate, an estimated 65 percent of which is covered by algal meadows (Parrish and Boland 2004). In Hawaii, there are two species of seagrasses and at least 204 species of red algae, 59 species of brown algae, and 92 species of green algae (Friedlander et al. 2005). Seaweeds are important in native Hawaiian culture, and are used in many foods (Preskitt 2002a). Coastal pollution, invasive species, and an increasing demand for fresh seaweed threaten native species (Friedlander et al. 2005).

Certain species of microscopic algae (dinoflagellates and diatoms, for example) can form algal blooms, which can pose serious threats to human health and wildlife species. Harmful algal blooms can deplete oxygen within the water column and block sunlight that other organisms need to live, and some algae within algal blooms release toxins that are dangerous to human and ecological health (Center for Disease Control and Prevention 2004). These algal blooms have a negative economic impact of hundreds of millions of dollars annually world-wide (National Centers for Coastal Ocean Science 2010).

The marine vegetation in the taxonomic groups of seagrass, cordgrass, and mangroves has more limited distributions; none of them occur in open ocean areas. The relative distribution of seagrass is influenced by the availability of suitable substrate in low-wave-energy areas at depths that allow sufficient light exposure. Cordgrasses form dense colonies in salt marshes that develop in temperate areas in protected, low-energy environments, along the intertidal portions of coastal lagoons, tidal creeks or rivers, or estuaries, wherever the sediment can support plant root development. Mangroves form in similar environments in the tropics and subtropics (Mitsch et al. 2009).

3.7.2.1 General Threats

Environmental stressors on marine vegetation are products of human activities (industrial, residential, and recreational) and natural occurrences. Species-specific information is discussed, where applicable, in Sections 3.7.3.2 (Physical Disturbance and Strike Stressors) and 3.7.3.3 (Secondary Stressors), and the cumulative impacts from these threats are analyzed in Chapter 4 (Cumulative Impacts).

Human-made stressors that act on marine vegetation include excessive nutrient input (pollutants, such as fertilizers), siltation (the addition of fine particles to the ocean), pollution (oil, sewage, trash), climate change, overfishing (Mitsch et al. 2009; Steneck et al. 2002), shading from structures (National Marine Fisheries Service 2002), habitat degradation from construction and dredging (National Marine Fisheries Service 2002), and invasion by exotic species (Hemminga and Duarte 2000; Spalding et al. 2003). The seagrass, cordgrass, and mangrove taxonomic group is more sensitive to stressors than the algal taxonomic groups. The great diversity of algae makes generalization difficult but, overall, algae are resilient and colonize disturbed environments (Levinton 2009b).

Seagrasses, cordgrasses, and mangroves are all susceptible to human-made stressors on marine vegetation, and their presence in the Study Area has decreased because of these stressors. Each of these types of vegetation is sensitive to additional unique stressors. Seagrasses are uprooted by dredging and scarred by boat propellers (Hemminga and Duarte 2000; Spalding et al. 2003). Seagrass that is scarred from boat propellers can take years to recover. Cordgrasses are damaged by sinking salt marsh habitat, a process known as marsh subsidence. Likewise, the global mangrove resource has decreased by 50 percent from aquaculture, changes in hydrology (water movement and distribution), and sea level rise (Feller et al. 2010).

Oil in runoff from land-based sources, natural seeps, and accidental spills (such as offshore drilling and oil tanker leaks) are some of the major sources of oil pollution in the marine environment (Levinton 2009a). The types and amounts of oil spilled, weather conditions, season, location, oceanographic conditions, and the method used to remove the oil (containment or chemical dispersants) are some of the factors that determine the severity of the effects. Sensitivity to oil varies among species and within species, depending on the life stage; generally, early-life stages are more sensitive than adult stages (Hayes et al. 1992).

Oil pollution, as well as chemical dispersants used in response to oil spills, can impact seagrasses directly by smothering the plants, or indirectly by lowering their ability to combat disease and other stressors (U.S. National Response Team 2010). Seagrasses that are totally submerged are less susceptible to oil spills because they largely escape direct contact with the pollutant. Depending on various factors, oil spills such as the Gulf War oil spill in 1991 (Kenworthy et al. 1993) can have no impact on seagrasses, or can have long-term impacts, such as the 4-year decrease in eelgrass density caused by the *Exxon Valdez* oil spill in 1989 (Peterson 2001). Algae are relatively resilient to oil spills, while mangroves are highly sensitive to oil exposure. Contact with oil can cause death, leaf loss, and failure to germinate (Hoff et al. 2002). Salt marshes can also be severely impacted by oil spills, and the effects can be long term (Culbertson et al. 2008).

3.7.2.2 Taxonomic Groups

3.7.2.2.1 Dinoflagellates (Phylum Dinophyta)

Dinoflagellates are single-celled organisms with two flagella (whiplike structures used for locomotion) in the phylum Dinophyta (Bisby et al. 2010). Dinoflagellates are predominantly marine algae, with an estimated 1,200 species living in surface waters of the ocean worldwide (Castro and Huber 2000). Most dinoflagellates can use the sun’s energy to produce food through photosynthesis and also can ingest small food particles. Photosynthetic dinoflagellates are important primary producers in coastal waters (Waggoner and Speer 1998). Organisms such as zooplankton (microscopic animals that drift passively in the water column), feed on dinoflagellates.

Dinoflagellates are also valuable for their close relationship with reef-building corals. Some species of dinoflagellates (zooxanthellae) live inside corals. This mutually beneficial relationship provides shelter and food (in the form of coral waste products) for the dinoflagellates; in turn, the corals receive essential nutrients produced by dinoflagellates (Spalding et al. 2001). Dinoflagellates cause some types of harmful algal blooms which result from sudden increases in nutrients (e.g., fertilizers) from land into the ocean or changes in temperature and sunlight (Levinton 2009c). Additional information on harmful algal blooms can be accessed on the Centers for Disease Control and the National Oceanic and Atmospheric Administration websites.

3.7.2.2.2 Blue-Green Algae (Phylum Cyanobacteria)

Blue-green algae are single-celled, photosynthetic bacteria that inhabit the lighted surface waters and seafloors of the world's oceans (Bisby et al. 2010). Blue-green algae are key primary producers in the marine environment, and provide valuable ecosystem services such as producing oxygen and nitrogen. The blue-green algae *Prochlorococcus* is responsible for a large part of the oxygen produced globally by photosynthetic organisms. Other species of blue-green algae have specialized cells that convert nitrogen gas into a form that can be used by other marine plants and animals (nitrogen fixation) (Hayes et al. 2007; Sze 1998). In nutrient-poor waters of coral reef ecosystems in the Hawaiian archipelago in the Hawaiian portion of the Study Area, blue-green algae are an important source of food. Coral reefs in Hawaii exposed to physical and biological disturbance may be colonized by highly productive or invasive blue-green algae that may persist if animals that feed on them are not present (Cheroske et al. 2000).

3.7.2.2.3 Green Algae (Phylum Chlorophyta)

Green algae are single-celled organisms in the phylum Chlorophyta that may form large colonies of individual cells (Bisby et al. 2010). Green algae are predominately found in freshwater, with only 10 percent of the estimated 7,000 species living in the marine environment (Castro and Huber 2000). These species are important primary producers that play a key role at the base of the marine food web. Green algae are found in areas with a wide range of salinity, such as bays and estuaries, and are eaten by various organisms, including zooplankton and snails. Green seaweeds harvested for human consumption in Hawaii's coastal waters include *Ulva fasciata, Enteromorpha prolifera,* and *Codium edule* (Preskitt 2002a).

Invasive marine green algal species are found in coastal waters of the Study Area. *Caulerpa taxifolia* and *Codium fragile tomentosoide* are found in the Southern California portion of the Study Area (Global Invasive Species Database 2005). The invasive green algae *Avrainvillea amadelpha* has been recorded in the main Hawaiian Islands (Preskitt 2010). Invasive green algae represent a serious threat to coral reefs, and may displace, outcompete, or hybridize with non-invasive native green algae species, resulting in the loss of native biodiversity or alteration of ecosystem processes. Native Hawaiian green algal species that may become invasive include *Cladophora sericea*, *Caulerpa taxifolia*, *Dictyosphaeria cavernosa*, *Ulva fasciata*, and *Enteromorpha flexuasa.* These species are a valuable food source for green sea turtles (Preskitt 2010).

3.7.2.2.4 Brown Algae (Phylum Heterokontophyta)

Brown and golden-brown algae are single-celled (diatoms) and large multi-celled marine species with structures varying from fine filaments to thick leathery forms (Castro and Huber 2000). Most species are attached to the seafloor in coastal waters, although a free-floating type of brown algae (*Sargassum*) occurs in the Study Area.

Invasive marine brown algal species are found in coastal waters of the Southern California portion of the Study Area. *Undaria pinnatifida*, native to Japan, is found along the California coast (Global Invasive Species Database 2005). Two introduced species of *Sargassum* inhabit the Study Area. The brown alga *Sargassum muticum* was introduced from the Sea of Japan, and now occupies portions of the California coast (Monterey Bay Aquarium Research Institute 2009). *Sargassum horneri,* which is native to western Japan and Korea, occurs in Long Beach Harbor and in Southern California waters off San Diego, Orange County, San Clemente Island, and Santa Catalina Island (Miller et al. 2007).

3.7.2.2.4.1 Diatoms

Diatoms are single celled organisms with cell walls made of silicon dioxide. Two major groups of diatoms are generally recognized, centric diatoms and pinnate diatoms. Centric diatoms exhibit radial symmetry (symmetry about a point), while the pinnate diatoms are bilaterally symmetrical (symmetry about a line). Diatoms such as *Coscinodiscus* species (spp.) commonly occur in the Study Area. Some strains of another genus of diatoms, *Pseudo-nitzschia*, produce a toxic compound called domoic acid. Humans, marine mammals, and seabirds become sick or die when they eat organisms that feed on *Pseudo-nitzschia* strains that produce the toxic compound. The Southern California portion of the Study Area off the coasts of Los Angeles and Orange Counties had some of the highest concentrations of the toxic compound ever recorded in U.S. waters (Schnetzer et al. 2007). *Pseudo-nitzschia* blooms in the Southern California Bight during 2003 and 2004 were linked to over 1,400 marine mammal strandings (Schnetzer et al. 2007). Pollutants carried from land to the ocean by rainwater (Kudela and Cochlan 2000) and decreases in the movement of cool, nutrient-rich waters by the wind are believed to be the main causes of these harmful algal blooms in the Southern California portion of the Study Area (Kudela et al. 2004).

3.7.2.2.4.2 Kelp and *Sargassum*

Kelp is the most conspicuous brown algae occurring extensively along the coast in the Southern California portion of the Study Area. The giant kelp (*Macrocystis pyrifera*) can live up to eight years, and can reach lengths of 197 ft. (60 m). The leaf-like fronds can grow up to 24 inches (in.) (61 centimeters [cm]) per day (Leet et al. 2001). Bull kelp (*Nereocystis luetkeana*) can grow up to 5 in. (13 cm) per day. Bull kelp attaches to rocky substrates, and can grow up to 164 ft. (50 m) in length in nearshore areas. In turbid waters, the offshore edge of kelp beds occurs at depths of 50–60 ft. (15–18 m), which can extend to a depth of 100 ft. (30 m) in the clear waters around the Channel Islands off the coast of Southern California (Wilson 2002). The kelp beds along the California coast and in waters off the Channel Islands are the most extensive and elaborate submarine forests in the world (Rodriguez et al. 2001).

Six species of canopy-forming kelp occur in the coastal waters of the California coast: the giant kelp (*Macrocystis pyrifera*), bull kelp (*Nereocystis luetkeana*), elk horn kelp (*Pelagophycus porra*), feather boa kelp (*Egregia menziesii*), chain bladder kelp (*Stephanocystis osmundacea*), and winged kelp (*Alaria marginata*) (Dayton 1985). The dominant kelp in the Southern California portion of the Study Area is giant kelp (see Figure 3.3-2 for a map of kelp bed locations near San Diego Bay). Since the first statewide survey in 1967, the total area of kelp canopies has generally declined; the greatest decline occurred along the mainland coast of Southern California (Wilson 2002).

Kelp is managed by the California Department of Fish and Game, which issues exclusive leases to harvest designated beds for up to 20 years. Although they are not limited in the amount, harvesters cannot take kelp from deeper than 4 ft. (1.2 m) below the water's surface to protect the reproductive structures at the kelp's base (Wilson 2002). Edible brown seaweeds that are collected in Hawaii's coastal waters include *Sargassum echinocarpu*m and *Dictyopteris plagiograma* (Preskitt 2002a). Collection is regulated by the State of Hawaii Department of Land and Natural Resources.

3.7.2.2.5 Red Algae (Phylum Rhodophyta)

Red algae are predominately marine, with approximately 4,000 species worldwide (Castro and Huber 2000). Red algal species exist in a range of forms, including single and multicellular forms (Bisby et al. 2010), from fine filaments to thick calcium carbonate crusts. Within the Study Area, they occur in coastal waters, primarily in reef environments and intertidal zones of Hawaii and California. Abbott (1999) identified 343 species of red algae in Hawaiian waters. Representative native species in Hawaii include *Laurencia* spp., *Gracilaria coronopifolia*, *Hypnea cervicornis*, and *Gracilaria parvispora*. Representative non-native invasive species include *Acanthophora spicifera*, *Gracilaria salicornia*, *Hypnea musciformis*, *Kappaphycus alvarezii*, and *Gracilaria tikvahiaea*. Many Rhodophyta species support coral reefs by hardening the reef and by cementing coral fragments (Veron 2000), and are food for various sea urchins, fishes, and chitons. In California waters, common species include *Endocladia muricata*, *Mastocarpus papillatus*, and *Mazaella* spp.

3.7.2.2.6 Seagrasses, Cordgrasses, and Mangroves (Phylum Spermatophyta)

Seagrasses, cordgrasses, and mangroves are flowering marine plants in the phylum Spermatophyta (Bisby et al. 2010). These marine flowering plants create important habitat, and are a food source for many marine species.

3.7.2.2.6.1 Seagrasses

Seagrasses are unique among flowering plants because they grow submerged in shallow marine environments. Except for some species that inhabit the rocky intertidal zone, seagrasses grow in shallow, subtidal, or intertidal sediments, and can extend over a large area to form seagrass beds (Garrison 2004; Phillips and Meñez 1988). Seagrass beds provide important ecosystem services as a structure-forming keystone species (Harborne et al. 2006). They provide suitable nursery habitat for commercially important organisms (e.g., crustaceans, fish, and shellfish) and also is a food source for numerous species (e.g., turtles) (Heck et al. 2003; National Oceanic and Atmospheric Administration 2001). Seagrass beds combat coastal erosion, promote nutrient cycling through the breakdown of detritus (Dawes 1998), and improve water quality. Seagrasses also contribute a high level of primary production to the marine environment, which supports high species diversity and biomass (Spalding et al. 2003).

Seagrasses that occur in the coastal areas of the Southern California portion of the Study Area in the California Current Large Marine Ecosystem include eelgrass (*Zostera marina* and *Zostera asiatica*), surfgrass (*Phyllospadix scouleri* and *Phyllospadix torreyi*), widgeon grass (*Ruppia maritima*), and shoal grass (*Halodule wrightii*) (Spalding et al. 2003). The distribution of underwater vegetation is patchy along the California coast. In the Southern California portion of the Study Area, eelgrass and surfgrass are the dominant native seagrasses (see Figure 3.3-2 for a map of eelgrass beds within San Diego Bay) (Wyllie-Echeverria and Ackerman 2003).

In Hawaii, the most common seagrasses are Hawaiian seagrass (*Halophila hawaiiana*) and paddle grass (*Halophila decipiens*). Hawaiian seagrass is a native species found at 1.6–3.1 ft. (0.5–0.9 m) in subtidal, sandy areas surrounding reefs, in bays, or in fishponds. It occurs in coastal waters of Oahu near Mamala Bay (southern coast), in Maunalua Bay (southeastern coast), in Kaneohe Bay (northeast coast), in coastal waters of Maui, in the inner reef flats of southern Molokai, at Anini Beach on the northern shore of Kauai, and at Midway Atoll in the Northwestern Hawaiian Islands (Phillips and Meñez 1988). Paddle grass is possibly a nonnative species that occurs only on Oahu in waters to 115 ft. (35 m) deep; it is apparently restricted to the southern shore of Oahu (see Figure 3.3-3 for a map of seagrass locations off Oahu) (Maragos 2000; Preskitt 2001, 2002b).

3.7.2.2.6.2 Cordgrasses

Cordgrasses are temperate salt-tolerant land plants that inhabit salt marshes, mudflats, and other soft-bottom coastal habitats (Castro and Huber 2000). Salt marshes develop in intertidal, protected low-energy environments, usually in coastal lagoons, tidal creeks, rivers, or estuaries (Mitsch et al. 2009). The structure and composition of salt marshes provide important ecosystem services. Salt marshes support commercial fisheries by providing habitat for wildlife, protecting the coastline from erosion, filtering fresh water discharges into the open ocean, taking up nutrients, and breaking down or binding pollutants before they reach the ocean (Dreyer and Niering 1995; Mitsch et al. 2009). Salt marshes also are carbon sinks (carbon reservoirs) and facilitate nutrient cycling (Bouillon 2009; Chmura 2009). Carbon sinks are important in reducing the impact of climate change (Laffoley and Grimsditch 2009), and nutrient cycling facilitates the transformation of important nutrients through the environment. In salt marshes and mudflats along the California coast, native cordgrass species include California cordgrass (*Spartina foliosa*). Atlantic cordgrass (*Spartina alterniflora*) is a native cordgrass species from the Atlantic and Gulf coasts, and is considered an invasive species in California because it produces seeds at higher rates than the native cordgrass, and can quickly colonize mudflats (Howard 2008).

3.7.2.2.6.3 Mangroves

Mangroves are a group of woody plants that have adapted to salt water flooded environments with tidal and salinity fluctuations in the tropics and subtropics (Ruwa 1996). All mangrove trees have root systems (prop roots or pneumatophores-structures) that stick up in the air for oxygen intake in oxygen poor soils and secrete salts from the leaves after to process fresh water from the saline environment. Mangroves can trap sediments and pollution from terrestrial environments and can shield and stabilize coastlines from wave action. The red mangrove, *Rhizophora mangle*, and several other species of mangroves were introduced to Hawaii (Allen 1998). Since the introduction of this species, mangroves have invaded intertidal areas formerly devoid of trees. The red mangrove is now well-established in the main Hawaiian Islands. The red mangrove is considered to be an invasive species in the main Hawaiian Islands, and various resource agencies and organizations (e.g., Hawaii Department of Land and Natural Resources, Pacific Cooperative Studies Unit, Malama O Puna) have eradication programs targeting the red mangrove and other mangrove infestations. Red mangrove infestations can damage cultural sites (e.g., fish pond structures) and create an anoxic pond of slowly decomposing litter. These depleted oxygen environments can kill fish and aquatic biota (much of it endemic and rare). No mangroves are found within California coastal environments.

3.7.3 Environmental Consequences

This section evaluates how and to what degree the activities described in Chapter 2 (Description of Proposed Action and Alternatives) potentially impact marine vegetation. General characteristics of all Navy stressors were introduced in Section 3.0.5.3 (Identification of Stressors for Analysis), and living resources' general susceptibilities to stressors were introduced in Section 3.0.5.7 (Biological Resource Methods). Each marine vegetation stressor is introduced, analyzed by alternative, and analyzed for training activities and testing activities. Table F-3 in Appendix F shows the warfare areas and associated stressors that were considered for analysis of marine vegetation.

The stressors vary in intensity, frequency, duration, and location within the Study Area. Based on the general threats to marine vegetation discussed in Section 3.7.2 (Affected Environment) the stressors applicable to marine vegetation are:

- Acoustic (underwater explosives)
- Physical disturbance and strikes (vessels and in-water devices, military expended materials, seafloor devices)
- Secondary (sediments and water quality)

Because marine vegetation is not susceptible to energy, entanglement, or ingestion stressors, those stressors will not be assessed. Only the Navy training and testing activity stressors and their components that occur in the same geographic location as marine vegetation are analyzed in this section. Details of all training and testing activities, stressors, components that cause the stressor, and geographic occurrence within the Study Area, are summarized in Section 3.0.5.3 (Identification of Stressors for Analysis) and detailed in Appendix A (Navy Activities Descriptions).

3.7.3.1 Acoustic Stressors

This section analyzes the potential impacts from acoustic stressors that may occur during Navy training and testing activities on marine vegetation within the Study Area. The acoustic stressors that may impact marine vegetation include explosives that are detonated on or near the surface of the water, or underwater; therefore, only these types of explosions are discussed in this section.

3.7.3.1.1 Impacts from Explosives

Various types of explosives are used during training and testing activities. The type, number, and location of activities that use explosives under each alternative are discussed in Section 3.0.5.3.1.2 (Explosions). Explosive sources are the only acoustic stressor applicable to this resource because explosives could physically damage marine vegetation.

The potential for an explosion to injure or destroy marine vegetation would depend on the amount of vegetation present, the number of munitions used, and their net explosive weight. In areas where marine vegetation and locations for explosions overlap, vegetation on the surface of the water, in the water column, or rooted in the seafloor may be impacted. Seafloor macroalgae and single-celled algae may overlap with underwater and sea surface explosion locations. If these vegetation types are near an explosion, only a small number of them are likely to be impacted relative to their total population level. The low number of explosions relative to the amount of seafloor macroalgae and single-celled algae in the Study Area also decreases the potential for impacts on these vegetation types. Based on these factors, the impact on these types of marine vegetation would not be detectable and they will not be discussed further. In addition, seafloor macroalgae are resilient to high levels of wave action (Mach et al. 2007), which may aid in their ability to withstand underwater explosions that occur near them. Underwater explosions also may temporarily increase the turbidity (sediment suspended in the water) of nearby waters, incrementally reducing the amount of light available to marine vegetation. Reducing light availability will decrease, albeit temporarily, the photosynthetic ability of marine vegetation.

The potential for seagrass to overlap with underwater and surface explosions is limited to bayside areas of Silver Strand Training Complex (SSTC), as well as to protected areas along oceanside portions of SSTC. For instance, eelgrass is known to occur off Breakers Beach, but no explosives training occurs in known locations. Eelgrass primarily occurs in bayside areas, and may overlap with explosives training areas. Seagrasses could be uprooted or damaged by sea surface or underwater explosions. They are much less resilient to disturbance than *Sargassum* and other marine algae; regrowth after uprooting can take up to 10 years (Dawes et al. 1997). Explosions may also temporarily increase the turbidity (sediment suspended in the water) of nearby waters, but the sediment would settle to pre-explosion conditions within a number of days. Sustained high levels of turbidity may reduce the amount of light that reaches vegetation. This scenario is not likely because of the low number of explosions planned in areas with seagrass.

3.7.3.1.1.1 No Action Alternative

Training Activities

Under the No Action Alternative, training activities that use explosives do not generally occur near shorelines, bays, rivers, or estuaries. In addition, the majority of underwater explosions in the Study Area would likely occur over unvegetated seafloor because it is the predominant bottom-type in the areas proposed for these activities. However, areas of marine algae may overlap with underwater explosions. In the Southern California Range Complex (SOCAL), nearshore explosions occur within SSTC Boat Lanes and training areas surrounding San Clemente Island. An area off Breakers Beach supports eelgrass, however, no explosives training occurs in this area. Eelgrass and other seagrasses are found in portions of SSTC bayside areas where Navy training involves simulated explosives, but no actual detonations. Within the coastal waters of Hawaii, explosives training occurs at Puuloa Underwater Range, Barbers Point Underwater Range, Lima Landing area, and Ewa Training Minefield. These areas, all located on the underwater portion of the Ewa Plain, are characterized by benthic algae beds (primarily green algae) and uncolonized pavement (U.S. Department of the Navy 1998). MK-8 marine mammal training occurs within Hawaiian coastal waters; however, the training in Hawaii does not involve explosives.

Underwater and surface explosions conducted for training activities are not expected to cause any risk to kelp beds, other marine algae, or seagrass because: (1) the relative coverage of marine algae is low, (2) new growth may result from marine algae exposure to explosives, (3) the impact area of underwater explosions is very small relative to kelp beds and other marine algae distribution (see Section 3.3.3.1, Acoustic Stressors [Explosives] in Section 3.3, Marine Habitats), and (4) seagrass does not overlap with areas where the stressor occurs. Based on these factors, potential impacts on multi-cellular marine algae from underwater and surface explosions are not expected to result in detectable changes to its growth, survival, or propagation, and are not expected to result in population-level impacts; and there are no potential impacts on seagrass species.

Testing Activities

Under the No Action Alternative, testing activities that involve explosions are limited to open ocean portions of the Study Area, primarily within SOCAL. Therefore, seagrasses would not be impacted by explosions because the depth of water where testing activities occur is too deep to support benthic vegetation. Only marine algae floating at the surface or suspended near the surface would be impacted by explosions. As stated previously, this type of algae is capable of recovering quickly from wave action, and will likely demonstrate rapid recovery rates after explosions.

Underwater and surface explosions conducted for testing activities are not expected to pose a risk to marine algae or seagrass because: (1) the relative coverage of marine multi-cellular algae is low, (2) new growth may result from marine algae exposure to explosives, (3) the impact area of underwater explosions is very small relative to kelp beds and other marine algae distribution, and (4) seagrass does not overlap with areas where the stressor occurs. Based on these factors, potential impacts on marine algae from underwater and surface explosions are not expected to result in detectable changes to its growth, survival, or propagation, and are not expected to result in population-level impacts; and there are no potential impacts on seagrass species.

3.7.3.1.1.2 Alternative 1

Training Activities

Under Alternative 1, the total number of explosive training events would increase by approximately 12 percent relative to the No Action Alternative. Most of these increases would occur within SOCAL open ocean training areas. The number of explosions within SSTC Boat Lanes would increase slightly, from 408 under the No Action Alternative to 414 under Alternative 1. This increase would only occur as part of Mine Neutralization – Explosive Ordinance Disposal training activities. All other activities within SSTC involving explosions would not increase relative to the No Action Alternative. As stated previously, the SSTC Boat Lanes explosive activity areas do not overlap with eelgrass or other seagrass habitats.

The potential impacts on marine algae from exposure to underwater and surface explosions are as described in Section 3.7.3.1.2.1 (No Action Alternative). The impact of underwater explosions from mine neutralization activities on bottom habitats provides some perspective on the potential impact area. The impact footprint of underwater explosions on bottom habitats is 0.04 square nautical miles (nm^2); see Table 3.3-3, Section 3.3.3.1.1.1 (Training Activities). This impact footprint is small relative to the distribution of marine algae, such as kelp, in the Study Area (see Figure 3.3-2).

In comparison to the No Action Alternative, the increase in activities presented in Alternative 1 may increase the risk to marine algae from exposure to underwater and surface explosions. The majority of the difference is because of the increase in medium-caliber projectiles, which are the smallest type of explosive described in Chapter 2 (Description of Proposed Action and Alternatives). Despite the increase in underwater and surface explosions, the potential impacts on exposed marine algae are expected to be the same as under the No Action Alternative because the overlap with the resource is limited. Underwater and surface explosions conducted for training activities are not expected to pose a risk to seagrass because: (1) the impact area of underwater explosions is very small relative to seagrass distribution, (2) the low number of charges reduces the potential for impacts, and (3) disturbance would be temporary. For the same reasons as stated in Section 3.7.3.1.1.1 (No Action Alternative) for marine algae and here for seagrass, the use of surface and underwater explosions is not expected to result in detectable changes to their growth, survival, or propagation, and are not expected to result in population-level impacts.

Testing Activities

Under Alternative 1, underwater and surface explosions in the Study Area would increase by approximately 200 percent compared to the No Action Alternative (see Table 3.0-9). As under the No Action Alternative, testing activities would continue to occur in open ocean portions of SOCAL and Hawaii Range Complex (HRC). No explosives are used during testing activities within SSTC training areas, therefore, seagrasses in and around San Diego Bay would not be impacted by acoustic stressors from testing activities.

The general conditions described for testing activities, the overlap with multi-cellular marine algae, lack of overlap with seagrass, and the potential impacts on marine algae from exposure to underwater and surface explosions are as described in Section 3.7.3.1.2 (No Action Alternative). The impact footprint of underwater explosions on bottom habitats is 0.06 nm^2; see Table 3.3-4, Section 3.3.3.1.2.1 (Training Activities). This impact footprint is small relative to the distribution of marine algae in the Study Area.

In comparison to the No Action Alternative, the increase in activities presented in Alternative 1 may increase the risk to marine algae from exposure to underwater and surface explosions. The majority of the difference is due to the increase in medium-caliber projectiles, which are the smallest type of explosive described in Table 3.0-9 (Explosives for Training and Testing Activities in the Hawaii-Southern California Training and Testing Study Area). Despite the increase in underwater and surface explosions, the potential impacts on exposed marine algae are expected to be the same as under the No Action Alternative because the overlap with the resource is limited. For the same reasons as stated in Section 3.7.3.1.2 (No Action Alternative), the use of surface and underwater explosions is not expected to result in detectable changes in marine algae growth, survival, or propagation, and are not expected to result in population-level impacts.

3.7.3.1.1.3 Alternative 2

Training Activities

Under Alternative 2, the same number of training activities and underwater detonations would occur as under Alternative 1. Therefore, underwater detonations under Alternative 2 would have the same impacts on marine vegetation as under Alternative 1.

In comparison to the No Action Alternative, the increase in activities presented in Alternative 2 may increase the risk of marine algae from exposure to underwater and surface explosions. It should be noted that the majority of the difference is because of the increase in medium-caliber projectiles, which are the smallest type of explosive described in Chapter 2 (Description of Proposed Action and Alternatives). Despite the increase in underwater and surface explosions, the potential impacts on exposed marine algae are expected to be the same as under the No Action Alternative because the overlap with the resource is limited. Underwater and surface explosions conducted for training activities are not expected to pose a risk to seagrass because: (1) the impact area of underwater explosions is very small relative to seagrass distribution, (2) the low number of charges reduces the potential for impacts, and (3) disturbance would be temporary.

Testing Activities

Under Alternative 2, underwater and surface explosion use in the Study Area would increase by 11-fold compared to the No Action Alternative; see Table 3.0-9 (Explosives for Training and Testing Activities in the Hawaii-Southern California Training and Testing Study Area). As under the No Action Alternative, testing activities would continue to occur in open ocean portions of SOCAL and HRC. No explosives are used during testing activities within SSTC training areas, therefore, seagrasses in and around San Diego Bay would not be impacted.

The general conditions described for testing activities, the overlap with *Sargassum*, lack of overlap with seagrass, and the potential impacts on marine algae from exposure to underwater and surface explosions are as described in Section 3.7.3.1.1.1 (No Action Alternative). The impact footprint of underwater explosions on bottom habitats is 0.04 nm^2; see Table 3.3-6, Section 3.3.3.1.1 (Underwater Explosions). This impact footprint is small relative to the distribution of marine algae in the Study Area.

In comparison to the No Action Alternative, the 11-fold increase in activities in Alternative 2 may increase the risk to marine algae from exposure to underwater and surface explosions. The majority of the difference is because of the increase in medium-caliber projectiles, which are the smallest type of explosive described in Table 3.0-9 (Explosives for Training and Testing Activities in the Hawaii-Southern California Training and Testing Study Area). Despite the increase in underwater and surface explosions, the potential impacts to exposed marine algae are expected to be the same as under the No Action

Alternative because the overlap with the resource is limited. For the same reasons as stated in Section 3.7.3.1.1.1 (No Action Alternative), surface and underwater explosions are not expected to result in detectable changes in marine algae growth, survival, or propagation, and are not expected to result in population-level impacts.

3.7.3.1.1.4 Substressor Impact on Marine Vegetation as Essential Fish Habitat (Preferred Alternative)

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of explosives during training and testing activities may have an adverse effect on Essential Fish Habitat by reducing the quality and quantity of marine vegetation that constitutes Essential Fish Habitat or Habitat Areas of Particular Concern. The HSTT Essential Fish Habitat Assessment report states that the impact on attached macroalgae is determined to be minimal and temporary to short-term throughout the Study Area (U.S. Department of the Navy 2012). The impact on floating macroalgae is determined to be minimal and short-term throughout the Study Area (U.S. Department of the Navy 2012). Given the available information, the impact on submerged rooted vegetation beds is determined to be minimal and long-term (U.S. Department of the Navy 2012).

3.7.3.2 Physical Disturbance and Strike Stressors

This section analyzes the potential impacts on marine vegetation of the various types of physical disturbance and strike stressors during training and testing activities within the Study Area. Three types of physical stressors are evaluated for their impacts on marine vegetation, including: (1) vessels, in-water devices, and towed in-water devices; (2) military expended materials; and (3) seafloor devices.

The evaluation of the impacts from physical strike and disturbance stressors on marine vegetation focuses on proposed activities that may cause vegetation to be damaged by an object that is moving through the water (e.g., vessels and in-water devices), dropped into the water (e.g., military expended materials), or deployed on the seafloor (e.g., mine shapes and anchors). Not all activities are proposed throughout the Study Area. Wherever appropriate, specific geographic areas of potential impact are identified.

Single-celled algae may overlap with physical disturbance or strike stressors, but the impact would be minimal relative to their total population level; therefore, they will not be discussed further. Seagrasses and macroalgae on the seafloor are the only types of marine vegetation that occur in locations where physical disturbance or strike stressors may be encountered. Therefore, only seagrasses, and macroalgae, are analyzed further for potential impacts from physical disturbance or strike stressors. Since the occurrence of marine algae is an indicator of marine mammal and sea turtle presence, some mitigation measures designed to reduce impacts on these resources may indirectly reduce impacts on marine algae; see Section 5.3.2.2 (Physical Strike and Disturbance).

3.7.3.2.1 Impacts from Vessels and In-Water Devices

Several different types of vessels (ships, submarines, boats, amphibious vehicles) and in-water devices (towed devices, unmanned underwater vehicles) are used during training and testing activities throughout the Study Area, as described in Chapter 2 (Description of Proposed Action and Alternatives). Vessel movements occur intermittently, are variable in duration, ranging from a few hours to a few weeks, and are dispersed throughout the Study Area. Events involving large vessels are widely spread over offshore areas, while smaller vessels are more active in nearshore areas.

The potential impacts from Navy vessels and in-water devices used during training and testing activities on marine vegetation are based on the vertical distribution of the vegetation. Surface vessels include ships, boats, and amphibious vehicles; and seafloor vessels include unmanned underwater vehicles and autonomous underwater vehicles. Vessels may impact vegetation by striking or disturbing vegetation on the sea surface or seafloor (Spalding et al. 2003). In the open ocean, marine algae on the sea surface such as kelp paddies have a patchy distribution. Marine algae could be temporarily disturbed if struck by moving vessels or by the propeller action of transiting vessels. Fragmentation would be on a small spatial scale, and algal mats would be expected to re-form. These strikes could also injure the organisms that inhabit kelp paddies or other marine algal mat, such as sea turtles, seabirds, marine invertebrates, and fish (see Sections 3.5, 3.6, 3.8, and 3.9, respectively). In open-ocean areas, marine algae on the sea surface may be disturbed by vessels and in-water devices. Marine algae could be temporarily disturbed if struck by transiting vessels or by their propellers. It is resilient to winds, waves, and severe weather that could sink the mat or break it into pieces. If an algal mat is struck, broken pieces may grow into new algal mats because marine algae reproduces by vegetative fragmentation (i.e., new plants develop from pieces of the parent plant) (South Atlantic Fishery Management Council 1998). Impacts on marine algae by strikes may collapse the pneumatocysts (air sacs) that keep the mats afloat. Evidence suggests that some floating marine algae will continue to float even when up to 80 percent of the pneumatocysts are removed (Zaitsev 1971).

Vegetation on the seafloor such as seagrasses and macroalgae may be disturbed by amphibious combat vehicles. Seagrasses are resilient to the lower levels of wave action that occur in sheltered estuarine shorelines, but are susceptible to vessel propeller scarring (Sargent et al. 1995). Seagrasses could take up to 10 years to fully regrow and recover from propeller scars (Dawes et al. 1997). Seafloor macroalgae may be present in locations where these vessels and in-water devices occur, but the impacts would be minimal because of their resilience, distribution, and biomass. A literature search of at-risk marine macroalgae species in the Study Area (International Union for Conservation of Nature and Natural Resources 2011) did not indicate that this type of vegetation is more resilient to stressors than other marine vegetation. Because seafloor macroalgae in coastal areas are adapted to natural disturbances, such as storms and wave action that can exceed 33 ft. (10 m) per second (Mach et al. 2007), macroalgae will quickly recover from vessel and in-water device movements. Macroalgae that is floating in the area may be disturbed by amphibious combat vehicle activities, but the impact would not be detectable because of the low number of activities (see Table 2.8-1) and will not be considered further.

Towed in-water devices include towed targets that are used during activities such as missile exercises and gun exercises. These devices are operated at low speeds either on the sea surface or below it. The analysis of in-water devices will focus on towed surface targets because of the potential for impacts on marine algae. Unmanned underwater vehicles and autonomous underwater vehicles are used in training and testing activities in the Study Area. They are typically propeller-driven, and operate within the water column or crawl along the seafloor. The propellers of these devices are encased, eliminating the potential for seagrass propeller scarring. Algae on the seafloor could be disturbed by these devices although, for the same reasons given for vessel disturbance, unmanned underwater vehicles are not expected to compromise the health or condition of algae.

3.7.3.2.1.1 No Action Alternative, Alternative 1, and Alternative 2

Training Activities

Estimates of relative vessel use and location for each alternative are provided in Section 3.0.5.3.3.1 (Vessels). These estimates are based on the number of activities predicted for each alternative. While these estimates provide a prediction of use, actual Navy vessel use depends upon military training requirements, deployment schedules, annual budgets, and other unpredictable factors. Testing and training concentrations are most dependent upon locations of Navy shore installations and established testing and training areas. Under Alternatives 1 and 2, the Study Area would be expanded, but the concentration of use and the manner in which the Navy tests and trains would remain consistent with the range of variability observed over the last decade. Consequently, the Navy is not changing the rate of vessel use and, therefore, the level of expected strikes would not change either. The difference in events from the No Action Alternative to Alternative 1 and Alternative 2, shown in Table 3.0-30, is not likely to change the probability of a vessel strike in any meaningful way.

Under all alternatives, a variety of vessels, in-water devices, and towed in-water devices would be used throughout the Study Area during training activities, as described in Chapter 2 (Description of Proposed Action and Alternatives). Most activities would involve one vessel, but activities may occasionally use two vessels. Most vessel traffic would occur in SSTC, in and near Pearl Harbor, off portions of Marine Corps Base Camp Pendleton, and on portions of San Clemente Island. Within SSTC, shallow-water vessel movements in defined boat lanes would continue to occur with minimal impacts on marine vegetation because these boat lanes overlie cobble and bare substrates.

Unlike most vessels used in offshore training activities that occur in deep water, amphibious vehicles are designed to move personnel and equipment from ship to shore in shallow water. In San Diego Bay, eelgrass beds are avoided to the maximum practicable extent. Because of the dredging history of San Diego Bay near the Navy ship berths, impacts from vessel movements on marine vegetation are expected to be minimal (U.S. Department of the Navy and San Diego Unified Port District 2011). Because of the quantity of vessel traffic in Hawaiian nearshore waters since the 1940s (especially in waters off Oahu and within Pearl Harbor), the existing vegetation community profile is well-adapted to vessel disturbances. Amphibious vehicles are an exception to this general conclusion because they are designed to come into contact with the seafloor in the surf zone (area of wave action). However, attached macroalgae and seagrass do not overlap with amphibious combat vehicle activities (see Figure 3.3-3). Amphibious vehicles operate within Kaneohe Bay. Macroalgae floating in the area may be disturbed by amphibious combat vehicle activities but the impact would not be detectable given the low number of activities (see Table 2.8-1) and will not be considered further.

On the open ocean, vessel strikes of marine vegetation would be limited to floating marine algae. Vessel movements may disperse or injure algal mats. Because algal distribution is patchy, mats may re-form, and events would be on a small spatial scale, Navy training activities involving vessel movement would not impact the general health of marine algae. Navy mitigation measures would ensure that vessels avoid large algal mats, eelgrass beds, or other sensitive vegetation that other marine life depend on for food or habitat; these measures would safeguard this vegetation type from vessel strikes. In addition, Navy mitigation measures would require helicopter crews that tow in-water devices for mine warfare exercises to monitor the water surface before and during exercises to identify and avoid marine algae.

Under all Alternatives, the impacts from vessel, in-water device, and towed in-water device physical disturbances and strikes during training activities would be minimal disturbances of algal mats and seaweeds. Eelgrass bed damage is not likely but, if it occurs, the impacts would be minor, such as short-term turbidity increases.

The net impact of vessel, in-water device, and towed in-water device physical disturbances and strikes on marine vegetation is expected to be negligible under all alternatives, based on: (1) Navy mitigation measures; (2) the quick recovery of most vegetation types; (3) the short-term nature of most vessel movements and local disturbances of the surface water, with some temporary increase in suspended sediment in shallow areas; and (4) the deployment of in-water devices at depths where they would not likely come in contact with marine vegetation.

Testing Activities

Under all alternatives, the Navy would test a variety of vessels, vehicles, and in-water devices. Most of the testing activities involving vessel movements and in-water devices occur at sea within the SOCAL Range Complex and HRC, or within the transit corridor between the two range complexes. Some of the testing occurs pierside in San Diego Bay or Pearl Harbor.

On the sea surface, vessel and towed surface target strikes of marine vegetation would be limited to floating marine algal mats. Vessel movements may disperse or injure algal mats. However, algal mats may re-form, and testing events would be on a small spatial scale. Therefore, Navy testing activities involving vessel movement and towed surface targets are not expected to impact the general health of marine algae. No testing activities would occur near seagrasses, such as eelgrass beds in San Diego Bay.

The net impact of vessel, in-water device, and towed in-water device physical disturbances and strikes on marine vegetation during testing activities is expected to be negligible under all alternatives, based on: (1) Navy mitigation measures; (2) the quick recovery of most vegetation types; (3) the short-term nature of most vessel movements and local disturbances of the surface water, with some temporary increase in suspended sediment in shallow areas; and (4) the deployment of in-water devices at depths where they would not likely come in contact with marine vegetation.

3.7.3.2.1.2 Substressor Impact on Marine Vegetation as Essential Fish Habitat (Preferred Alternative)

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of vessels and in-water devices during training and testing activities would have no impact on attached macroalgae or submerged rooted vegetation that constitutes Essential Fish Habitat or Habitat Areas of Particular Concern. The use of vessels and in-water devices during training and testing activities may have an adverse effect by reducing the quality and quantity of floating macroalgae that constitutes Essential Fish Habitat or Habitat Areas of Particular Concern. The HSTT Essential Fish Habitat Assessment report states that any impacts on marine vegetation incurred by vessel movements and in-water devices would be minimal and short-term (U.S. Department of the Navy 2012).

3.7.3.2.2 Impacts from Military Expended Materials

This section analyzes the strike potential to marine vegetation of the following categories of military expended materials: (1) non-explosive practice munitions, (2) fragments of high-explosive munitions, and (3) expended materials other than ordnance, such as sonobuoys and expendable targets. For a discussion of the types of activities that use military expended materials, where they are used, and how many activities would occur under each Alternative, see Section 3.0.5.3.3.3 (Military Expended Material Strikes).

Military expended materials can impact floating marine algae in the open ocean, and seagrass and other types of algae on the seafloor in coastal areas. Most types of military expended materials are deployed in the open ocean. In coastal water training areas, only projectiles (small and medium), target fragments, and countermeasures could be introduced into areas where shallow water vegetation such as seagrass and seafloor macroalgae may be impacted.

The following are descriptions of the types of military expended materials that could impact marine algae and seagrass. Marine algae could overlap with military expended materials anywhere in the Study Area. SSTC is the only location where these materials could overlap with seagrasses. Potential impacts on marine algae and seagrass are as discussed in Section 3.7.3.2.2. Tables 3.0-65 through 3.0-67 present the numbers and locations of activities that expend military materials during training and testing activities by location and alternative.

Small-, Medium-, and Large-Caliber Projectiles. Small-, medium-, and large-caliber non-explosive practice munitions, or fragments of high-explosive projectiles expended during training and testing activities rapidly sink to the seafloor. The majority of these projectiles would be expended in the open ocean areas of SOCAL and HRC. Because of the small sizes of the projectiles and of their casings, damage to marine vegetation is unlikely. Large-caliber projectiles are primarily used in offshore areas at depths greater than 26 m (85.3 ft.), while small- and medium-caliber projectiles would be expended in both offshore and coastal areas at depths less than 26 m (85.3 ft.). Marine algae could occur where these materials are expended, but seagrasses generally do not because these activities do not normally occur in water that is shallow enough for seagrass to grow.

Bombs, Missiles, and Rockets. Bombs, missiles, and rockets, or their fragments (if high-explosive) are expended offshore (at depths greater than 26 m [83.3 ft.]) during training and testing activities, and rapidly sink to the seafloor. Marine algae could occur where these materials are expended, but seagrass generally does not because of water depth limitations for activities that expend these materials.

Parachutes. Parachutes of varying sizes are used during training and testing activities. The types of activities that use parachutes, the physical characteristics of these expended materials, where they are used, and the number of activities that would occur under each alternative are discussed in Section 3.0.5.3.4.2 (Parachutes). Marine algae could occur in any of the locations where these materials are expended.

Targets. Many training and testing activities use targets. Targets that are hit by munitions could break into fragments. Target fragments vary in size and type, but most fragments are expected to sink. Pieces of targets that are designed to float are recovered when possible. Target fragments would be spread out over large areas. Marine algae and seagrass could occur where these materials are expended.

Countermeasures. Defensive countermeasures such as chaff and flares are used to protect against missile and torpedo attack. Chaff is made of aluminum-coated glass fibers and flares are pyrotechnic devices. Chaff, chaff canisters, and flare end caps are expended materials. Chaff and flares are dispensed from aircraft or fired from ships. Floating marine algal mats could occur in any of the locations that these materials are expended.

3.7.3.2.2.1 No Action Alternative

Training Activities

Tables 3.0-65 through 3.0-67 list the numbers and locations of military expended materials, most of which are small- and medium-caliber projectiles. The numbers and footprints of military expended materials are detailed in Table 3.3-5.

In HRC, projectiles would be expended in shallow-water habitats around Kaula Island during air-to-ground gunnery exercises. Small-caliber projectiles would be expended over the course of 18 events per year, expending about 15,000 small- and medium-caliber projectiles per year. While most of these will remain on the small island, a small number could be expected to settle in the shallow water around Kaula Island. Common algae found in rocky intertidal habitats include sea lettuce, coralline red algae, red fleshy algae, brown algae, and fleshy green algae (U.S. Department of the Navy 2005). Common plants that inhabit the sandy beach intertidal habitat include the beach morning glory (*Ipomoea* spp.), beach heliotrope (*Tournefortia argentea*), milo (*Thespesia populnea*), and hau (*Hibiscus tiliaceus*), as well as seagrasses found in shallow waters around Kaula Island (Maragos 2000). The footprint of expended projectiles would be very small, and would have no impact on intertidal vegetation. No other activity would introduce projectiles or casings into shallow water in Hawaii.

Floating marine algal mats and other types of algae that occur on the sea surface in the open ocean may be temporarily disturbed if struck by military expended materials. This type of disturbance would not likely be different from conditions created by waves or rough weather. If enough military expended materials land on algal mats, the mats can sink. The likelihood is low that mats would accumulate enough material to cause sinking from military activities, because military expended materials are dispersed widely through an activity area. The few algal mats that would prematurely sink would not have an impact on populations. Strikes would have little impact and would not likely result in the mortality of marine algae or other algae, although these strikes may injure the organisms that inhabit marine algae, such as sea turtles, birds, marine invertebrates, and fish (see Sections 3.5, 3.6, 3.8, and 3.9, respectively).

Military expended materials used for training activities are not expected to pose a risk to marine algae or seagrass because: (1) the relative coverage of marine algae in the Study Area is low, (2) new growth may result from marine algae exposure to military expended materials, (3) the impact area of military expended materials is very small relative to marine algae distribution, and (4) seagrass overlap with areas where the stressor occurs is very limited (see Figure 3.3-2). Based on these factors, potential impacts on marine algae and seagrass from military expended materials are not expected to result in detectable changes in their growth, survival, or propagation, and are not expected to result in population-level impacts.

Testing Activities

Tables 3.0-65 through 3.0-67 list the numbers and locations of military expended materials, most of which are small- and medium-caliber projectiles. The numbers and footprints of military expended materials are detailed in Tables 3.3-5 through 3.3-7. Under the No Action Alternative, testing activities would expend materials in shallow-water habitats. No testing activities would expend materials in shallow-water habitats of SSTC; however, some testing events would expend medium-caliber rounds in SOCAL testing areas as part of Naval Air Systems Command testing of the Airborne Projectile-based mine clearance system.

Under the No Action Alternative, military expended materials used for testing activities are not expected to pose a risk to marine algae or seagrass because: (1) the relative coverage of marine algae in the Study Area is low, (2) new growth may result from marine algae exposure to military expended materials, (3) the impact area of military expended materials is very small relative to marine algae distribution, and (4) seagrass does not overlap with areas where the stressor occurs. Based on these factors, potential impacts on marine algae from military expended materials are not expected to result in detectable changes in its growth, survival, or propagation, and are not expected to result in population-level impacts; and there are no potential impacts on seagrass.

3.7.3.2.2.2 Alternative 1

Training Activities

Tables 3.0-65 through 3.0-67 list the numbers and locations of military expended materials, most of which are small- and medium-caliber projectiles. The numbers and footprints of military expended materials are detailed in Table 3.3-6. As indicated in Section 3.0.5.3.3.3 (Military Expended Materials Strikes), under Alternative 1, the total amount of military expended materials is more than twice the amount expended in the No Action Alternative. The activities and type of military expended materials under Alternative 1 would be expended in the same geographic locations as the No Action Alternative.

Floating marine algal mats and other types of algae that occur on the sea surface in the open ocean may be temporarily disturbed if struck by military expended materials. This type of disturbance would not likely differ from conditions created by waves or rough weather. If enough military expended materials land on algal mats, the mats can sink. Sinking occurs as a natural part of the aging process of marine algae (Schoener and Rowe 1970). The likelihood is low that mats would accumulate enough material to cause sinking from military activities, as military expended materials are dispersed widely through an activity area. The few algal mats that would prematurely sink would not have an impact on populations. Strikes would have little impact, and would not likely result in the mortality of floating algal mats or other algae, although these strikes may injure the organisms that inhabit marine algal mats, such as sea turtles, birds, marine invertebrates, and fish (see Sections 3.5, 3.6, 3.8, and 3.9, respectively).

In comparison to the No Action Alternative, the increase in activities presented in Alternative 1 may increase the risk to marine algae and seagrass of exposure to military expended materials. Despite the increase in the number of military expended materials, the potential impacts on exposed algal mats and seagrass are expected to be the same as under the No Action Alternative because overlap with the resources are limited. For the same reasons as stated in Section 3.7.3.2.2.1 (No Action Alternative), the use of military expended materials is not expected to result in detectable changes in marine algae or seagrass growth, survival, or propagation, and are not expected to result in population-level impacts.

Testing Activities

Tables 3.0-65 through 3.0-67 list the numbers and locations of military expended materials, most of which are small- and medium-caliber projectiles. The numbers and footprints of military expended materials are detailed in Table 3.3-6. As indicated in Section 3.0.5.3.3.3 (Military Expended Materials Strikes), under Alternative 1, the total amount of military expended materials is nearly four times the amount expended in the No Action Alternative. Testing activities under Alternative 1 would be in the same locations as under the No Action Alternative, and military materials would be expended in the same locations as under the No Action Alternative. Military expended materials would typically be of the same type listed under the No Action Alternative.

Under Alternative 1, increased deposition of military expended materials during testing activities would not increase the risk of physical disturbance or strike to seagrass. Under Alternative 1, increased deposition of military expended materials during testing activities could increase the risk of physical disturbance or strike to marine algae. Any damage from deposition of military expended materials would be followed by a recovery period lasting weeks to months. Marine algae could have a detectable response to physical disturbances or strikes by military expended materials, but would recover completely, with no impact on its growth, survival, reproductive success, or lifetime reproductive success.

3.7.3.2.2.3 Alternative 2

Training Activities

The numbers and locations of training activities under Alternative 2 are identical to those of training activities under Alternative 1. Therefore, impacts on and comparisons to the No Action Alternative also are identical, as described in Section 3.7.3.2.2.1 (No Action Alternative).

Testing Activities

Tables 3.0-65 through 3.0-67 list the numbers and locations of military expended materials, most of which are small- and medium-caliber projectiles. The numbers and footprints of military expended materials are detailed in Table 3.3-7. As indicated in Section 3.0.5.3.3.3 (Military Expended Materials Strikes), under Alternative 2, the total amount of military expended materials is nearly five times the amount expended in the No Action Alternative. This represents a 10 percent increase over Alternative 1. The types of activities and military expended materials occurring under Alternative 2 would be the same as those in the No Action Alternative. Furthermore, the activities would occur in the same geographic locations as the No Action Alternative.

In comparison to the No Action Alternative, the overall increase in activities presented in Alternative 2 may increase the risk of marine algae and seagrass exposure to military expended materials. However, the differences in species overlap and potential impacts of surface explosions on marine algae and seagrass during testing activities would not be discernible from those described in Section 3.7.3.2.2.1 (No Action Alternative). For the same reasons as stated in Section 3.7.3.2.2.1 (No Action Alternative) for marine algae and seagrass, the use of military expended materials is not expected to result in detectable changes to marine algae or seagrass growth, survival, or propagation, and is not expected to result in population-level impacts.

3.7.3.2.2.4 Substressor Impact on Marine Vegetation as Essential Fish Habitat (Preferred Alternative)

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, military expended materials used for training and testing activities may adversely affect Essential Fish Habitat by reducing the quality and quantity of marine vegetation that constitutes Essential Fish Habitat or Habitat Areas of Particular Concern. The HSTT Essential Fish Habitat Assessment states that any impacts of military expended materials on attached macroalgae or submerged rooted vegetation would be minimal and long-term, and any impacts on floating macroalgae would be minimal and short-term (U.S. Department of the Navy 2012).

3.7.3.2.3 Impacts from Seafloor Devices

For a discussion of the types of activities that use seafloor devices, where they are used, and how many activities would occur under each alternative, see Section 3.0.5.3.3.4 (Seafloor Devices). Six training and testing activities require the installation or removal of devices and infrastructure on the seafloor: (1) elevated causeway system and causeway pier insertion and retraction activities; (2) anti-terrorism/force protection underwater surveillance system training; (3) the installation of fixed intelligence, surveillance, and reconnaissance sensor systems; (4) precision anchoring training; (5) offshore petroleum discharge system training; and (6) salvage operations. Marine vegetation on the seafloor may be impacted by seafloor devices, while vegetation on the sea surface such as marine algal mats is not likely to be impacted; therefore, it will not be discussed further. Seagrasses and seafloor macroalgae in the Study Area may be impacted by the use of seafloor devices.

Seafloor device operation, installation, or removal could impact seagrass by physically removing vegetation (e.g., uprooting), crushing, temporarily increasing the turbidity (sediment suspended in the water) of waters nearby, or shading seagrass which may interfere with photosynthesis. If seagrass is not able to photosynthesize, its ability to produce energy is compromised. However, the intersection of seagrasses and seafloor devices is limited, and suspended sediments would settle in a few days. For seafloor devices, in particular, the potential for overlap with seagrass in the Study Area is limited to elevated causeway system and causeway pier insertion and retraction activities and offshore petroleum discharge system training activities. The bayside Bravo training area contains an estimated 1.13 ac. (0.45 ha) of eelgrass habitats; however, the designated Bravo Beach training lane (where the training activity would occur) is a previously disturbed and previously used zone within the Bay (see Figure 3.3-2).

3.7.3.2.3.1 No Action Alternative

Training Activities

Under the No Action Alternative, elevated causeway systems training in Bravo may remove eelgrass within the footprint of the pile. Furthermore, the Navy is participating in mitigation programs for eelgrass restoration if this type of disturbance occurs within eelgrass habitats (U.S. Department of the Navy 2011).

Four anti-terrorism/force protection underwater surveillance training events would occur every year in San Diego Bay. Typical events last five days, and day events may range from 8 to 24 hours per training day. These training activities would involve placing clump anchors around existing piers and ships. These areas are characterized as deep subtidal habitats greater than 20 ft. (6 m) in depth, subject to periodic dredging since the 1940s (U.S. Department of the Navy and San Diego Unified Port District 2011). These areas are too deep to support eelgrass.

Precision anchoring training events would occur 72 times per year within SSTC anchorages. Six offshore petroleum discharge system training events would occur every year. These training events would primarily occur in SSTC boat lanes, but may also occur in the Bravo Beach designated boat lane and waters outside of boat lanes in waters off SSTC.

Marine plant species found within the nearshore waters off San Diego and in waters around San Clemente Island are adapted to natural disturbance, and recover quickly from storms, as well as from wave and surge action. Bayside marine plant species, such as eelgrass, are found in areas where wave action is minimal. Pile driving and installation of seafloor devices may impact vegetation in benthic habitats, but the impacts would be temporary and would be followed by rapid (within a few weeks) recovery, particularly in oceanside boat lanes in nearshore waters off San Diego and in designated training areas adjoining San Clemente Island. However, opportunistic and potentially invasive vegetation could become established in disturbed areas. In bayside areas, recovery of eelgrass from direct disturbance by pile driving would occur over longer timeframes (e.g., over a period of months). Eelgrass beds show signs of recovery after a cessation of physical disturbance; the rate of recovery is a function of the severity of the disturbance (Neckles et al. 2005). The main factors that contribute to eelgrass recovery include improving water quality and cessation of major disturbance activities (e.g., dredging) (Chavez 2009). Pile driving and installation of seafloor devices, in contrast to dredging, have a minor impact limited to the area of the actual pile and footprint of the mooring.

Seafloor device installation in shallow water habitats under the No Action Alternative training activities would pose a negligible risk to marine vegetation. Any damage from seafloor devices would be followed by a recovery period lasting weeks to months. Although marine vegetation growth near seafloor devices installed during training activities under the No Action Alternative would be inhibited during recovery, population-level impacts are unlikely because of the small, local impact areas, the frequency of training activities, and the wider geographic distribution of seagrasses in and adjacent to training areas.

Testing Activities

Testing activities under the No Action Alternative would install seafloor devices within the Study Area. Space and Naval Warfare Systems Command activities that may impact marine vegetation by installing seafloor devices include fixed system underwater communications testing (nine events in San Diego Bay, nine events at Point Loma and in Imperial Beach, and nine events in San Clemente Island Testing areas), fixed autonomous oceanographic research and meteorology and oceanography testing activities (45 events per year at Point Loma and Imperial Beach locations and 45 events in San Clemente Island Testing areas), and fixed intelligence, surveillance, and reconnaissance sensor system testing activities (9 events per year at Point Loma and Imperial Beach locations and 14 events in San Clemente Island Testing areas).

These testing activities would involve the temporary installation of several arrays on the seafloor, buried 2–6 in. (5–15 cm) in sandy seafloor substrates or suspended in the water column with a mooring structure. Typical tests last 5 days, and day events occur over an 8-hour period. Arrays may stay in the water for several months.

Seafloor devices installed in shallow-water habitats under the No Action Alternative testing activities would pose a negligible risk to marine vegetation. Any damage from deposition of military expended materials would be followed by a recovery period lasting weeks to months. Although marine vegetation growth near seafloor devices installed during testing activities under the No Action Alternative would be inhibited during recovery, population level impacts are unlikely because of the small, local impact areas, the frequency of testing activities, and the wider geographic distribution of seagrasses in and adjacent to testing areas.

3.7.3.2.3.2 Alternative 1

Training Activities

Under Alternative 1, no additional elevated causeway system training events or any other new activity that involves pile driving are proposed. Precision anchoring events within SSTC anchorages would remain the same as under the No Action Alternative, at 72 events per year. Offshore petroleum discharge system training would also remain the same as under the No Action Alternative, at six events per year, as would salvage operations training (remaining steady at three events per year). The number of anti-terrorism/force protection underwater surveillance training events would increase by two events per year (for a total of six events per year) in San Diego Bay over the number of training events for this activity under the No Action Alternative.

Seafloor devices installed in shallow-water habitats under Alternative 1 training activities would pose a negligible risk to marine vegetation. Any damage from deposition of military expended materials would be followed by a recovery period lasting weeks to months. Although marine vegetation growth near seafloor devices installed for training activities under Alternative 1 would be inhibited during recovery, the long-term survival, reproductive success, and lifetime reproductive success would not be impacted.

Testing Activities

Alternative 1 testing events would increase relative to the No Action Alternative. Fixed-system, underwater communications testing would increase by one event per year in each testing area used for this activity (San Diego Bay, Point Loma and Imperial Beach, and San Clemente Island testing areas). Fixed autonomous oceanographic research and meteorology and oceanography testing activities would increase by 10 events per year to account for 50 events in Point Loma and Imperial Beach locations and 50 events in San Clemente Island testing areas. Fixed intelligence, surveillance, and reconnaissance sensor system testing activities would increase by one event per year at Point Loma and Imperial Beach locations, and would increase by two per year at San Clemente Island testing areas. These activities also include bottom-crawling unmanned underwater vehicles (UUVs) and placement of mine shapes (non-explosive).

As noted previously, the Navy uses sandy substrates devoid of marine vegetation to the extent possible. Marine plant species found within San Diego Bay and in waters off San Clemente Island are adapted to natural disturbance, and recover quickly from storms, as well as to high-energy wave action and tidal surges in oceanside areas. As noted previously, eelgrass beds would require longer recovery periods in bayside areas.

Seafloor devices installed in shallow-water habitats during Alternative 1 testing activities would pose a negligible risk to marine vegetation. Any damage from deposition of military expended materials would be followed by a recovery period lasting weeks to months. Although marine vegetation growth in the vicinity of seafloor devices installed during testing activities under Alternative 1 would be inhibited during recovery, the long-term survival, reproductive success, and lifetime reproductive success would not be impacted.

3.7.3.2.3.3 Alternative 2

Training Activities

Under Alternative 2, no additional elevated causeway system training events or other new activities that involve pile driving are proposed. Precision anchoring events within SSTC anchorages would remain the same as under the No Action Alternative, at 72 events per year. Offshore petroleum discharge system training would also remain the same as under the No Action Alternative, at six events per year, as would salvage operations training (remaining at three events per year). Anti-terrorism/force protection underwater surveillance training would increase by two events per year (to six events per year) in San Diego Bay over the No Action Alternative.

Seafloor devices installed in shallow-water habitats during Alternative 2 training activities would pose a negligible risk to marine vegetation. Any damage from deposition of military expended materials would be followed by a recovery period lasting weeks to months. Although marine vegetation growth near seafloor devices installed during training activities under Alternative 2 would be inhibited during recovery, the long-term survival, reproductive success, or lifetime reproductive success would not be impacted.

Testing Activities

Alternative 2 testing events would increase relative to the No Action Alternative. Fixed-system underwater communications testing would increase by two events per year in each testing area used for this testing activity (San Diego Bay, Point Loma and Imperial Beach, and San Clemente Island testing areas). Fixed autonomous oceanographic research and meteorology and oceanography testing activities would increase by 20 events per year to account for 55 events in Point Loma and Imperial Beach locations and 55 events in San Clemente Island testing areas. Fixed intelligence, surveillance, and reconnaissance sensor system testing activities would increase by two events per year at Point Loma and Imperial Beach locations and increase by four per year at San Clemente Island testing areas. These activities also include bottom-crawling UUVs and placement of mine shapes (non-explosive).

The Navy uses sandy substrates devoid of marine vegetation to the extent possible. Marine plant species found within San Diego Bay and in waters off San Clemente Island are adapted to natural disturbance, and recover quickly from storms, as well as to high-energy wave action and tidal surges in oceanside areas. As noted previously, eelgrass beds in bayside areas would require longer recovery periods.

Seafloor devices installed in shallow-water habitats during Alternative 2 testing activities would pose a negligible risk to marine vegetation. Any damage from deposition of military expended materials would be followed by a recovery period lasting weeks to months. Although marine vegetation growth in the vicinity of seafloor devices installed during testing activities under Alternative 2 would be inhibited during recovery, the long-term survival, reproductive success, or lifetime reproductive success would not be impacted.

3.7.3.2.3.4 Substressor Impact on Marine Vegetation as Essential Fish Habitat (Preferred Alternative)

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of seafloor devices during training and testing activities would not affect floating macroalgae that constitutes Essential Fish Habitat or Habitat Areas of Particular Concern. The use of seafloor devices during training and testing activities may adversely affect Essential Fish Habitat by reducing the quality or quantity of attached macroalgae and submerged rooted vegetation that constitutes Essential Fish Habitat or Habitat Areas of Particular Concern. The HSTT Essential Fish Habitat Assessment report states that any impacts of seafloor devices on attached macroalgae or submerged rooted vegetation would be minimal and short-term (U.S. Department of the Navy 2012).

3.7.3.3 Secondary Stressors

This section analyzes potential impacts on marine vegetation exposed to stressors indirectly through changes in sediments and water quality. Section 3.1 (Sediments and Water Quality) considered the impacts on marine sediments and water quality from explosives and explosion by-products, metals, chemicals other than explosives, and other materials (marine markers, flares, chaff, targets, and miscellaneous components of other materials). One example of a local impact on water quality could be an increase in cyanobacteria associated with munitions deposits in marine sediments. Cyanobacteria may proliferate when iron is introduced to the marine environment, and this proliferation can negatively affect adjacent habitats by releasing toxins. Introducing iron into the marine environment from munitions or infrastructure is not known to cause toxic red tide events; rather, these harmful events are more associated with natural causes (e.g., upwelling) and the effects of other human activities (e.g., agricultural runoff and other coastal pollution) (Hayes et al. 2007; Whitton and Potts 2008).

The analysis included in Section 3.1 (Sediments and Water Quality) determined that neither state or federal standards or guidelines for sediments nor water quality would be violated by the No Action Alternative, Alternative 1, or Alternative 2. Because of these conditions, population-level impacts on marine vegetation are likely to be inconsequential and not detectable. Therefore, because these standards and guidelines are structured to protect human health and the environment, and the proposed activities do not violate them, no indirect impacts are anticipated on marine vegetation from the training and testing activities proposed by the No Action Alternative, Alternative 1, or Alternative 2.

3.7.4 Summary of Potential Impacts (Combined Impacts from All Stressors) on Marine Vegetation

3.7.4.1 Combined Impacts of All Stressors

Activities described in this EIS/OEIS that have potential impacts on vegetation are widely dispersed, and not all stressors would occur simultaneously in a given location. The stressors that have potential impacts on marine vegetation include acoustic (underwater and surface explosions) and physical disturbances or strikes (vessels and in-water devices, military expended materials, and seafloor devices). Unlike mobile organisms, vegetation cannot flee from stressors once exposed. Marine algae are the most likely to be exposed to multiple stressors in combination because they occur over large expanses. Discrete locations in the Study Area (mainly within offshore areas with depths greater than 26 m (85 ft.) in portions of range complexes and testing ranges) could experience higher levels of activity involving multiple stressors, which could result in a higher potential risk for impacts on marine algae.

The potential for exposure of seagrasses and attached macroalgae to multiple stressors would be less because activities are not concentrated in coastal distributions (areas with depths less than 26 m [85 ft.]) of these species. The combined impacts of all stressors would not be expected to affect marine vegetation populations because: (1) activities involving more than one stressor are generally short in duration, (2) such activities are dispersed throughout the Study Area, and (3) activities are generally scheduled where previous activities have occurred. The aggregate effect on marine vegetation would not observably differ from existing conditions.

3.7.4.2 Essential Fish Habitat Determinations

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of metal, chemical, and other material contaminants during training and testing activities would have no adverse impact on marine vegetation that constitutes Essential Fish Habitat or Habitat Areas of Particular Concern. The use of explosives and other impulsive sources, vessel movement, in-water devices, military expended materials, and seafloor devices during training and testing activities may adversely affect Essential Fish Habitat by reducing the quality and quantity of marine vegetation that constitutes Essential Fish Habitat or Habitat Areas of Particular Concern. The HSTT Essential Fish Habitat Assessment report states that individual stressor impacts on marine vegetation were either no effect or minimal, and ranged in duration from temporary to long-term, depending on the habitat impacted (U.S. Department of the Navy 2012).

This Page Intentionally Left Blank

REFERENCES

Abbott, I. A. (1999). Marine Red Algae of the Hawaiian Islands. Honolulu, Hawaii: Bishop Museum Press.

Adams, A. J., Locascio, J. V. & Robbins, B. D. (2004). Microhabitat use by a post-settlement stage estuarine fish: Evidence from relative abundance and predation among habitats. *Journal of Experimental Marine Biology and Ecology, 299*, 17-33. doi:10.1016/j.jembe.2003.08.013

Allen, J. A. (1998). Mangroves as alien species: The case of Hawaii. *Global Ecology and Biogeography Letters, 7*(1), 61-71.

Bisby, F. A., Roskov, Y. R., Orrell, T. M., Nicolson, D., Paglinawan, L. E., Bailly, N., Baillargeon, G. (2010). *Species 2000 & ITIS Catalogue of Life: 2010 Annual Checklist*. [Online database] Species 2000. Retrieved from http://www.catalogueoflife.org/annual-checklist/2010/browse/tree, 05 September 2010.

Bouillon, S. (2009). Mangroves D. d. A. Laffoley and G. Grimsditch (Eds.), *The management of natural coastal carbon sinks*. (pp. 13-20). Prepared by I. U. f. C. o. Nature.

Castro, P. & Huber, M. E. (2000). Marine prokaryotes, protists, fungi, and plants. In *Marine Biology* (3rd ed., pp. 83-103). McGraw-Hill.

Center for Disease Control and Prevention. (2004). Red Tide: Harmful Algal Blooms. Retrieved from http://www.cdc.gov/hab/redtide/pdfs/about.pdf, as accessed on 29 October, 2011.

Chavez, E. (2009). 2008 San Diego Bay Eelgrass Inventory and Bathymetry Update. San Diego Unified Port District Environmental Advisory Committee. Presented by Eric Chavez, National Marine Fisheries Service. September 10, 2009.

Cheroske, A. G., Williams, S. L. & Carpenter, R. C. (2000). Effects of physical and biological disturbances on algal turfs in Kaneohe Bay, Hawaii. *Journal of Experimental Marine Biology and Ecology, 248*, 1-34.

Chmura, G. L. (2009). Tidal Salt Marshes D. d. A. Laffoley and G. Grimsditch (Eds.), *The management of natural coastal carbon sinks*. (pp. 5-11). Prepared by I. U. f. C. o. Nature.

Culbertson, J. B., Valiela, I., Pickart, M., Peacock, E. E. and Reddy, C. M. (2008). Long-term consequences of residual petroleum on salt marsh grass. *Journal of Applied Ecology, 45*(4), 1284-1292. doi: 10.1111/j.1365-2664.2008.01477.x

Dawes, C. J. (1998). *Marine Botany* (2nd ed.). New York, NY: John Wiley and Sons, Inc.

Dawes, C. J., Andorfer, J., Rose, C., Uranowski, C. and Ehringer, N. (1997). Regrowth of the seagrass Thalassia testudinum into propeller scars. *Aquatic Botany, 59*(1-2), 139-155. 10.1016/s0304-3770(97)00021-1 Retrieved from http://www.sciencedirect.com/science/article/pii/S0304377097000211

Dayton, P. K. (1985). Ecology of kelp communities. *Annual Review of Ecology and Systematics, 16*, 215-245. doi:10.1146/annurev.es.16.110185.001243

Dreyer, G. D. and Niering, W. A. (1995). Tidal marshes of Long Island Sound: Ecology, history and restoration. [Electronic]. *Connecticut Aboretum Bulletin, 34*, 2. Retrieved from http://www.conncoll.edu/ccrec/greennet/arbo/publications/34/frame.htm

Feller, I. C., Lovelock, C. E., Berger, U., McKee, K. L., Joye, S. B. and Ball, M. C. (2010). Biocomplexity in mangrove ecosystems. *Annual Review of Marine Science, 2*(1), 395-417. doi:10.1146/annurev.marine.010908.163809

Friedlander, A., Aeby, G., Brown, E., Clark, A., Coles, S., Dollar, S., Wiltse, W. (2005). The state of coral reef ecosystems of the main Hawaiian islands. In J. Waddell (Ed.), *The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005*. (NOAA Technical Memorandum NOS NCCOS 11, pp. 222-269). Silver Spring, MD: NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team.

Garrison, T. (2004). *Essentials of Oceanography* (3rd ed.). Pacific Grove, CA: Brooks/Cole-Thomas Learning.

Global Invasive Species Database. (2005). *List of invasive marine algae in California*. [Online database] Invasive Species Specialist Group of the IUCN Species Survival Commission. Retrieved from http://www.issg.org/database/species/search.asp?sts=sss&st=sss&fr=1&sn=&rn=California&hci=8&ei=186&lang=EN&Image1.x=22&Image1.y=12, 05 September 2010.

Green, E. P. and Short, F. T. (2003). *World Atlas of Seagrasses* (pp. 298). Berkeley, California: University of California Press.

Harborne, A.R., P.J. Mumby, F. Micheli, C.T. Perry, C.P. Dahlgren, K.E. Holmes, & D.R. Brumbaugh. (2006). The Functional Value of Caribbean Coral Reef, Seagrass and Mangrove Habitats to Ecosystem Processes. *Advances in Marine Biology Volume 50*.

Hayes, M. O., Hoff, R., Michel, J., Scholz, D. and Shigenaka, G. (1992). *An Introduction to Coastal Habitats and Biological Resources for Oil Spill Response*. (Report No. HMRAD 92-4, pp. 401). Seattle, WA: U. S. Department of Commerce, National Oceanic and Atmospheric Administration, Hazardous Materials Response and Assessment Division.

Hayes, P. K., El Semary, N. A. & Sanchez-Baracaldo, P. (2007). The taxonomy of cyanobacteria: Molecular insights into a difficult problem. In J. Brodie and J. Lewis (Eds.), *Unravelling the Algae: The Past, Present, and Future of Algal Systematics* (pp. 93-102). Boca Raton, FL: CRC Press.

Heck, K. L., Jr, Hays, G. & Orth, R. J. (2003). Critical evaluation of the nursery role hypothesis for seagrass meadows. *Marine Ecology Progress Series, 253*, 123-136.

Hemminga, M. and Duarte, C. (2000). Seagrasses in the human environment. In *Seagrass Ecology* (pp. 248-291). Cambridge, UK: Cambridge University Press.

Hoff, R., Hensel, P., Proffitt, E. C., Delgado, P., Shigenaka, G., Yender, R., et al. (Eds.). (2002). *Oil Spills in Mangroves: Planning & Response Considerations*. (pp. 72). Silver Spring, MD: U. S. Department of Commerce, National Oceanic and Atmospheric Administration, Ocean Service, Office of Response and Restoration.

Howard, V. (2008). *Spartina alterniflora*. USGS Nonindigenous Aquatic Species Database, Gainesville, FL. Retreived from: http://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=1125, on 31 October 2011.

International Union for Conservation of Nature. (2011). IUCN Red List of Threatened Species. Version 2011.2. Retrieved from: www.iucnredlist.org, as accessed on 10 November 2011.

Kenworthy, W. J., Durako, M. J., Fatemy, S. M. R., Valavi, H. and Thayer, G. W. (1993). Ecology of seagrasses in northeastern Saudi Arabia one year after the Gulf War oil spill. *Marine Pollution Bulletin, 27*, 213-222. doi: 10.1016/0025-326x(93)90027-h

Kudela, R., Cochlan, W. & Roberts, A. (2004). Spatial and temporal patterns of *Pseudo-nitzschia* spp. in central California related to regional oceanography. In K. A. Steidinger, J. H. Landsberg, C. R. Tomas and G. A. Vargo (Eds.), *Harmful Algae 2002* (pp. 347-349). St. Petersburg, FL: Florida Fish and Wildlife Conservation Commission, Florida Institute of Oceanography, and Intergovernmental Oceanographic Commission of UNESCO.

Kudela, R. M. & Cochlan, W. P. (2000). Nitrogen and carbon uptake kinetics and the influence of irradiance for a red tide bloom off southern California. *Aquatic Microbial Ecology, 21*, 31-47.

Laffoley, D. d. A. and Grimsditch, G. (2009). Introduction D. d. A. Laffoley and G. Grimsditch (Eds.), *The management of natural coastal carbon sinks*. (pp. 1-3). Prepared by I. U. f. C. o. Nature.

Leet, W. S., Dewees, C. M., Klingbeil, R. & Larson, E. J. (Eds.). (2001). *California's Living Marine Resources: A Status Report*. (pp. 588) California Department of Fish and Game.

Levinton, J. (2009a). Environmental impacts of industrial activities and human populations. In *Marine Biology: Function, Biodiversity, Ecology* (3rd ed., pp. 564-588). New York, NY: Oxford University Press.

Levinton, J. (2009b). Seaweeds, sea grasses, and benthic microorganisms. In *Marine Biology: Function, Biodiversity, Ecology* (3rd ed., pp. 309-320). New York: Oxford University Press.

Levinton, J. (2009c). The water column: Plankton. In *Marine Biology: Function, Biodiversity, Ecology* (3rd ed., pp. 167-186). New York: Oxford University Press.

Mach, K. J., Hale, B. B., Denny, M. W. & Nelson, D. V. (2007, July). Death by small forces: a fracture and fatigue analysis of wave-swept macroalgae. Journal of Experimental Biology, 210(13), 2231-2243. 10.1242/jeb.001578 Retrieved from http://jeb.biologists.org/content/210/13/2231.abstract.

Maragos, J. E. (2000). Hawaiian Islands (U.S.A.). In C. R. C. Sheppard (Ed.), *Seas at the Millenium: An Environmental Evaluation* (Vol. II. Regional Chapters: The Indian Ocean to the Pacific, pp. 791-812). Elsevier Science Ltd.

Miller, K., Engle, J., Uwai, S. & Kawai, H. (2007). First report of the Asian seaweed *Sargassum filicinum* Harvey (Fucales) in California, USA. *Biological Invasions, 9*(5), 609-613. 10.1007/s10530-006-9060-2

Mitsch, W. J., Gosselink, J. G., Anderson, C. J. and Zhang, L. (2009). *Wetland Ecosystems* (pp. 295). Hoboken, NJ: John Wiley & Sons, Inc.

Monterey Bay Aquarium Research Institute. (2009, Last updated 5 February 2009). *Marine Flora of Monterey*. [Web page]. Retrieved from http://www.mbari.org/staff/conn/botany/flora/mflora.htm, 5 September 2010.

National Centers for Coastal Ocean Science. (2010, Last updated April 2010). *Economic Impacts of Harmful Algal Blooms*. [Fact sheet] Center for Sponsored Coastal Ocean Research. Retrieved from http://www.cop.noaa.gov/stressors/extremeevents/hab/current/econimpact_08.pdf

National Marine Fisheries Service. (2002). *Final recovery plan for Johnson's seagrass (Halophia johnsonni)*. (pp. 134). Silver Spring, MD. Prepared by the Johnson's seagrass recovery team. Prepared for [NMFS] National Marine Fisheries Service.

National Oceanic and Atmospheric Administration. (2001). *Seagrasses: An Overview for Coastal Managers*. (pp. 20) NOAA Coastal Services Center.

Neckles, H.A., F.T. Short, S. Barker, & B.S. Kopp. (2005). Disturbance of eelgrass *Zostera marina* by commercial mussel *Mytilus edulis* harvesting in Maine: dragging impacts and habitat recovery.

Parrish, F. A. & Boland, R. C. (2004). Habitat and reef-fish assemblages of banks in the Northwestern Hawaiian Islands. *Marine Biology, 144*, 1065-1073. doi:10.1007/s00227-003-1288-0

Peterson, C. H. (2001). The "Exxon Valdez" oil spill in Alaska: Acute, indirect and chronic effects on the ecosystem. In A. J. Southward, P. A. Tyler, C. M. Young and L. A. Fuiman (Eds.), *Advances in Marine Biology* (Vol. 39, pp. 1-103). San Diego, CA: Academic Press. doi: 10.1016/S0065-2881(01)39008-9

Phillips, R. C. & Meñez, E. G. (1988). Seagrasses. *Smithsonian Contributions to the Marine Sciences, 34*, 104.

Preskitt, L. (2001). *Halophila hawaiiana*. In *Invasive Marine Algae of Hawai'i*. [Web page] University of Hawai'i at Manoa Department of Botany. Retrieved from http://www.hawaii.edu/reefalgae/invasive_algae/seagrasses/halophia_hawaiiana.htm

Preskitt, L. (2002a). *Edible* Limu*: Gifts from the Sea*. [Poster] University of Hawai'i at Manoa Department of Botany. Retrieved from http://www.hawaii.edu/reefalgae/publications/ediblelimu/index.htm, 05 September 2010.

Preskitt, L. (2002b). *Halophila decipiens*. In *Invasive Marine Algae of Hawai'i*. [Web page] University of Hawaiʻi at Manoa Department of Botany. Retrieved from http://www.hawaii.edu/reefalgae/invasive_algae/seagrasses/halophila_decipiens.htm, 16 June 2010.

Preskitt, L. (2010). *Invasive Marine Algae of Hawai'i*. [Web page] University of Hawai'i at Manoa Department of Botany. Retrieved from http://www.hawaii.edu/reefalgae/invasive_algae/INDEX.HTM, 05 September 2010.

Rodriguez, S., Santiago, A. R. T. & Shenker, G. (2001). *A Public-Access GIS-Based Model of Potential Species Habitat Distribution for the Santa Barbara Channel and the Channel Islands National Marine Sanctuary.* (Master's group project). University of California, Santa Barbara.

Ruwa, R. K. (1996). Intertidal wetlands. In T. R. McClanahan and T. P. Young (Eds.), *East African Ecosystems and Their Conservation* (pp. 101-130). New York, New York: Oxford University Press.

Sargent, F. J., Leary, T. J., Crewz, D. W. and Kruer, C. R. (1995). Scarring of Florida's Seagrasses: Assessment and Management Options *Technical Report*. Florida Department of Environmental Protection.

Schnetzer, A., Miller, P. E., Schaffner, R. A., Stauffer, B. A., Jones, B. H., Weisberg, S. B., Caron, D. A. (2007). Blooms of *Pseudo-nitzschia* and domoic acid in the San Pedro Channel and Los Angeles harbor areas of the Southern California Bight, 2003-2004. *Harmful Algae, 6*, 372-387. doi:10.1016/j.hal.2006.11.004

Schoener, A. and Rowe, G. T. (1970). Pelagic Sargassum and its presence among the deep-sea benthos. *Deep-Sea Research, 17*, 923-925.

South Atlantic Fishery Management Council. (1998). *Final habitat plan for the South Atlantic region: Essential fish habitat requirements for fishery management plans of the South Atlantic Fishery Management Council*. Charleston, SC: South Atlantic Fishery Management Council.

Spalding, M. D., Ravilious, C. and Green, E. P. (2001). *World Atlas of Coral Reefs* (pp. 424). Berkeley, California: University of California Press.

Spalding, M., Taylor, M., Ravilious, C., Short, F. & Green, E. (2003). Global overview: The distribution and status of seagrasses. In E. P. Green and F. T. Short (Eds.), *World Atlas of Seagrasses* (pp. 5-26). Berkeley, CA: University of California Press.

Steneck, R. S., Graham, M. H., Bourque, B. J., Corbett, D., Erlandson, J. M., Estes, J. A., et al. (2002). Kelp forest ecosystems: Biodiversity, stability, resilience and future. *Environmental Conservation, 29*(4), 436-459. doi:10.1017/S0376892902000322

Sze, P. (1998). Cyanobacteria. In *A Biology of the Algae* (3rd ed., pp. 21-38). McGraw-Hill.

U.S. Department of the Navy. (1998). *Pacific Missile Range Facility Enhanced Capability Final Environmental Impact Statement*. Volume 1 of 3, December.

U.S. Department of the Navy. (2005). *Marine Resources Assessment for the Hawaiian Islands Operating Area, Final Report*. Prepared for the Department of the Navy, Commander, U.S. Pacific Fleet, December.

U.S. Department of the Navy. (2011). *San Diego Bay Integrated Natural Resources Management Plan*. San Diego, CA. Prepared by Tierra Data Systems, Escondido, CA.

U.S. Department of the Navy. (2012). *Hawaii Training and Testing Essential Fish Habitat Assessment.* Preparend for Commander, Prepared for the Department of the Navy, Commander, U.S. Pacific Fleet.

U.S. Department of the Navy and San Diego Unified Port District. (2011). San Diego Bay Integrated Natural Resources Management Plan, Draft November 2011. San Diego, California. Prepared by Tierra Data Inc., Escondido, California.

U.S. National Response Team. (2010). *What are the Effects of Oil on Seagrass?* [Electronic Pamphlet] U. S. Environmental Protection Agency, Region IV. Retrieved from http://www.nrt.org/production/NRT/RRTHome.nsf/resources/RRTIV-Pamphlets/$File/27_RRT4_Seagrass_Pamphlet.pdf

Veron, J. (2000). Corals of the World. Vol 3. Australia: Australian Institute of Marine Sciences and CRR Qld Pty Ltd.

Waggoner, B. & Speer, B. R. (1998, Last updated August 1998). *Introduction to the Dinoflagellata*. [Web page] University of California Museum of Paleontology. Retrieved from http://www.ucmp.berkeley.edu/protista/dinoflagellata.html, 05 September 2010.

Wilson, C. (2002, Last updated September 2002). *Giant Kelp (*Macrocystis pyrifera*)*. [Web page] California Department of Fish and Game. Retrieved from http://www.dfg.ca.gov/mlpa/response/kelp.pdf.

Whitton, B. A. & Potts, M. (2008). *The Ecology of Cyanobacteria: Their Diversity in Time and Space*. Kluwer Academic Publishers.

Wyllie-Echeverria, S. & Ackerman, J. D. (2003). The seagrasses of the Pacific coast of North America. In E. P. Green and F. T. Short (Eds.), *World Atlas of Seagrasses* (pp. 199-206). Berkeley, CA: University of California Press.

Zaitsev, Y.P. (1971). Marine neustonology. Translation by A. Mercado. Jerusalém: Israel Program for Scientific Translations. 207 p.

3.8 Marine Invertebrates

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

3.8 MARINE INVERTEBRATES

MARINE INVERTEBRATES SYNOPSIS

The United States Department of the Navy considered all potential stressors, and the following have been analyzed for marine invertebrates:

- Acoustic (sonar and other active acoustic sources, underwater explosives)
- Energy (electromagnetic devices)
- Physical disturbance and strike (vessels and in-water devices, military expended materials, seafloor devices)
- Entanglement (fiber optic cables and guidance wires, parachutes)
- Ingestion (military expended materials)
- Secondary

Preferred Alternative (Alternative 2)

- Acoustics: Pursuant to the Endangered Species Act (ESA), the use of sonar and other active acoustic sources would have no effect on ESA-listed black abalone (*Haliotis cracherodii*) or white abalone (*Haliotis sorenseni*) species or on ESA-listed coral species. Underwater explosives may affect but are not likely to adversely affect black abalone or white abalone, and would have no effect on ESA-listed coral species. Acoustic stressors would have no effect on designated critical habitat.
- Energy: Pursuant to the ESA, the use of electromagnetic devices would have no effect on ESA-listed black abalone, white abalone or coral species. Energy stressors would have no effect on designated critical habitat.
- Physical Disturbance and Strike: Pursuant to the ESA, the use of vessels and in-water devices, military expended materials, and seafloor devices may affect but is not likely to adversely affect ESA-listed black abalone and white abalone, and would have no effect on coral species proposed for ESA listing. Physical disturbance and strike stressors would have no effect on designated critical habitat.
- Entanglement: Pursuant to the ESA, the use of fiber optic cables and guidance wires, and parachutes would have no effect on ESA-listed black abalone, white abalone or coral species. Entanglement stressors would have no effect on designated critical habitat.
- Ingestion: Pursuant to the ESA, the potential for ingestion of military expended materials would have no effect on ESA-listed black abalone, white abalone or coral species.
- Secondary: Pursuant to the ESA, secondary stressors may affect, but are not likely to adversely affect, ESA-listed black abalone and white abalone, and would not affect coral species proposed for ESA listing. Secondary stressors would have no effect on designated critical habitat.

MARINE INVERTEBRATES SYNOPSIS

Preferred Alternative (Alternative 2, continued)

- Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of sonar and other active acoustic sources; electromagnetic sources; vessel movement; in-water devices; and metal, chemical, or other material contaminants will have no adverse effect on sedentary invertebrate beds or reefs that constitute Essential Fish Habitat or Habitat Areas of Particular Concern. The use of explosives, pile driving, military expended materials, seafloor devices, and explosives and explosive byproduct contaminants may have an adverse effect on Essential Fish Habitat by reducing the quality and quantity of sedentary invertebrate beds or reefs that constitute Essential Fish Habitat or Habitat Areas of Particular Concern.

3.8.1 INTRODUCTION

In this Environmental Impact Statement/Overseas Environmental Impact Statement, marine invertebrates are evaluated based on their distribution and life history relative to the stressor or activity being considered. Activities are evaluated for their potential impact on marine invertebrates in general, and are evaluated by taxonomic and regulatory groupings as appropriate.

Invertebrates are animals without backbones, and marine invertebrates are a large, diverse group of at least 50,000 species (Brusca and Brusca 2003). Many of these species are important to humans ecologically and economically, providing essential ecosystem services (coastal protection) and income from tourism and commercial and recreational fisheries (Spalding et al. 2001). Because marine invertebrates occur in all habitats, activities that affect the water column or the seafloor could impact numerous zooplankton (invertebrates not generally visible to the naked eye), eggs, larvae, larger invertebrates living in the water column, and benthic invertebrates that live on or in the seafloor. The greatest densities of marine invertebrates are usually on the seafloor (Sanders 1968); therefore, activities that contact the seafloor have a greater potential for impact.

The following subsections briefly introduce the Endangered Species Act (ESA)-listed species, federally managed species, habitat types, and major taxonomic groups of marine invertebrates in the Study Area. Federally managed marine invertebrate species regulated under the Magnuson-Stevens Fishery Conservation and Management Act are described in the Hawaii-Southern California Training and Testing (HSTT) Essential Fish Habitat Assessment. The National Oceanic and Atmospheric Administration Fisheries Office of Protected Resources maintains a website that provides additional information on the biology, life history, species distribution (including maps), and conservation of invertebrates.

3.8.1.1 Endangered Species Act-Listed Species

In response to a petition from the Center for Biological Diversity to list under the ESA and designate critical habitat for species of coral, National Marine Fisheries Service (NMFS) reviewed the status of 82 "candidate species" of corals. Candidate species are those petitioned species that are actively being considered for listing as endangered or threatened under the ESA, as well as those species for which

NMFS has initiated an ESA status review that it has announced in the Federal Register. In April 2012, NMFS completed a status review report and draft Management Report of the candidate species of corals. On 7 December 2012, NMFS published a proposed rule with the determination that 66 of these 82 species warrant listing under the ESA as either threatened or endangered. Four of these species occur within the Study Area in waters off the coast of Hawaii and are currently proposed under the ESA as threatened.[1] Of the species determined to not warrant listing as either threatened or endangered, five coral species are found in waters off the coast of Hawaii, and are discussed under Section 3.8.2.11 (Corals, Hydroids, Jellyfish [Phylum Cnidaria]). In waters off the coast of California and within the Study Area, two marine invertebrate species (the black abalone and the white abalone) are endangered under the ESA. NMFS also considers two other marine invertebrate found in waters off of California and within the Study Area as species of concern.

The status and presence of these species in the Study Area are listed in Table 3.8-1. Profiles of the endangered abalone species and a group profile of the four coral species currently proposed as threatened under the ESA are provided in Sections 3.8.2.3 through 3.8.2.9. Emphasis on species-specific information in the following species descriptions will be placed on the two ESA-protected species because any threats to or potential impacts on those species are subject to consultation with regulatory agencies.

Table 3.8-1: Status of Endangered Species Act-Listed and Species Proposed for Endangered Species Act Listing within the Study Area

Species Name and Regulatory Status			Presence in Study Area		
Common Name	**Scientific Name**	**Endangered Species Act Status**	**Open Ocean Area/ Transit Corridor**	**California Current**	**Insular Pacific-Hawaiian**
Black abalone	*Haliotis cracherodii*	Endangered	No	Yes	No
White abalone	*Haliotis sorenseni*	Endangered	No	Yes	No
Fuzzy table coral	*Acropora paniculata*	Proposed Threatened	No	No	Yes
Irregular rice coral (Hawaiian reef coral)	*Montipora dilitata*	Proposed Threatened	No	No	Yes
Blue rice coral	*Montipora flabellate*	Proposed Threatened	No	No	Yes
Sandpaper rice coral	*Montipora patula*	Proposed Threatened	No	No	Yes

3.8.1.2 Federally Managed Species

Federally managed species of marine invertebrates likely to occur within the Study Area are listed in **Error! Reference source not found.**. In the context of federally managed species, the term "fishery" applies to any biologically generated object extracted from the ocean (e.g., there is a lobster "fishery"

[1] Proposed species are those candidate species that were found to warrant listing as either threatened or endangered and were officially proposed as such in a Federal Register notice after the completion of a status review and consideration of other protective conservation measures. Public comment is always sought on a proposal to list species under the ESA. NMFS generally has 1 year after a species is proposed for listing under the ESA to make a final determination whether to list a species as threatened or endangered.

even though the animals are not fish). Assessments in Section 3.8.3 (Environmental Consequences) combine federally managed species with the rest of their taxonomic group, unless impacts or differential effects warrant separate treatment. The analysis of impacts on commercial and recreational fisheries is provided in Section 3.11 (Socioeconomics).

Table 3.8-2: Federally Managed Marine Invertebrate Species with Essential Fish Habitat within the Study Area, Covered under Each Fishery Management Plan

Pacific Fishery Management Council	
Pacific Coast Coastal Pelagic Species Fishery Management Plan	
Common Name	**Scientific Name**
Market squid	*Loligo opalescens*
Western Pacific Fishery Management Council	
Fishery Ecosystem Plan for the Hawaii Archipelago	
Common Name	**Scientific Name**
Hawaiian spiny lobster	*Panulirus marginatus*
Spiny lobster	*Panulirus penicillatus*
Ridgeback slipper lobster	*Scyllarides haanii*
Chinese slipper lobster	*Parribacus antarcticus*
Kona crab	*Ranina ranina*
Deepwater shrimp	*Heterocarpus* spp.
Pink coral	*Corallium secundum, Corallium laauense*
Red coral	*Corallium regale*
Midway deepsea coral	*Corallium* sp nov.
Gold coral	*Gerardia* spp., *Callogorgia gilberti, Narella* spp., *Calyptrophora* spp.
Bamboo coral	*Lepidisis olapa, Acanella* spp.
Black coral	*Antipathes dichotoma, Antipathis granids, Antipathes ulex*

3.8.1.3 Taxonomic Groups

All marine invertebrate taxonomic groups are represented in the Study Area. Major invertebrate phyla (taxonomic range)—those with greater than 1,000 species (Appeltans et al. 2010)—and the general zones they inhabit in the Study Area are listed in Table 3.8-3. Throughout the marine invertebrate section, organisms may be referred to by their phylum name or, more generally, as marine invertebrates.

Table 3.8-3: Major Taxonomic Groups of Marine Invertebrates in the Hawaii-Southern California Training and Testing Study Area

Major Invertebrate Groups[1]		Presence in Study Area[2]	
Common Name (Species Group)	**Description**	**Open Ocean**	**Coastal Waters**
Foraminifera, radiolarians, ciliates (Phylum Foraminifera)	Benthic and pelagic single-celled organisms; shells typically made of calcium carbonate or silica.	Water column, seafloor	Water column, seafloor
Sponges (Phylum Porifera)	Benthic animals; large species have calcium carbonate or silica structures embedded in cells to provide structural support.	Seafloor	Seafloor
Corals, hydroids, jellyfish (Phylum Cnidaria)	Benthic and pelagic animals with stinging cells.	Water column, seafloor	Water column, seafloor

Table 3.8-3: Major Taxonomic Groups of Marine Invertebrates in the Hawaii-Southern California Training and Testing Study Area (continued)

Major Invertebrate Groups[1]		Presence in Study Area[2]	
Common Name (Species Group)	**Description**	**Open Ocean**	**Coastal Waters**
Flatworms (Phylum Platyhelminthes)	Mostly benthic; simplest form of marine worm with a flattened body.	Water column, seafloor	Water column, seafloor
Ribbon worms (Phylum Nemertea)	Benthic marine worms with a long extension from the mouth (proboscis) from the mouth that helps capture food.	Water column, seafloor	Seafloor
Round worms (Phylum Nematoda)	Small benthic marine worms; many live in close association with other animals (typically as parasites).	Water column, seafloor	Water column, seafloor
Segmented worms (Phylum Annelida)	Mostly benthic, highly mobile marine worms; many tube-dwelling species.	Seafloor	Seafloor
Bryozoans (Phylum Bryozoa)	Lace-like animals that exist as filter feeding colonies attached to the seafloor and other substrates.	Seafloor	Seafloor
Cephalopods, bivalves, sea snails, chitons (Phylum Molluska)	Mollusks are a diverse group of soft-bodied invertebrates with a specialized layer of tissue called a mantle. Mollusks such as squid are active swimmers and predators, while others such as sea snails are predators or grazers and clams are filter feeders.	Water column, seafloor	Water column, seafloor
Shrimp, crab, lobster, barnacles, copepods (Phylum Arthropoda – Crustacea)	Benthic or pelagic; some are immobile; with an external skeleton; all feeding modes from predator to filter feeder.	Water column, seafloor	Water column, seafloor
Sea stars, sea urchins, sea cucumbers (Phylum Echinodermata)	Benthic predators and filter feeders with tube feet.	Seafloor	Seafloor

[1] Major species groups (those with more than 1,000 species) are based on the World Register of Marine Species (Appeltans et al. 2010) and Catalogue of Life (Bisby et al. 2010).

[2] Presence in the Study Area includes open ocean areas (North Pacific Gyre and North Pacific Transition Zone) and coastal waters of two Large Marine Ecosystems (California Current and Insular-Pacific Hawaiian).

Notes: Benthic = A bottom-dwelling organism; Pelagic = relating to, living, or occurring in the waters of the ocean or the open sea.

3.8.2 AFFECTED ENVIRONMENT

Marine invertebrates live in all of the world's oceans, from warm shallow waters to cold deep waters. They inhabit the seafloor and water column in all of the large marine ecosystems and open-ocean areas in the Study Area. Marine invertebrate distribution in the Study Area is influenced by habitat, ocean currents, and water quality factors such as temperature, salinity, and nutrient content (Levinton 2009). The distribution of invertebrates is also influenced by their distance from the equator (latitude); in general, the number of marine invertebrate species increases toward the equator (Macpherson 2002). The higher number of species (diversity) and abundance of marine invertebrates in coastal habitats, compared with the open ocean, is a result of more nutrient availability from terrestrial environments and the variety of habitats and substrates found in coastal waters (Levinton 2009).

Marine invertebrates in the Hawaii Range Complex (HRC) portion of the Study Area inhabit coastal waters and seafloor habitats, including rocky intertidal zones, coral reefs, deep-water slopes, canyons, and seamounts. The intertidal zone is exposed to air at low tide and covered by water at high tide. Inhabitants of the rocky, wave-beaten intertidal zone include species such as helmet urchins

(*Colobocentrotus atratus*) and limpets (Zabin 2003). At least 15 species of intertidal crab live in sandy beaches in the intertidal zone, feeding on algae and detritus (Waikiki Aquarium 2009a).

Corals are the primary living structural components of Hawaii's subtidal zone, with an average of about 20.3 percent coral coverage in the main Hawaiian Islands (Friedlander et al. 2005). Approximately 250 species of corals are found within the main Hawaiian Islands (Maragos et al. 2004). Six species of corals dominate Hawaiian waters: lobe coral (*Porites lobata*), finger coral (*Porites compressa*;), rice coral (*Montipora capitata*), sandpaper rice coral (*Montipora patula*), cauliflower coral (*Pocillopora meandrina*;), and blue rice coral (*Montipora flabellate*) (Friedlander et al. 2005). Blue rice coral is proposed for ESA listing (see Table 3.8-1). The Northwestern Hawaiian Islands have at least 57 species of stony coral, including seven genera of the table coral *Acropora*, which is rare in the main Hawaiian Islands but abundant and widespread in the French Frigate Shoals region (Maragos et al. 2004).

The coral reefs of the Northwestern Hawaiian Islands support diverse communities of bottom-dwelling invertebrates. Over 800 non-coral invertebrate species have been identified from the Northwestern Hawaiian Islands. Mollusks, echinoderms, and crustaceans dominate, representing 80 percent of the invertebrate species (Friedlander et al. 2005). Five species of lobster occur in Hawaii, primarily within the subtidal zone, although their range can extend slightly deeper. Four species occur throughout the tropical oceans of the world (Waikiki Aquarium 2009c), while the Hawaiian spiny lobster (*Panulirus marginatus*) is found only in Hawaii and Johnston Atoll (Polovina et al. 1999). Deepwater corals in the HRC portion of the Study Area include black corals, pink corals, red corals, gold coral, and bamboo coral. These species attach to relatively steep banks with strong currents that provide a steady stream of small algae and animals that drift in the water (plankton) to feed on, as well as minimal sedimentation that would inhibit colonization and growth of these slow-growing species (Grigg 1993).

Marine invertebrates in the Southern California portion of the Study Area inhabit coastal waters and benthic habitats, including salt marshes, kelp forests, soft sediments, canyons, and the continental shelf. Salt marsh invertebrates include oysters (such as the Olympia oyster [*Ostreola conchaphila*]), crabs, and worms that are important prey for birds and small mammals. Mudflats provide habitat for substantial amounts of crustaceans, bivalves, and worms. Representative species include various species of ghost shrimp and marine worms, California jackknife clams (*Ensis myrae*), and California horn snails (*Cerithidea californica*). Sand flats are dominated by bivalves such as heart cockle (*Corculum cardissa*), white-sand clam (*Macoma secta*), and bent-nosed clam (*Macoma nasuta*) (Proctor et al. 1980). The sandy intertidal area is dominated by species that are highly mobile and can burrow. The most common invertebrates are the common sand crab, isopods, talitrid amphipods, polychaetes, Pismo clam (*Tivela stultorum*), bean clam (*Donax gouldii*), and purple olive snail (*Olivella biplicata*) (Dugan et al. 2000).

More than 260 species of sponges, hydroids, sea fans, mollusks, echinoderms, and ascidians (sea squirts) have been identified in the subtidal rocky reefs of central and Southern California (Chess and Hobson 1997). Rock oysters and mussels dominate the tops of rocky reefs. The orange cup coral (*Balanophyllia elegans*) is a common stony coral in hard-bottom habitats of the shallow subtidal zones of the Study Area (Bythell 1986; Kushner et al. 1999). At greater depths, there are calcareous bryozoans, sea fans, stony corals, purple sea urchins, rock scallops, and red abalone (Chess and Hobson 1997).

The Channel Islands, located off the coast of Southern California, are situated in a transitional location between cold and warm water (National Oceanic and Atmospheric Administration 2007). Four of the southern Channel Islands (Santa Barbara, Santa Catalina, San Nicolas, and San Clemente islands) are within the Southern California portion of the Study Area. This area is diverse in invertebrates, supporting over 5,000 species. The dominant taxa include sea lilies, crabs, lobsters, basket stars, brittle stars, brachiopods, sea urchins, anemones, and salps (Tissot et al. 2006). This diversity is supported by a number of structure-forming invertebrates, including black corals, sea whips, and sponges. Diversity among marine invertebrate species appears greatest for black corals (Tissot et al. 2006). The 17 known species of stony corals include two species that are endemic to the area, flower coral (*Nomlandia californica*) and tree coral (*Dendrophyllia californica*) (Cairns 1994).

The soft-bottom sediments of California's estuarine communities are highly productive, with a high diversity of invertebrates. Representative organisms in the soft-bottom communities of California estuaries, such San Diego Bay, include crustaceans (e.g., caridean or bay shrimps, Pacific razor clams, gaper clams, Washington clams, littleneck clams, and blue mussels) (Emmett et al. 1991; Kalvass 2001). Marine worms, crustaceans, and mollusks are the dominant invertebrates living on and in the soft-bottom sediment and the submerged aquatic vegetation of San Diego Bay (U.S. Department of the Navy 2011).

3.8.2.1 Invertebrate Hearing and Vocalization

Very little is known about sound detection and use of sound by aquatic invertebrates (Budelmann 2010; Montgomery et al. 2006; Popper et al. 2001). Organisms may detect sound by sensing either the particle motion or pressure component of sound, or both. Aquatic invertebrates probably do not detect pressure since many are generally the same density as water and few, if any, have air cavities that would function like the fish swim bladder in responding to pressure (Budelmann 2010; Popper et al. 2001). Many aquatic invertebrates, however, have ciliated "hair" cells that may be sensitive to water movements, such as those caused by currents or water particle motion very close to a sound source (Budelmann 2010). These cilia may allow invertebrates to sense nearby prey or predators or help with local navigation.

Aquatic invertebrates that can sense local water movements with ciliated cells include cnidarians, flatworms, segmented worms, urochordates (tunicates), mollusks, and arthropods (Budelmann 2010; Popper et al. 2001). The sensory capabilities of corals are largely limited to detecting water movement using receptors on their tentacles (Gochfeld 2004), and the exterior cilia of coral larvae likely help them detect nearby water movements (Vermeij et al. 2010). Some aquatic invertebrates have specialized organs called statocysts for the determination of equilibrium and, in some cases, linear or angular acceleration. Statocysts allow an animal to sense movement, and may enable some species, such as cephalopods and crustaceans, to be sensitive to water particle movements associated with sound (Hu et al. 2009; Kaifu et al. 2008; Montgomery et al. 2006; Popper et al. 2001). Because any acoustic sensory capabilities, if present at all, are limited to detecting water motion, and water particle motion near a sound source falls off rapidly with distance, aquatic invertebrates are probably limited to detecting nearby sound sources rather than sound caused by pressure waves from distant sources.

Both behavioral and auditory brainstem response studies suggest that crustaceans may sense sounds up to three kilohertz (kHz), but best sensitivity is likely below 200 Hertz (Hz) (Lovell et al. 2005; Lovell et al. 2006; Goodall et al. 1990). Most cephalopods (e.g., octopus and squid) likely sense low-frequency sound below 1,000 Hz, with best sensitivities at lower frequencies (Budelmann 2010; Mooney et al. 2010; Packard et al. 1990). A few cephalopods may sense higher frequencies up to 1,500 Hz (Hu et al. 2009). Squid did not respond to toothed whale ultrasonic echolocation clicks at sound pressure levels ranging from 199 to 226 decibels (dB) referenced to (re) 1 μ (micro) Pascal (Pa) peak-to-peak, likely because these clicks were outside of squid hearing range (Wilson et al. 2007). However, squid exhibited alarm responses when exposed to broadband sound from an approaching seismic airgun with received levels exceeding 145 to 150 dB re 1 µPa root mean square (McCauley et al. 2000b).

Aquatic invertebrates may produce and use sound in territorial behavior, to deter predators, to find a mate, and to pursue courtship (Popper et al. 2001). Some crustaceans produce sound by rubbing or closing hard body parts together, such as lobsters and snapping shrimp (Latha et al. 2005; Patek and Caldwell 2006). The snapping shrimp chorus makes up a significant portion of the ambient noise budget in many locales (Cato and Bell 1992). Each click is up to 215 dB re 1 µPa, with a peak around 2 to 5 kHz (Heberholz and Schmitz 2001). Other crustaceans, such as the California spiny lobster, make low-frequency rasping or rumbling noises, perhaps used in defense or territorial display, that are often obscured by ambient noise (Patek and Caldwell 2006; Patek et al. 2009).

Reef noises, such as fish pops and grunts, sea urchin grazing (around 1.0 kHz to 1.2 kHz), and snapping shrimp noises (around 5 kHz) (Radford et al. 2010), may be used as a cue by some aquatic invertebrates. Nearby reef noises were observed to affect movements and settlement behavior of coral and crab larvae (Jeffs et al. 2003; Radford et al. 2007; Stanley et al. 2010; Vermeij et al. 2010). Larvae of other crustacean species, including pelagic and nocturnally emergent species that benefit from avoiding coral reef predators, appear to avoid reef noises (Simpson et al. 2011). Detection of reef noises is likely limited to short distances (less than 330 feet [ft.] [100 meters {m}]) (Vermeij et al. 2010).

3.8.2.2 General Threats

General threats to marine invertebrates include overexploitation and destructive fishing practices (Jackson et al. 2001; Miloslavich et al. 2011; Pandolfi et al. 2003), habitat degradation from pollution and coastal development (Cortes and Risk 1985; Downs et al. 2009), disease, and invasive species (Bryant et al. 1998; Galloway et al. 2009; National Marine Fisheries Service 2010b; Wilkinson 2002). These threats are compounded by global threats to all marine life, including the increasing temperature and decreasing pH of the ocean from pollution linked to global climate change (Cohen et al. 2009; Miloslavich et al. 2011).

In the Study Area, marine invertebrates that are managed to ensure their sustainability have delineated essential fish habitat, which is designated by NMFS and regional fishery management councils. The sustainability and abundance of these organisms are vital to the marine ecosystem and to the sustainability of the world's commercial fisheries (Pauly et al. 2002). Marine invertebrates are harvested for food and for the aquarium trade. Economically important invertebrate groups that are fished, commercially and recreationally, for food in the United States are crustaceans (e.g., shrimps, lobsters, and crabs), bivalves (e.g., scallops, clams, and oysters), and cephalopods (e.g., squid and octopuses) (Morgan and Chuenpagdee 2003; Pauly et al. 2002). These fisheries are a key part of the commercial fisheries industry in the United States (Food and Agriculture Organization of the United Nations 2005). Global threats to crustaceans, bivalves, and cephalopods are largely the result of overfishing, destructive fishing techniques (e.g., trawling) and habitat modification (Morgan and Chuenpagdee 2003; Pauly et al. 2002). A relatively new threat to invertebrates is bioprospecting, the collection of organisms in pursuit of new compounds for pharmaceutical products (National Marine Fisheries Service 2013a).

Additional information on the biology, life history, and conservation of marine invertebrates can be found on the websites maintained by the following organizations:

- NMFS, particularly for ESA-listed species, species currently proposed for ESA listing, species considered as candidate species for ESA listing, and species of concern

- U.S. Coral Reef Task Force
- Marine Bio Conservation Society
- Waikiki Aquarium
- Monterey Bay Aquarium

The discussion above represents general threats to marine invertebrates. Additional threats to individual species within the Study Area are described below in the accounts of those species. The following sections include descriptions of species listed or proposed to be listed as threatened or endangered under the ESA, and descriptions of the major marine invertebrate taxonomic groups in the Study Area. The species-specific information emphasizes the ESA-listed and candidate species because any threats to or potential impacts on those species are subject to consultation with regulatory agencies. These taxonomic group descriptions include descriptions of key habitat-forming invertebrates, including reef-forming sponges, shallow-water corals, two groups of key deep-water corals that form essential fish habitat, corals, and other organisms that define live hardbottom, reef-building worms, and reef-building mollusks (e.g., oysters).

The ESA listing process for 82 species of reef-building corals petitioned by the Center for Biological Diversity (Sakashita and Wolf 2009) is the broadest and most complex listing process undertaken by NMFS (National Oceanic and Atmospheric Administration 2012, Brainard et al. 2011). A threat evaluation was developed for these corals and 19 key threats were selected as the most important factors influencing the potential extinction of candidate coral species before the year 2100 (Table 3.8-4). Because most of these threats are also known to affect marine invertebrate groups, generally, the information is presented here in General Threats rather than within a subsequent subsection.

Table 3.8-4: Summary of Proximate Threats to Coral Species

Proximate Threat[1]	Importance	Used in Coral ESA Determinations
Ocean Warming	High	Yes
Disease	High	Yes
Ocean Acidification	Med-High	Yes
Reef Fishing—Trophic Effects	Medium	Yes
Sedimentation	Low-Medium	Yes
Nutrients	Low-Medium	Yes
Sea-Level Rise	Low-Medium	Yes
Toxins	Low	No
Changing Ocean Circulation	Low	No
Changing Storm Tracks/Intensities	Low	No
Predation	Low	Yes
Reef Fishing—Habitat Impacts/Destructive Fishing Practices	Low	No
Ornamental Trade	Low	Yes
Natural Physical Damage	Low	No

[1] As summarized by Brainard et al. (2011). The authors note that, accepting “natural physical damage” and “changes in insolation,” the ultimate factor for all of the proximate threats is growth in human population and consumption of natural resources.

Note: ESA = Endangered Species Act

Table 3.8-4: Summary of Proximate Threats to Coral Species (continued)

Proximate Threat[1]	Importance	Used in Coral ESA Determinations
Human-induced Physical Damage	Negligible-Low	No
Aquatic Invasive Species	Negligible-Low	No
Salinity	Negligible	No
African/Asian Dust	Negligible	No
Changes in Insolation	Probably Negligible	No

[1] As summarized by Brainard et al. (2011). The authors note that, accepting "natural physical damage" and "changes in insolation," the ultimate factor for all of the proximate threats is growth in human population and consumption of natural resources.

Note: ESA = Endangered Species Act

3.8.2.3 Black Abalone (*Haliotis cracherodii*)

3.8.2.3.1 Status and Management

The black abalone (*Haliotis cracherodii*) was listed as endangered under the ESA on 14 January 2009 (VanBlaricom et al. 2009). A dramatic decline in abundance, likely caused by a disease known as withering syndrome (explained in more detail below), prompted closure of both the commercial and recreational fisheries in California. The State of California imposed a moratorium on black abalone harvesting throughout California in 1993 and on all abalone harvesting in central and Southern California in 1997 (VanBlaricom et al. 2009). A system of California Marine Protected Areas aids in enforcing these regulations. An *Abalone Recovery Management Plan* was adopted by the State of California in 2005.

NMFS has prepared a status review for this species (VanBlaricom et al. 2009). Critical habitat was designated for black abalone by NMFS on 27 October 2011 (76 Federal Register 66806-66844). Most of the designated critical habitat lies along the California coast north of the Study Area. Designated critical habitat includes rocky intertidal and subtidal habitats from the mean higher high water line to a depth of approximately 20 ft. (6 m), as well as the waters encompassed by these areas. Designated critical habitat extends from Del Mar Landing Ecological Reserve to the Palos Verdes Peninsula. Within the Study Area, critical habitat occurs in waters surrounding Santa Catalina and Santa Barbara Islands. No training or testing activities occur in waters surrounding these islands (the training activities occur in open ocean portions). The specific areas proposed for designation off San Nicolas and San Clemente Islands were determined to be ineligible for designation because the U.S. Department of the Navy's (Navy's) Integrated Natural Resources Management Plans provide benefits to black abalone in those areas. The critical habitat designation also identifies primary constituent elements, which are habitat elements essential for the conservation of the species. The primary constituent elements for black abalone are rocky substrate, food resources, juvenile settlement habitat, suitable water quality, and suitable nearshore circulation patterns.

Various projects are in place to monitor the status of the species, to understand and address withering disease, to improve reproduction, and to minimize illegal harvest. For instance, the Navy monitors black abalone populations on San Clemente and San Nicolas Islands, and the species is managed under both the *San Clemente Island Integrated Natural Resources Management Plan* and *San Nicolas Island Integrated Natural Resources Management Plan*.

3.8.2.3.2 Habitat and Geographic Range

The distribution of the black abalone ranges approximately from Point Arena in northern California to Bahia Tortugas and Isla Guadalupe, Mexico (VanBlaricom et al. 2009). Although the geographic range of black abalone extends to northern California, the most abundant populations historically have occurred in the Channel Islands (VanBlaricom et al. 2009). A map of the black abalone range can be accessed at http://www.nmfs.noaa.gov/pr/species/invertebrates/blackabalone.htm.

Black abalone live on rocky substrates in the high to low intertidal zone (with most animals found in the middle and lower intertidal) within the Southern California portion of the Study Area. They occur among other invertebrate species, including California mussels (*Mytilus californianus*), gooseneck barnacles (*Pollicipes polymerus*), and anemones. Of the eight species of abalone in the waters of California, the black abalone inhabits the shallowest areas. It is rarely found deeper than 20 ft. (6.1 m), and smaller individuals generally inhabit the higher intertidal zones. Complex surfaces with cracks and crevices may be crucial habitat for juveniles, and appear to be important for adult survival as well (VanBlaricom et al. 2009).

3.8.2.3.3 Population and Abundance

Black abalones were abundant before 1985 in the coastal waters from Point Arena in northern California to Bahia Tortugas and Isla Guadalupe, Mexico. Substantial populations also occurred in the coastal waters of the Channel Islands of Southern California. In the early 1970s, the black abalone constituted the largest abalone fishery in California (Smith et al. 2003). Because of withering syndrome, black abalone populations south of Monterey County, California have experienced 95 percent or greater declines in abundance since the mid-1980s (Neuman et al. 2010). Withering syndrome is caused by the bacteria species *Candidatus Xenohaliotis californiensis*, which attacks the lining of the abalone's digestive tract, inhibiting the production of digestive enzymes. To prevent starvation, the abalone consumes its own body mass, causing its characteristic muscular "foot" to wither and atrophy. This impairs the abalone's ability to adhere to rocks, making it far more vulnerable to predation or starvation (VanBlaricom et al. 2009).

Major declines in abundance in the Channel Islands, the primary fishing grounds for this species before closure of the abalone fishery, have severely reduced the population as a whole (VanBlaricom et al. 2009). The Black Abalone Status Review Team estimates that, unless effective measures are put in place to counter the population decline caused by withering syndrome and overfishing, the species will likely be extinct within 30 years (VanBlaricom et al. 2009). San Nicolas Island is one of the only locations in Southern California where black abalone have been increasing and where multiple recruitment events have occurred since 2005 (VanBlaricom et al. 2009).

3.8.2.3.4 Predator-Prey Interactions

The black abalone diet varies with life history stage. As larvae, black abalones receive nourishment from an egg yolk and do not actively feed. Settled abalone clamp tightly to rocky substrates and feed on algal matter that they scrape from the rocks. Juveniles feed on bottom-dwelling diatoms, bacterial films, and algae. As they increase in size and become less vulnerable to predation, abalones move into more open locations (though still cryptic) and gain access to both attached and drift algae. Adult abalone feed primarily on fragments of drift kelp (Smith et al. 2003) and red algae (VanBlaricom et al. 2009). The primary predators of abalone are humans, fish, otters (Smith et al. 2003), sea stars, and striped crabs (National Oceanic and Atmospheric Administration 2010a).

3.8.2.3.5 Species-Specific Threats

The black abalone population is declining because of withering syndrome and overharvesting. An additional factor in the population decline is the black abalone’s reproductive process and low population density in areas affected by the disease. The black abalone is a broadcast spawner and a relatively sedentary marine mollusk that requires a critical population size and the proximity of other spawning abalone to successfully reproduce. The reduction in black abalone populations has isolated many individuals, preventing them from reproducing successfully (VanBlaricom et al. 2009).

3.8.2.4 White Abalone (*Haliotis sorenseni*)

3.8.2.4.1 Status and Management

The white abalone (*Haliotis sorenseni*) was listed as endangered under the ESA in May 2001 (National Marine Fisheries Service 2001), and is recognized as one stock (Hobday and Tegner 2000). Overfishing in the 1970s reduced the population to such low densities that successful reproduction was severely restricted. White abalone survival and recovery continue to be negatively affected by reproductive failure (Hobday et al. 2001), as well as by rising sea surface temperatures (Vilchis et al. 2005) and diseases, such as withering syndrome (Friedman et al. 2003).

The State of California suspended all forms of harvesting of the white abalone in 1996 and, in 1997, imposed an indefinite moratorium on the harvesting of all abalone in central and Southern California (National Marine Fisheries Service 2008). Critical habitat is not designated for white abalone. NMFS determined that informing the public of the locations of critical habitat, which includes areas where white abalone still exist, would increase the risk of illegal harvesting of white abalone (National Marine Fisheries Service 2001, 2008). Potential habitat may exist between Point Conception, California, and the California/Mexico border, with much of it occurring in the isolated, deep waters off the Channel Islands. In reaction to concerns over the status of white abalone, the White Abalone Restoration Consortium was formed to propagate a captive-reared stock to enhance the depleted wild stock (National Marine Fisheries Service 2008). There is now a captive breeding program at the Bodega Bay Marine Laboratory, UC Davis, in partnership with several facilities throughout California.

3.8.2.4.2 Habitat and Geographic Range

The white abalone is a well-concealed, attached, bottom-dwelling species that prefers reefs and rock piles with low relief areas surrounded by sandy areas (Hobday and Tegner 2000). White abalone in the Southern California Bight typically inhabit depths ranging from 60 to 195 ft. (18 to 59 m), with the highest densities occurring between 130 and 165 ft. (40 and 50 m) (Butler et al. 2006). White abalones are found in waters deeper than other west coast abalone species. Overall, habitat associations of white abalone depend on its main food source, attached or drifting brown algae (National Marine Fisheries Service 2001). Thus, depth distribution is limited by water clarity and light penetration as well as by the availability of hard substrate or anchoring points on seafloor (Butler et al. 2006). Evidence suggests that white abalone prefer the sand and rock interface at the reef's edge, rather than the middle sections of reefs (National Marine Fisheries Service 2008).

White abalone were historically found between Point Conception, California, and Punta Abreojos, Baja California, Mexico, at depths as shallow as 16 ft. (5 m) (National Marine Fisheries Service 2008). White abalone was once abundant throughout its range, but was more common and abundant along the coast in the northern and southern extents of its range. This area includes the Channel Islands of San Clemente (Navy owned) and Santa Catalina islands in the northeastern corner of the Southern California portion of the California Current Large Marine Ecosystem (Figure 3.8-1) (Butler et al. 2006; National Marine Fisheries Service 2008). On the southern end of the range, the species was also common around a number of islands, including Isla Cedros and Isla Natividad, Mexico (Hobday and Tegner 2000).

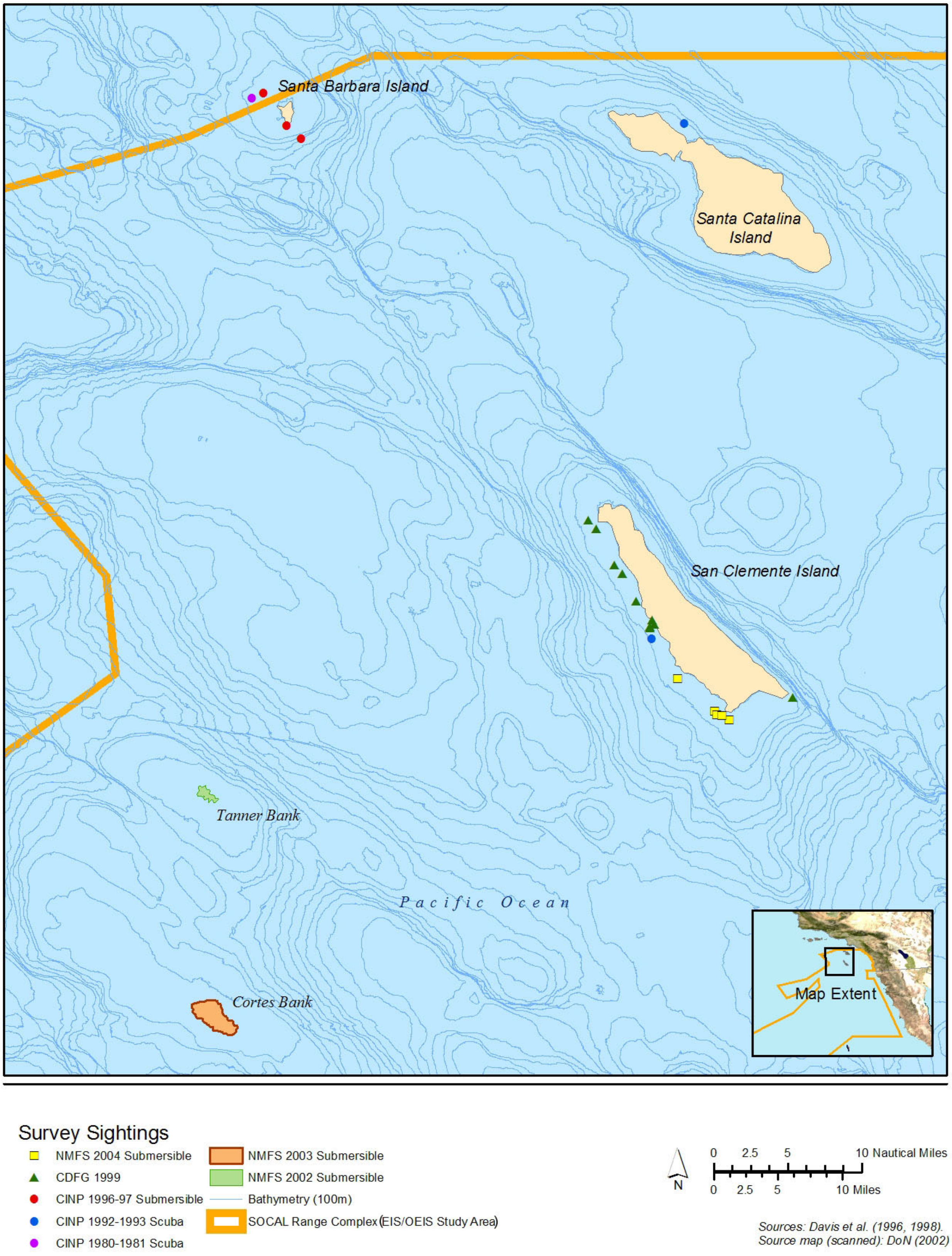


Figure 3.8-1: Locations of White Abalone in the Hawaii-Southern California Training and Testing Study Area

Although it occurs in extremely low numbers, its current range appears similar to that of its historical range (National Marine Fisheries Service 2008).

Except for some isolated survivors, the species is distributed only around the Channel Islands and along various banks within the Study Area (Hobday and Tegner 2000; Rogers-Bennett et al. 2002). Since 1996, various researchers (Butler et al. 2006; Davis et al. 1996, 1998; Hobday and Tegner 2000) have conducted submersible surveys off Tanner and Cortes Banks (approximately 50 miles [80 kilometers {km}] southwest of San Clemente Island) to map abalone habitat structure, examine distributions, and estimate the population size. They recorded 258 animals, with 168 recorded on Tanner Bank in 2002, at depths ranging from 105 to 180 ft. (32 to 55 m). In 2004, 35 individuals were recorded at Tanner Bank, 12 at Cortez Bank, and five off San Clemente Island. One study (Butler et al. 2006) documented 5 square miles (mi.^{2}) (1,359 hectares [ha]) of available white abalone habitat at Tanner Bank, 4 mi.^{2} (1,139 ha) at Cortez Bank, and 3 mi.^{2} (889 ha) on the western side of San Clemente Island. Both of these banks are underwater mountains that occur off the coast of Southern California.

3.8.2.4.3 Population and Abundance

Since the 1970s, the white abalone population has experienced a 99 percent reduction in density (National Marine Fisheries Service 2008). Between 2002 and 2010, decreases in abundance (approximately 78 percent) and density (33 to 100 percent depending on depth and survey year) have been reported at Tanner Bank, an area of historically high abundance (>1 per square meter [m^2]) (Butler et al. 2006, Stierhoff et al. 2012). An increase in the size distribution over this same time period suggests individuals in the white abalone population are growing larger (and aging) with little or no indication of adequate recruitment success. With a dispersed population of aging individuals, prospects for recruitment remain low without management intervention, such as outplanting of healthy, captive-bred white abalone in suitable habitats where populations are approaching or have reached local extinction (Stierhoff et al. 2012).

3.8.2.4.4 Predator-Prey Interactions

Similar to black abalone, the white abalone diet varies with life history stage. As larvae, white abalones do not actively feed. Settled abalone clamp tightly to rocky substrates and feed on algal matter scraped from the rocks or trapped under their shells. Juveniles feed on bottom-dwelling diatoms, bacterial films, and algae. As they increase in size and become less vulnerable to predation, abalones leave their sheltered habitat to search for food. Adult white abalone feed primarily on fragments of attached or drifting brown algae (National Oceanic and Atmospheric Administration 2010c). Predators of white abalone include sea otters, fish, sea stars, crabs, and octopuses, as well as humans through illegal harvesting (Hobday and Tegner 2000).

3.8.2.4.5 Species Specific Threats

White abalone faces similar threats (overharvesting, low population densities, and withering syndrome) to those of black abalone. Because of the small population of white abalone, impacts on the remaining population are magnified.

3.8.2.5 Fuzzy Table Coral (*Acropora paniculata*)

3.8.2.5.1 Status and Management

In February 2010, NMFS issued *Notice of 90-Day Finding on a Petition to List 83 Species of Corals as Threatened or Endangered Under the ESA*, which included fuzzy table coral (*Acropora paniculata*) (National Marine Fisheries Service 2010). In December 2012, NMFS published a proposed rule to list this species as threatened under the ESA. NMFS has not proposed a critical habitat designation for this species.

3.8.2.5.2 Habitat and Geographic Range

Fuzzy table coral has been reported to occupy upper reef slopes, subtidal, reef edges, and sheltered lagoons in water depths ranging from 33 to 115 ft. (10 to 35 m) (Carpenter et al. 2008). This coral species has a wide geographic range, stretching from the Red Sea, across the Indo-Pacific, western and central Pacific Ocean to the Papahanaumokuakea Marine National Monument at French Frigate Shoals (Brainard et al. 2011). Within the Study Area, this species exists only in the Hawaiian archipelago at French Frigate Shoals.

3.8.2.5.3 Population and Abundance

Fuzzy table coral is in the Acroporidae family of corals. Like other Acroporidae, fuzzy table coral can reproduce both sexually or asexually. Some are hermaphrodites, meaning that they possess both male and female reproductive organs. Some species reproduce sexually by releasing eggs and sperm into the water, where fertilization occurs and larvae begin to develop. After larvae settle on an appropriate surface, the colony begins to grow (Boulon et al. 2005). Fragmentation is a common form of asexual reproduction in species with thin branches. During a storm, thin branches typically break off from a colony and form new colonies by attaching to a suitable surface (Richmond 1997). Although fragmentation helps maintain high growth rates, it reduces the reproductive potential of some coral species by delaying the production of eggs and sperm for years following the damage (Lirman 2000).

Abundance of fuzzy table coral has been reported as uncommon to rare on most reefs (Veron 2000); however, it is common in Papua New Guinea (Wallace 1999). Apparently isolated to the French Frigate Shoals, this species is not common in the Study Area.

3.8.2.5.4 Predator-Prey Interactions

Like other Acroporidae corals, fuzzy table coral feed on zooplankton or other materials suspended in the water column, the majority of which are small marine organisms. Corals use stinging cells on tentacles surrounding their mouths to capture prey (Brusca and Brusca 2003). In addition to actively capturing prey, reef-building corals including fuzzy table coral have another method of acquiring nutrients through their symbiotic relationship with zooxanthellae. The waste products of the fuzzy table coral host provide nitrogen to the zooxanthellae, and the zooxanthellae provide organic compounds (e.g., carbohydrates) produced by photosynthesis to its host (Brusca and Brusca 2003, Schuhmacher and Zibrowius 1985). The photosynthetic pigments in zooxanthellae also provide corals with their characteristic color. Predators of corals include sea stars, snails, and fish (e.g., parrotfish and butterfly fish). See Section 3.8.2.11 (Corals, Hydroids, Jellyfish [Phylum Cnidaria]) for an overview of coral predator-prey relationships.

The specific effects of predation are poorly known for fuzzy table coral. Most members of the genus *Acropora* are preferentially consumed by crown-of-thorns seastars (*Acanthaster planci*) and by corallivorous snails, both of which occur in the Study Area.

3.8.2.5.5 Species Specific Threats

There are no species-specific threats associated with fuzzy table coral. It is susceptible to the same suite of stressors that generally threaten corals (Section 3.8.2.2, General Threats). As stated previously, the distribution of fuzzy table coral is limited to the French Frigate Shoals within the Papahanaumokuakea Marine National Monument. This species is protected by three regulatory agencies, including the NOAA

National Ocean Service, the U.S. Fish and Wildlife Service, and the State of Hawaii. The harvest of any coral is prohibited within the Papahanaumokuakea Marine National Monument. There is no human habitation within the monument and, therefore, no anthropogenic effects. Fishing, sedimentation, and pollution are not factors that could contribute to decline. While fuzzy table coral is not common in Hawaii, it is fully protected from human-caused impacts (due to state and federal regulations restricting activities within protected waters).

3.8.2.6 Irregular Rice Coral (*Montipora dilatata*)

3.8.2.6.1 Status and Management

In December 2012, NFMS published a proposed rule to list irregular rice coral (*Montipora dilatata*) as threatened under the ESA. NMFS has not proposed a critical habitat designation for irregular rice coral. Previously, this species was considered a species of concern by NMFS because of the rarity of this species and small geographic distribution, limited to a few Hawaiian reef locations.

There have been recent disagreements regarding taxomony of this species. NMFS prefers to group *Montipora flabellata, Montipora turgescens*, and *Montipora dilitata* for evaluation purposes for extinction risk. In November 2012, the State of Hawaii submitted comments on this strategy, stating that grouping these three species is not warranted. For instance, *Montipora turgescens* has a wide distribution in the Pacific, which contrasts with the narrower endemic distributions of the other two species.

3.8.2.6.2 Habitat and Geographic Range

Irregular rice coral is endemic to Hawaii and has a highly restricted distribution. According to the State of Hawaii, the only reliable location of irregular rice coral is Kaneohe Bay, on the island of Oahu, Hawaii, and reports of its occurrence elsewhere have been discredited or determined to be a misidentification of similar *Montipora* species (National Oceanic and Atmospheric Administration 2012 and Brainard et al. 2011).

3.8.2.6.3 Population and Abundance

Irregular rice coral is extremely rare. As stated previously, the distribution of this coral species is restricted to Kaneohe Bay, where there are only 10 colonies. Irregular rice coral colonies break easily in storms or through bioerosion, and the resulting fragments can form new colonies (National Marine Fisheries Service 2007). This species is sensitive to thermal stress, as are all *Montipora* species, and recovers slowly after a bleaching event (Brainard et al. 2011).

3.8.2.6.4 Predator-Prey Interactions

There is no species-specific information regarding predator-prey interactions for irregular rice corals. Members of genus *Montipora*, however, are a preferred prey species of crown-of-thorns sea star and subject to snail predation. (Brainard et al. 2011)

3.8.2.6.5 Species Specific Threats

Irregular rice coral is subject to the same suite of threats as other corals (Brainard et al. 2011). Irregular rice coral was originally considered a species of concern based on the following factors: (1) vulnerability to coral bleaching; (2) fresh water kills and exposure at extreme low tide; (3) habitat degradation and modification as a result of sedimentation, pollution, and alien alga invasion; and (4) damage by anchors, fish pots, swimmers, and divers (National Marine Fisheries Service 2010).

3.8.2.7 Blue Rice Coral (*Montipora flabellate*)

3.8.2.7.1 Status and Management

In February 2010, NMFS issued *Notice of 90-Day Finding on a Petition to List 83 Species of Corals as Threatened or Endangered Under the ESA*, which included blue rice coral (*Montipora flabellate*) (National Marine Fisheries Service 2010). In December 2012, NFMS published a proposed rule to list this species as threatened under the ESA. NMFS has not proposed a critical habitat designation for this species.

3.8.2.7.2 Habitat and Geographic Range

Blue rice coral, like irregular rice coral, is endemic to Hawaiian reef systems, although with a wider distribution in Hawaii. Veron (2000) reports this species as occupying most reef flats and slopes, and Carpenter et al. (2008) report this species to depths of 33 to 115 ft. (10 to 35 m).

3.8.2.7.3 Population and Abundance

Blue rice coral is the fifth-most common coral in Hawaii and is generally thought to be in decline. Declines in irregular rice coral are suspected to be greater than in blue rice corals (National Oceanic and Atmospheric Administration 2012, Brainard et al. 2011).

3.8.2.7.4 Predator-Prey Interactions

There is no species-specific information regarding predator-prey interactions for blue rice corals. Members of genus *Montipora,* however, are a preferred prey species of crown-of-thorns and subject to snail predation.

3.8.2.7.5 Species Specific Threats

There are no species-specific threats associated with blue rice coral. It is susceptible to the same suite of stressors that generally threaten corals (Section 3.8.2.2, General Threats).

3.8.2.8 Sandpaper Rice Coral (*Montipora patula*)

3.8.2.8.1 Status and Management

In February 2010, NMFS issued *Notice of 90-Day Finding on a Petition to List 83 Species of Corals as Threatened or Endangered Under the ESA*, which included sandpaper rice coral (*Montipora patula*) (National Marine Fisheries Service 2010). In December 2012, NFMS published a proposed rule to list this species as threatened under the ESA. NMFS has not proposed a critical habitat designation for this species.

3.8.2.8.2 Habitat and Geographic Range

Sandpaper rice coral is also a shallow reef (depth of 33 ft. [10 m]) (Brown and Wolf 2009), but it may occur in deeper habitats (National Oceanic and Atmospheric Administration 2012). Sandpaper rice coral is common in wave-swept environments but less tolerant of sediment-impacted areas (Jokiel et al. 2007). The geographic range of sandpaper rice coral is restricted to the Hawaiian Islands, Johnston Atoll, and the Mariana Islands (Veron 2000). Within the Study Area, records are reported from islands within the Papahanaumokuakea Marine National Monument, Johnston Atoll, waters off Molokai, and the western coast of Hawaii Island.

3.8.2.8.3 Population and Abundance

Sandpaper rice coral has been reported as the fourth-most abundant coral in Hawaii (National Oceanic and Atmospheric Administration 2012, Brainard et al. 2011). Declines of sandpaper rice coral have been reported on a subset of transects over 12 years, but other transects within sites show high variability between surveys and/or similar cover between the beginning and end of the study (Dollar and Grigg 2004).

3.8.2.8.4 Predator-Prey Interactions

There is no species-specific information regarding predator-prey interactions for sandpaper rice corals. Members of genus *Montipora,* however, are a preferred prey species of crown-of-thorns and subject to snail predation (Brainard et al. 2011).

3.8.2.8.5 Species Specific Threats

There are no species-specific threats associated with sandpaper rice coral. It is susceptible to the same suite of stressors that generally threaten corals (Section 3.8.2.2, General Threats). It should be noted that sandpaper rice coral is among the most bleaching-susceptible species in the Northwestern Hawaiian Islands (Kenyon and Brainard 2006).

3.8.2.9 Forminiferans, Radiolarians, Ciliates (Phylum Protozoa)

Foraminiferans, radiolarians, and ciliates are minute singled-celled organisms, sometimes forming colonies of cells, belonging to the Phylum Protozoa (Castro and Huber 2000). They are found in the water column and seafloor of the world's oceans. Foraminifera in the genus *Globergerina* occur in the waters around the California Current and Insular Pacific-Hawaiian Large Marine Ecosystems (Field et al. 2006). Forminifera form diverse and intricate shells out of calcium carbonate (Wetmore 2006). The shells of formanifera that live in the water column eventually sink to the deep seafloor, forming sediments known as formaminiferan ooze (Wetmore 2006). Formaninfera feed on diatoms and other small organisms. Their predators include copepods and other zooplankton. Radiolarians are microscopic organisms that form glass-like shells made of silica. Radiolarian ooze covers large areas of the ocean floor (Castro and Huber 2000; Wetmore 2006). Ciliates are protozoans with small hairs (cilia) that are used to feed and move around.

3.8.2.10 Sponges (Phylum Porifera)

Sponges include over 8,000 marine species worldwide, and are classified in the Phylum Porifera (Appeltans et al. 2010). Sponges are bottom-dwelling, multi-cellular animals that can be best described as an aggregation of cells that perform different functions. Sponges are largely sessile (not mobile), except for their larval stages, and are common throughout the Study Area at all depths. Sponges reproduce both sexually and asexually. Water flowing through the sponge provides food and oxygen and removes wastes (Castro and Huber 2000; Collins and Waggoner 2006). Many sponges form calcium carbonate or silica spicules or bodies embedded in cells to provide structural support (Castro and Huber 2000). Sponges provide homes for a variety of animals, including shrimp, crabs, barnacles, worms, brittle stars, sea cucumbers, and other sponges (Colin and Arneson 1995d). Sponges in the genera *Grantiidae* and *Clathria* occur in the waters around the California Current Large Marine Ecosystems. Common species in the Insular Pacific-Hawaiian Large Marine Ecosystem include grey encrusting sponge (*Gelliodes fibrosa*) and *blue Caribbean sponge* (*Haliclona caerulea*) (Quanzi and Wang 2009).

3.8.2.11 Corals, Hydroids, Jellyfish (Phylum Cnidaria)

There are over 10,000 marine species of corals, hydroids, and jellyfish worldwide (Appeltans et al. 2010). Members of this group are found throughout the Study Area at all depths. Hydroids are colonial animals similar in form to corals. Hydroids have both flexible and rigid skeletons, but are not considered to be habitat-forming (Colin and Arneson 1995a; Gulko 1998). Jellyfish are motile as larvae, sessile as an intermediate colonial polyp stage, and motile as adults (Brusca and Brusca 2003). They are predatory at all stages and, like all Cnidaria, use tentacles equipped with stinging cells to capture prey (Castro and Huber 2000; University of California at Berkeley 2010a). Jellyfish are an important prey species for a range of organisms, including some sea turtles and ocean sunfish (*Mola mola*) (Heithaus et al. 2002; James and Herman 2001).

Corals are in a class of animals that also includes anemones and soft corals. The individual unit is referred to as a polyp, and most species occur as colonies of polyps. Reef-building corals in the photic zone, shallower than approximately 650 ft. (200 m), usually host zooxanthellae that provide extra energy to the corals (Castro and Huber 2000). All corals feed on small planktonic organisms or dissolved organic matter, although some shallow-water corals derive most of their energy from their symbiotic algae (Dubinsky and Berman-Frank 2001). Most hard corals and some soft corals are habitat-forming (i.e., they form coral reefs) (Freiwald et al. 2004; Spalding et al. 2001), and some soft corals define particular habitat types (e.g., hard bottom is typically characterized by sponges and soft corals) (South Atlantic Fishery Management Council 1998).

Apart from a few exceptions in the Pacific Ocean, coral reefs are confined to the warm tropical and subtropical waters between 30 degrees (°) North (N) and 30° South (S). The dominant species of corals in the Insular Pacific-Hawaiian Large Marine Ecosystem are in the genera Porites, Montipora, and Pavona (National Marine Fisheries Service 2007, 2009). Deep-sea coral communities are prevalent throughout the Hawaiian archipelago, and often form offshore reefs that surround all of the Main Hawaiian Islands at depths between 27 and 109 fathoms (50 to 200 m) (Maragos 1998). Much like shallow-water corals, deep-sea corals are fragile, slow growing, and can survive for hundreds of years (Roberts and Hirshfield, 2003). In the Hawaiian Islands, gorgonians are the most common group of deep-sea corals. Of the gorgonians, primnoids are the most abundant group in the Hawaiian archipelago and are dominant off Molokai (Chave and Malahoff, 1998).

While there are no coral reefs in the eastern Pacific Ocean, there are cold-water coral species that would occur within the California Current Large Marine Ecosystem. Corals of the in the California portion of the Study Area include anthozoans and hydrozoans (or hydrocorals); anthozoans include hexacorals and octocorals. Hexacorals are represented by scleractinians (stony corals), antipatharians (black corals), and corallimorpharians (coral-like organisms lacking a calcium carbonate skeleton); octocorals include soft corals and gorgonians (e.g., sea fans). Most of the habitat-forming deep-sea corals are anthozoans and hydrozoans (Etnoyer and Morgan 2003, 2005). The majorities of stony corals within the California Current Large Marine Ecosystem are, however, azooxanthellate and obtain energy from detritus, zooplankton, and nekton they capture from the surrounding water (Cairns 1994; Roberts and Hirshfield 2003). Since azooxanthellate corals do not depend on sunlight or a symbiotic existence with zooxanthellae, they can be found in water depths exceeding 20,000 ft. (6,000 m) (Etnoyer and Morgan 2005).

Not all of the 82 species included in the 2010 status review by NMFS were proposed for threatened or endangered status in the December 2012 proposed rule. Of the 16 species that were not proposed for listing, five of these occur within the Study Area. These species include swelling coral (*Leptoseris* *incrustans*), Puko's coral (*Porites pukoensis*), stellar coral (*Psammocora stellata*), Agassiz's coral (*Cyphastrea agassizi*), and ocellated coral (*Cyphastrea ocellina*). The December 2012 proposed rule obviated the status of these five species as ESA candidate species.

The coral species that were originally included in the status review, but not proposed for ESA listing, occur throughout the coastal areas of the Insular Pacific-Hawaiian Large Marine Ecosystem in the Hawaii portion of the Study Area. Swelling coral is a widespread species, occurring throughout the Red Sea and the East Indian Ocean as far as Hawaii and French Polynesia (Brown and Wolf 2009) in shallow reef flats (Veron 2000), although this species may occur at much deeper depths between 50 and 80 m on reef slopes (Rooney et al. 2010). Within the Study Area, reports of this species include Papahanaumokuakea Marine National Monument, Pacific Remote Islands Marine National Monument, and shallow waters off of Molokai and Hawaii Island. Puko's coral is endemic to Hawaii and is believed to occupy shallow protected reef environments, especially lagoons (Veron 2000). The current distribution is believed to be found at Puako, on the south side of Molokai, although this species has not been found there during recent searches (National Oceanic and Atmospheric Administration 2012). The depth range for this species is unknown, but is generally associated with shallow reef environments (Sheppard et al. 2008). Stellar coral is widely distributed across the Indo-Pacific region, from the Seychelles in the western Indian Ocean to areas on the Pacific coasts of North, Central, and South America (outside of the Southern California portion of the Study Area) (Cortes et al. 2008). Stellar coral has been reported to occupy shallow wave-washed rock (Veron 2000) and has been reported at depths ranging from 0 m to 20 m (Carpenter et al. 2008). Agassiz's coral and ocellated coral are uncommon in the Hawaiian archipelago (Fenner 2005). They are also found on Johnston Atoll, south of the Hawaiian Islands, as well as waters off the western coast of Hawaii Island and northern coast of Molokai. Agassiz's coral has been reported from shallow reef environments (Veron 2000) in depths ranging from 3 m to 20 m (Carpenter et al. 2008). Ocellated coral has been reported from shallow upper reef slopes (Veron 2000) in waters ranging from 5 m to 20 m (Carpenter et al. 2008).

Estimates of population or abundance for candidate corals in the Study Area are not available or speculative. Swelling coral is found throughout the Hawaiian archipelago and is believed to be decreasing (Brown and Wolf 2009). Stellar corals grow slowly but are also among the most opportunistic of corals because they can rapidly recolonize areas left vacant by disturbances (Brown and Wolf 2009). Sexual reproduction is important, but asexual reproduction and fragmentation are more effective strategies for colonizing free areas within the reef. The population trend for Puko's coral is unknown (Sheppard et al. 2008). This species is very rare, with likely fewer than 50 colonies occurring at a single site on Molokai (Sheppard et al. 2008). Stellar coral is abundant in the eastern Pacific portion of its range, although in the Hawaii portion of the Study Area, the species is reported as uncommon (Veron 2000). Both Agassiz's coral and ocellated coral are reported as rare or uncommon (Veron 2000, Carpenter 2008).

Predation information for swelling coral, Agassiz's coral, and ocellate coral is not available (Brainard et al. 2011). Puko's coral and other members of genus *Porites* are susceptible to crown-of-thorns seastar and snail predation. Butterfly fish are also known to predate on massive forms of Puko's coral (Brainard et al. 2011). Stellar coral is also susceptible to predation by crown-of-thorns seastar but is not a preferred prey species (Brainard et al. 2011).

3.8.2.12 Flatworms (Phylum Platyhelminthes)

Flatworms include between 8,000 and 20,000 marine species worldwide (Appeltans et al. 2010; Castro and Huber 2000), and are the simplest form of marine worm (Castro and Huber 2000). The largest single group of flatworms is parasites commonly found in fishes, seabirds, and whales (Castro and Huber 2000; University of California Berkeley 2010b). The life history of parasitic flatworms plays a role in the regulation of populations for the marine vertebrates they inhabit. Ingestion by the host organism is the primary dispersal method for parasitic flatworms. As parasites, they are not typically found in the water column, outside of a host organism. The remaining groups are non-parasitic carnivores, living without a host. Flatworms are found throughout the Study Area living on rocks in tide pools and reefs, or within the top layer of sandy areas. Flatworms in the genera *Waminoa* and *Freemania* occur in the waters around the California Current Large Marine Ecosystems. Dominant genera of flatworms in the Insular Pacific-Hawaiian Large Marine Ecosystem include *Pseudobiceros* and *Pseudoceros* (Appeltans et al. 2010; Castro and Huber 2000).

3.8.2.13 Ribbon Worms (Phylum Nemertea)

Ribbon worms include approximately 1,000 marine species worldwide (Appeltans et al. 2010). Ribbon worms, with their distinct gut and mouth parts, are more complex than flatworms (Castro and Huber 2000). Organisms in this phylum are bottom-dwelling, predatory marine worms that are equipped with a long extension from the mouth (proboscis) that helps them capture food (Castro and Huber 2000). Some species are also equipped with a sharp needle-like structure that delivers poison to kill prey. Ribbon worms occupy an important place in the marine food web as prey for a variety of fish and invertebrates and as a predator of other bottom-dwelling organisms, such as worms and crustaceans (Castro and Huber 2000). Some ribbon worms are parasitic and occupy the inside of the mantle of mollusks, where they feed on the waste products of their host (Castro and Huber 2000). Ribbon worms are found throughout the Study Area in soft-bottom habitat. *Emplectonema gracile* is a common species of ribbon worm that occurs in the waters around the California Current Large Marine Ecosystems. Several species of ribbon worms in the genus *Baseodiscus* are endemic to the Insular Pacific-Hawaiian Large Marine Ecosystem (Castro and Huber 2000).

3.8.2.14 Round Worms (Phylum Nematoda)

Round worms include over 5,000 marine species, though this number may be a gross underestimate (Appeltans et al. 2010). Common genera include *Anisakis* and *Thynnascaris* (Castro and Huber 2000). Round worms are small and cylindrical, and are abundant in sediments and in host organisms as parasites (Castro and Huber 2000). Round worms are one of the most widespread marine invertebrates, with population densities of one million organisms per 11 square feet ($ft.^2$) ($1\ m^2$) of mud (Levinton 2009). This group has a variety of food preferences, including algae, small invertebrates, annelid worms, and organic material from sediment. Like free-living flatworms, parasitic nematodes provide important ecosystem services by regulating populations of other marine organisms by causing illness or mortality in less viable organisms. Round worms are found throughout the Study Area. Species in the family Anisakidae infect marine fish, and may cause illness in humans if fish are consumed raw without proper precautions (Castro and Huber 2000).

3.8.2.15 Segmented Worms (Phylum Annelida)

Segmented worms include approximately 12,000 marine species worldwide in the phylum Annelida, although most marine forms are in the class Polychaeta (Appeltans et al. 2010). Segmented worms are the most complex group of marine worms, with a well-developed respiratory and gastrointestinal system (Castro and Huber 2000). Different species of segmented worms may be highly mobile or burrow in the seafloor (Castro and Huber 2000). Most segmented worms are predators; others are scavengers, deposit feeders, filter feeders, or suspension feeders of sand, sediment, and water (Hoover 1998c). The variety of feeding strategies and close connection to the seafloor make Annelids an integral part of the marine food web (Levinton 2009). Burrowing in the seafloor and agitating the sediment increases the oxygen content of the seafloor and makes important buried nutrients available to other organisms. This ecosystem service allows bacteria and other organisms, which are also an important part of the food web, to flourish on the seafloor. Segmented worms are found throughout the Study Area inhabiting rocky, sandy, and muddy areas of the seafloor. Common genera of segmented worms in the California Current Large Marine Ecosystem are *Nereis* and *Phragmatapoma*. Common species in the Insular Pacific-Hawaiian Large Marine Ecosystem are *Loimia medusa* and *Spirobranchus giganteus*. These worms also colonize corals, vessel hulls, docks, and floating debris (Castro and Huber 2000). Some species of worms build rigid tubes, and aggregations of these tubes form reefs. Giant tube worms (*Riftia pachyptila*) are chemosynthetic (a primary production process without sunlight) reef-forming worms living on hydrothermal vents of the abyssal oceans. Their distribution is poorly known in the Study Area.

3.8.2.16 Bryozoans (Phylum Bryozoa)

Bryozoans are small lace-like, colony-forming animals. Classified in the Phylum Bryozoa, there are approximately 5,000 marine species worldwide (Appeltans et al. 2010). Bryozoans attach to a variety of surfaces, including rocks, shells, wood, and algae, and feed on particles suspended in the water (Hoover 1998a). Bryozoans are found throughout the Study Area. Genera that occur in the California Current Large Marine Ecosystem are *Bugula* and *Schizporella*. Common species in the Insular Pacific-Hawaiian Large Marine Ecosystem are *Disporella violacea* and *Reteporellina denticulate*. Bryozoans are of economic importance for bioprospecting (the search for organisms for potential commercial use in pharmaceuticals). As a biofouling organism, bryozoans also interfere with boat operations and clog industrial water intakes and conduits (Hoover 1998a).

3.8.2.17 Squid, Bivalves, Sea Snails, Chitons (Phylum Molluska)

Approximately 27,000 marine species are classified in the Phylum Molluska worldwide (Appeltans et al. 2010). Octopus and squid (cephalopods), sea snails and slugs (gastropods), clams and mussels (bivalves), and chitons (polyplacophorans) are mollusks with a muscular organ called a foot, which is used for mobility (Castro and Huber 2000). Sea snails and slugs eat fleshy algae and a variety of invertebrates, including hydroids, sponges, sea urchins, worms, and small crustaceans, as well as detritus (Castro and Huber 2000; Colin and Arneson 1995c). Clams, mussels, and other bivalves feed on plankton and other suspended food particles (Castro and Huber 2000). Chitons use rasping tongues, known as radula, to scrape food (algae) off rocks (Castro and Huber 2000; Colin and Arneson 1995c). Squid and octopus are active swimmers at all depths, and use a beak to prey on a variety of organisms, including fish, shrimp, and other squids (Castro and Huber 2000; Hoover 1998c; Western Pacific Regional Fishery Management Council 2001). Octopuses mostly prey on fish, shrimp, eels, and crabs (Wood and Day 2005).

Important commercial, ecological, and recreational species of Molluska in the California Current Large Marine Ecosystem include all abalone species (black abalone, white abalone, green abalone, red abalone, pink abalone, threaded abalone, and flat abalone) found within the Study Area and the California market squid (*Loligo opalescens*) (Clark et al. 2005). Important commercial, ecological, and recreational species of Molluska in the Insular Pacific-Hawaiian Large Marine Ecosystem include various species of squid, the endemic cuttlefish (*Euprymna scolopes*), bivalves (clams and mussels), and limpets (*Cellana exarata* and *Cellana sandwicensis*), also called opihi (Western Pacific Regional Fishery Management Council 2001).

3.8.2.18 Shrimp, Crab, Lobster, Barnacles, Copepods (Phylum Arthropoda)

Shrimp, crab, lobster, barnacles, and copepods are animals with skeletons on the outside of their body (Castro and Huber 2000). Classified in the Phylum Arthropoda, over 50,000 species belong to the subphylum Crustacea within Phylum Arthropoda (Appeltans et al. 2010). Shrimp, crabs, and lobsters are typically carnivorous or omnivorous predators or scavengers, preying on mollusks (primarily gastropods, such as limpets, sea snails and slugs), other crustaceans, echinoderms (such as starfish, urchins, and sea cucumbers), small fish, algae, and sea grass (Waikiki Aquarium 2009a, b, c; Western Pacific Regional Fishery Management Council 2009). Barnacles and copepods feed by filtering algae and small organisms from the water (Levinton 2009).

Important commercial, ecological, and recreational species of Crustacea in the California Current Large Marine Ecosystem include the spot shrimp (*Pandalus platyceros*), ridgeback rock shrimp (*Sicyonia ingentis*), rock crab (*Cancer* species), sheep crab (*Loxorhynchus grandis*) and California spiny lobster (*Panulirus interruptus*) (Clark et al. 2005). The Hawaiian spiny lobster is an important commercial, ecological, and recreational species of Crustacea in the Insular Pacific-Hawaiian Large Marine Ecosystem.

3.8.2.19 Sea Stars, Sea Urchins, Sea Cucumbers (Phylum Echinodermata)

Phylum Echinodermata has over 6,000 marine species, such as sea stars, sea urchins, and sea cucumbers (Appeltans et al. 2010). Sea stars (asteroids), sea urchins (echinoids), sea cucumbers (holothuriods), brittle stars and basket stars (ophuiroids), and feather stars and sea lilies (crinoids) are symmetrical around the center axis of the body (Castro and Huber 2000). Most echinoderms have separate sexes, but unisexual forms occur among the sea stars, sea cucumbers, and brittle stars. Many species have external fertilization, producing planktonic larvae, but some brood their eggs, never releasing free-swimming larvae (Colin and Arneson 1995b). Many echinoderms are either scavengers or predators on organisms that do not move, such as algae, stony corals, sponges, clams, and oysters (Hoover 1998b). Some species filter food particles from sand, mud, or water.

Important commercial, ecological, and recreational species of echinoderms in the California Current Large Marine Ecosystem include California sea cucumbers (*Parastichopus californicus*), sea stars (*Pisaster* species), red sea urchin (*Strongylocentrotus franciscanus*), and purple sea urchin (*Strongylocentrotus purpuratus*) (Clark et al. 2005). Important commercial, ecological, and recreational species of echinoderm in the Insular Pacific-Hawaiian Large Marine Ecosystem include helmet urchins, the burrowing sea urchin (*Echinometra mathaei*), sea cucumbers, and sea stars. The crown-of-thorns sea star (*Acanthaster planci*) is a carnivorous predator that feeds on coal polyps and can devastate coral reefs because of its voracious appetite (Pawson 1995). In 1969, crown-of-thorns sea stars infested reefs off southern Molokai but did not cause extensive damage to living coral polyps of cauliflower coral (Gulko 1998; Hoover 1998b).

3.8.3 ENVIRONMENTAL CONSEQUENCES

This section analyzes the potential impacts on marine invertebrates from implementing the project alternatives, including the No Action Alternative, Alternative 1, and Alternative 2. Navy training and testing activities are evaluated for their potential impact on marine invertebrates in general, by taxonomic groups, and in detail for species listed under the ESA, species proposed for listing, and federally managed species or groups such as coral Habitat Areas of Particular Concern (Section 3.8.2, Affected Environment).

General characteristics of all Navy stressors were introduced in Section 3.0.5.3 (Identification of Stressors for Analysis) and living resources' general susceptibilities to stressors were introduced in Section 3.0.5.7 (Biological Resource Methods). Stressors vary in intensity, frequency, duration, and location within the Study Area. Based on the general threats to marine invertebrates discussed in Section 3.8.2 (Affected Environment), stressors applicable to marine invertebrates in the Study Area and analyzed below include the following:

- Acoustic (sonar, other active acoustic sources, underwater explosives)
- Energy (electromagnetic devices)
- Physical disturbance and strikes (vessels and in-water devices, military expended materials, seafloor devices)
- Entanglement (fiber optic cables, guidance wires, parachutes)
- Ingestion (military expended materials)
- Secondary

These components are analyzed for potential impacts on marine invertebrates within the stressor categories contained in this section. The specific analyses of the training and testing activities consider these components, within the context of geographic location and overlap of marine invertebrates. In addition to the analysis here, the details of all training and testing activities, stressors, and geographic occurrence within the Study Area are summarized in Section 3.0.5.3 (Identification of Stressors for Analysis) and detailed in Appendix A (Navy Activities Descriptions).

3.8.3.1 Acoustic Stressors

Assessing whether sounds may disturb or injure an animal involves understanding the characteristics of the acoustic sources, the animals that may be near the sound, and the effects that sound may have on the physiology and behavior of those animals. The methods used to predict acoustic effects on invertebrates build upon the Conceptual Framework for Assessing Effects from Sound-Producing Activities (Section 3.0.5.7.1). Categories of potential impacts are direct trauma, hearing loss, auditory masking, behavioral reactions, and physiological stress. Little information is available on the potential impacts on marine invertebrates of exposure to sonar, explosions, and other sound-producing activities. Most studies focused on squid or crustaceans, and the consequences of exposures to broadband impulsive air guns typically used for seismic exploration, rather than on sonar or explosions.

Direct trauma and mortality may occur due to the rapid pressure changes associated with an explosion. Most marine invertebrates lack air cavities that could make them vulnerable to trauma due to rapid pressure changes. Marine invertebrates could also be displaced by a shock wave, which could cause injury.

To experience hearing impacts, masking, behavioral reactions, or physiological stress, a marine invertebrate must be able to sense sound. Marine invertebrates are likely only sensitive to water particle motion caused by nearby low-frequency sources, and likely do not sense distant or mid- and high-frequency sounds (Section 3.8.2.1, Invertebrate Hearing and Vocalization). Andre et al. (2011) found progressive damage to statocyst hair cells in squid after exposure to two hours of 50 to 100 Hz sweeps at sound pressure levels of 157 to 175 dB re 1 µPa; however, it is impossible to determine whether damage was because of the sound exposure or some other aspect of capture or captivity because inappropriate and incorrect controls were used. No damage to statocysts and no impacts on crustacean balance (another function of the statocyst) were observed in crustaceans repeatedly exposed to high-intensity airgun firings (Christian et al. 2003; Payne et al. 2007). This limited information suggests that marine invertebrate statocysts may be resistant to impulsive sound (such as explosives) impacts, but that the impact of long-term or non-impulsive (such as sonar or other active acoustic sources) sound exposures is undetermined.

Masking occurs when a sound interferes with an animal's ability to detect other biologically relevant sounds in its environment. Little is known about how marine invertebrates use sound in their environment. Some studies have shown that crab and coral larvae and post-larvae may use nearby reef sounds when in their settlement phase (Jeffs et al. 2003; Radford et al. 2007; Stanley et al. 2010; Vermeij et al. 2010), although it is unknown what component of reef noise is used. Larvae likely sense particle motion of nearby sounds, limiting their reef noise detection range (less than 328 ft. [100 m]) (Vermeij et al. 2010). Anthropogenic sounds could mask important acoustic cues, affecting detection of settlement cues or predators, potentially affecting larval settlement patterns or survivability in highly modified acoustic environments (Simpson et al. 2011). Low-frequency sounds could interfere with perception of low-frequency rasps or rumbles among crustaceans, although these are often already obscured by ambient noise (Patek et al. 2009). Sonar is not used in areas where corals proposed for ESA listing are known to occur.

Studies of invertebrate behavioral responses to sound have focused on responses to impulsive sound. Some captive squid showed strong startle responses, including inking, when exposed to the first shot of broadband sound from a nearby seismic airgun (sound exposure level of 163 dB re 1 μPa^2-s), but strong startle responses were not seen when sounds were gradually increased (McCauley et al. 2000a, b). Slight increases in behavioral responses, such as jetting away or changes in swim speed, were observed at receive levels exceeding 145 dB re 1 μPa^2-s (McCauley et al. 2000a, b). Other studies have shown no observable response by marine invertebrates to sounds. Snow crabs did not react to repeated firings of a seismic airgun (peak received sound level was 201 dB re 1 µPa) (Christian et al. 2003), while squid did not respond to killer whale echolocation clicks (higher frequency signals ranging from 199 to 226 dB re 1 µPa) (Wilson et al. 2007). Krill did not respond to a research vessel approaching at 2.7 knots (source level below 150 dB re 1 µPa) (Brierley et al. 2003). Distraction may be a consequence of some sound exposures. Hermit crabs were shown to delay reaction to an approaching visual threat when exposed to continuous noise, putting them at increased risk of predation (Chan et al. 2010).

There is some evidence of possible stress effects on invertebrates from long-term or intense sound exposure. Captive sand shrimp exposed to low-frequency noise (30 to 40 dB above ambient) continuously for 3 months demonstrated decreases in both growth rate and reproductive rate (Lagardère 1982). Sand shrimp showed lower rates of metabolism when kept in quiet, soundproofed tanks than when kept in tanks with typical ambient noise (Lagardère and Régnault 1980). Repeated intense airgun exposures caused no changes in biochemical stress markers in snow crabs (Christian et al. 2003), but some biochemical stress markers were observed in lobsters (Payne et al. 2007). The study indicated that this may have been because of captivity rather than noise exposure. The effect of long-term (multiple years), intermittent sound exposure was examined in a statistical analysis of recorded catch rate of rock lobster and seismic airgun activity (Parry and Gason 2006). No correlation was found between catch rate and seismic airgun activity, implying no long-term population impacts from intermittent anthropogenic sound exposure over long periods.

Because research on the consequences of exposing marine invertebrates to anthropogenic sounds is limited, qualitative analyses were conducted to determine the effects of the following acoustic stressors on marine invertebrates within the Study Area: non-impulsive sources (including sonar, vessel noise, aircraft overflights, and other active acoustic sources) and impulsive acoustic sources (including explosives, pile driving, swimmer defense airguns, and weapons firing).

3.8.3.1.1 Impacts from Sonar and Other Active Acoustic Sources

Sources of non-impulsive underwater sound during testing and training events include broadband vessel noise (including surface ships, boats, and submarines), aircraft overflight noise (fixed-wing and rotary-wing aircraft), sonar, and other active non-impulsive sources. Non-impulsive sounds associated with testing and training are described in Section 3.0.5.3.1 (Acoustic Stressors).

Surface combatant ships and submarines are designed to be quiet to evade enemy detection, whereas other Navy ships and small craft have higher source levels, similar to equivalently sized commercial ships and private vessels (see Section 3.0.5.3.1.6, Vessel Noise). Ship noise tends to be low-frequency and broadband. Broadband noise from aircraft would depend on the platform, speed, and altitude (see Section 3.0.5.3.1.7, Aircraft Overflight Noise). Any sound transmitted through the air-water interface. Underwater sounds from aircraft are strongest just below the surface and directly under the aircraft. Sonar and other active acoustic sound sources emit sound waves into the water to detect objects, safely navigate, and communicate. These sources may emit low-, mid-, high-, or very-high-frequency sounds at various sound pressure levels.

Most marine invertebrates do not have the capability to sense sound; however, some may be sensitive to nearby low-frequency and possibly lower-mid-frequency sounds, such as some active acoustic sources or vessel noise (see Section 3.8.2.1, Invertebrate Hearing and Vocalization). Because marine invertebrates lack the adaptations that would allow them to sense sound pressure at long distances, the distance at which they may detect a sound is probably limited.

The relatively low sound pressure level beneath the water surface due to aircraft is likely not detectable by most marine invertebrates. For example, the sound pressure level from an H-60 helicopter hovering at 50 ft. is estimated to be about 125 dB re 1 µPa at 1 m below the surface, a sound pressure lower than other sounds to which marine invertebrates have shown no reaction (see Section 3.8.3.1, Acoustic Stressors). Therefore, impacts due to aircraft overflight noise are not expected.

3.8.3.1.1.1 No Action Alternative

<u>Training Activities</u>

Under the No Action Alternative, training activities using sonar and other active acoustic sources could occur throughout the Study Area, but would typically occur in the Southern California (SOCAL) Range Complex and HRC. Certain portions of the Study Area, such as areas near Navy ports, airfields, and range complexes are used more heavily by vessels and aircraft than other portions of the Study Area. Navy vessel noise and aircraft overflight noise associated with training could occur in all of the range complexes and throughout the Study Area while in transit. The locations and number of activities proposed for training under the No Action Alternative are shown in Table 2.8-1 of Chapter 2 (Description of Proposed Action and Alternatives). Sounds produced during training are described in Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources), Section 3.0.5.3.1.6 (Vessel Noise), and Section 3.0.5.3.1.7 (Aircraft Overflight Noise).

As discussed above, most marine invertebrates would not sense mid- or high-frequency sounds, distant sounds, or aircraft noise transmitted through the air-water interface (see Section 3.8.2.1, Invertebrate Hearing and Vocalization). Most marine invertebrates would not be close enough to intense sound sources, such as some sonars, to potentially experience impacts to sensory structures. Any marine invertebrate capable of sensing sound may alter its behavior if exposed to non-impulsive sound, although it is unknown if responses to non-impulsive sounds occur. Continuous noise, such as from vessels, may contribute to masking of relevant environmental sounds, such as reef noise. Because the distance over which most marine invertebrates are expected to detect any sounds is limited and vessels would be in transit, any sound exposures with the potential to cause masking or behavioral responses would be brief. Without prolonged proximate exposures, long-term impacts are not expected. Although non-impulsive underwater sounds produced during training activities may briefly impact individuals, intermittent exposures to non-impulsive sounds are not expected to impact survival, growth, recruitment, or reproduction of widespread marine invertebrate populations.

Under the No Action Alternative, ESA-listed black and white abalone and coral species proposed for ESA listing would not be able to hear sonar or other active acoustic sources. Training activities using sonar or other active acoustic sources are not proposed in designated black abalone or white abalone critical habitat in shallow waters within SOCAL, nor does this activity occur in waters known to support corals that are proposed for ESA listing. No critical habitat was designated for the coral species proposed for listing. Noise produced by transiting vessels would not result in the destruction or impairment of any hard substrate that could be habitat for black or white abalone, or habitat for corals proposed for ESA listing.

Pursuant to the ESA, the use of sonar and other active acoustic sources during training activities as described under the No Action Alternative:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

Under the No Action Alternative, testing activities using sonar and other active acoustic sources could occur throughout the Study Area, but would typically occur in SOCAL and HRC. Certain portions of the Study Area, such as areas near Navy ports and airfields, installations, and training ranges and testing areas are used more heavily by vessels and aircraft than other portions of the Study Area. Underwater noise from vessels and aircraft overflights associated with testing could occur in all the range complexes, the training ranges, and throughout the Study Area while in transit. The locations and number of activities proposed for testing under the No Action Alternative are shown in Table 2.8-2 through 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives). Sounds produced during testing are described in Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources), Section 3.0.5.3.1.6 (Vessel Noise), and Section 3.0.5.3.1.7 (Aircraft Overflight Noise).

As discussed above, most marine invertebrates would not sense mid- or high-frequency sounds, distant sounds, or aircraft noise transmitted through the air-water interface (see Section 3.8.2.1, Invertebrate Hearing and Vocalization). Most marine invertebrates would not be close enough to intense sound sources, such as some sonars, to potentially experience impacts to sensory structures. Any marine invertebrate capable of sensing sound may alter its behavior if exposed to non-impulsive sound, although it is unknown if responses to non-impulsive sounds occur. Continuous noise, such as from vessels, may contribute to masking of relevant environmental sounds, such as reef noise. Because the distance over which most marine invertebrates are expected to detect any sounds is limited and vessels would be in transit, any sound exposures with the potential to cause masking or behavioral responses would be brief. Without prolonged proximate exposures, long-term impacts are not expected. Although non-impulsive underwater sounds produced during testing activities may briefly impact individuals, intermittent exposures to non-impulsive sounds are not expected to impact survival, growth, recruitment, or reproduction of widespread marine invertebrate populations.

Under the No Action Alternative, ESA-listed black and white abalone and coral species proposed for ESA listing would not be able to hear sonar or other active acoustic sources. Testing activities using sonar or other active acoustic sources are not proposed in designated black abalone or white abalone critical habitat in shallow waters within SOCAL, nor does this activity occur in waters known to support corals that are proposed for ESA listing. No critical habitat was designated for the coral species proposed for listing. Noise produced by transiting vessels would not result in the destruction or impairment of any hard substrate that could be habitat for black or white abalone habitat, or habitat for corals proposed for ESA listing. The stressors discussed in this section do not co-occur with ESA-listed species or coral species proposed for ESA listing.

Pursuant to the ESA, the use of sonar and other active acoustic sources during testing activities as described under the No Action Alternative:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.1.1.2 Alternative 1

Training Activities

Under Alternative 1, marine invertebrates would be exposed to increased amounts of non-impulsive sound compared to the No Action alternative due to increased use of sonars and other active acoustic sources, vessels, and aircraft overflights. Non-impulsive sound sources used during training would be similar to those under the No Action Alternative, with the addition of new active acoustic sources associated with the introduction of the Littoral Combat Ship. The locations of training using vessels, aircraft, and sonars would be similar to those under the No Action Alternative. The locations and number of activities proposed for training under Alternative 1 are shown in Table 2.8-1 of Chapter 2 (Description of Proposed Action and Alternatives). Sounds produced during training are described in Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources), Section 3.0.5.3.1.6 (Vessel Noise), and Section 3.0.5.3.1.7 (Aircraft Overflight Noise).

In comparison to the No Action Alternative, the increased use under Alternative 1 of sonars, vessels, and aircraft associated with training would increase the likelihood of exposure of marine invertebrates to non-impulsive underwater sounds. The expected impacts on individual marine invertebrates capable of detecting the sound, however, would remain the same. For the same reasons as stated in Section 3.8.3.1.1.1 (No Action Alternative), non-impulsive sounds associated with training are not expected to impact most marine invertebrates or cause more than a short-term behavioral disturbance to some marine invertebrates capable of detecting nearby sound. No long-term impacts on the survival, growth, recruitment, or reproduction of marine invertebrate populations are expected. Similarly, non-impulsive underwater sound during training would not impact ESA-listed black or white abalone, coral species proposed for ESA listing, or their critical habitat. The stressors discussed in this section do not co-occur with ESA-listed species or coral species proposed for ESA listing.

Pursuant to the ESA, the use of sonar and other active acoustic sources during training activities as described under Alternative 1:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

Under Alternative 1, marine invertebrates would be exposed to increased amounts of sonars and active acoustic sources (including sources not analyzed under the No Action Alternative), vessel noise, and aircraft overflight noise during testing activities compared to the No Action Alternative. The locations of testing activities using vessels, aircraft, and sonars and other active acoustic sources would be similar to those under the No Action Alternative. The locations and number of activities proposed for testing under Alternative 1 are shown in Tables 2.8-2 through 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives). Sounds produced during testing are described in Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources), Section 3.0.5.3.1.6 (Vessel Noise), and Section 3.0.5.3.1.7 (Aircraft Overflight Noise).

In comparison to the No Action Alternative, the increased use under Alternative 1 of sonars, vessels, and aircraft associated with testing would increase the likelihood of exposure of marine invertebrates to non-impulsive underwater sounds. The expected impacts on individual marine invertebrates capable of detecting the sound, however, would remain the same. For the same reasons as stated in Section 3.8.3.1.1.1 (No Action Alternative), non-impulsive sounds associated with testing are not expected to impact most marine invertebrates or cause more than a short-term behavioral disturbance to some marine invertebrates capable of detecting nearby sound. No long-term impacts on the survival, growth, recruitment, or reproduction of marine invertebrate populations are expected. Similarly, non-impulsive underwater sound during training would not impact ESA-listed black or white abalone, coral species proposed for ESA listing, or their critical habitat. The stressors discussed in this section do not co-occur with ESA-listed species or coral species proposed for ESA listing.

Pursuant to the ESA, the use of sonar and other active acoustic sources during testing activities as described under Alternative 1:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.1.1.3 Alternative 2

Training Activities

Under Alternative 2, the number of training activities with non-impulsive sound would be the same as under Alternative 1. Therefore, Alternative 2 would have the same effects as under Alternative 1.

Pursuant to the ESA, the use of sonar and other active acoustic sources during training activities as described under Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

Under Alternative 2, marine invertebrates would be exposed to increased amounts of sonars and active acoustic sources, vessel noise, and aircraft overflight noise during testing activities compared to the No Action Alternative. The locations of testing activities using vessels, aircraft, and sonars and other active acoustic sources would be similar to those under the No Action Alternative. The locations and number of activities proposed for testing under Alternative 2 are shown in Tables 2.8-2 through 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives). Sounds produced during testing are described in Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources), Section 3.0.5.3.1.6 (Vessel Noise), and Section 3.0.5.3.1.7 (Aircraft Overflight Noise).

In comparison to the No Action Alternative, the increased use under Alternative 2 of sonars, vessels, and aircraft associated with testing would increase the likelihood of exposure of marine invertebrates to non-impulsive underwater sounds. The expected impacts on individual marine invertebrates capable of detecting the sound, however, would remain the same. For the same reasons as stated in Section 3.8.3.1.1.2 (Alternative 1), non-impulsive sounds associated with testing are not expected to impact most marine invertebrates or cause more than a short-term behavioral disturbance to some marine invertebrates capable of detecting nearby sound. No long-term impacts on the survival, growth, recruitment, or reproduction of marine invertebrate populations are expected. Similar to Alternative 2, non-impulsive underwater sound during training would not affect ESA-listed black or white abalone, coral species proposed for ESA listing, or their critical habitats. The stressors discussed in this section do not co-occur with ESA-listed species or coral species proposed for ESA listing.

Pursuant to the ESA, the use of sonar and other active acoustic sources during testing activities as described under Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.1.1.4 Substressor Impact on Sedentary Invertebrate Beds and Reefs as Essential Fish Habitat

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of sonar and other non-impulsive sound sources during training and testing activities will have no adverse effect on sedentary invertebrate beds or reefs that constitute Essential Fish Habitat or Habitat Areas of Particular Concern within the Study Area.

3.8.3.1.2 Impacts from Explosives and Other Impulsive Sources

Explosives impact pile driving; weapons firing, launch, and impact of ordnance on the water surface; and swimmer defense airguns introduce loud, impulsive, broadband sounds into the marine environment.

Impulsive sources are characterized by rapid pressure rise times and high peak pressures. Explosions produce high-pressure shock waves that could cause injury or physical disturbance due to rapid pressure changes. Some other impulsive sources, such as swimmer defense airguns and impact pile driving, also produce shock waves, but of lower intensity. Impulsive sounds are usually brief, but the associated rapid pressure changes can injure or startle marine invertebrates.

Limited studies of crustaceans have examined mortality rates at various distances from detonations in shallow water (Aplin 1947; Chesapeake Biological Laboratory 1948; Gaspin et al. 1976). Similar studies of mollusks have shown them to be more resistant than crustaceans to explosive impacts (Chesapeake Biological Laboratory 1948; Gaspin et al. 1976). Other invertebrates found in association with mollusks, such as sea anemones, polychaete worms, isopods, and amphipods, were observed to be undamaged in areas near detonations (Gaspin et al. 1976). Using data from these experiments, Young (1991) developed curves that estimate the distance from an explosion beyond which at least 90 percent of certain marine invertebrates would survive, depending on the weight of the explosive (Figure 3.8-2).

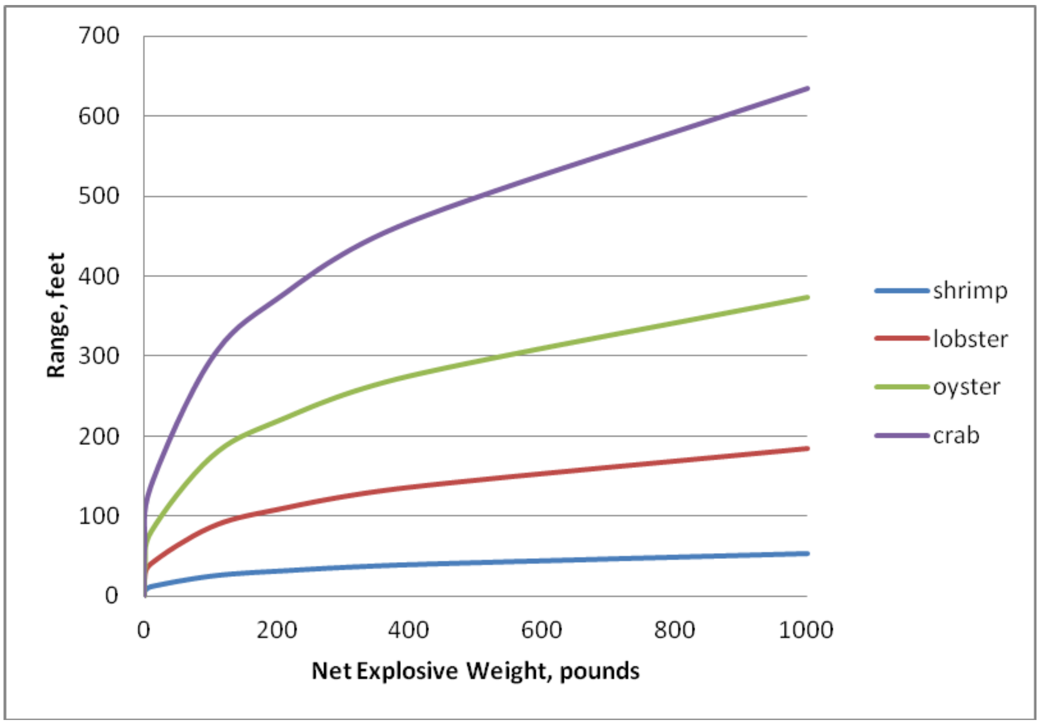


Figure 3.8-2: Prediction of Distance to 90 Percent Survivability of Marine Invertebrates Exposed to an Underwater Explosion (Young 1991)

In deeper waters where most detonations would occur near the water surface, most benthic marine invertebrates would be beyond the 90 percent survivability ranges shown above, even for larger quantities of explosives. In addition, most detonations would occur near the water surface, releasing a portion of the explosive energy into the air rather than the water and reducing impacts to marine invertebrates throughout the water column. The number of organisms affected would depend on the size of the explosive, the distance from the explosion, and the presence of groups of pelagic invertebrates. In addition to trauma caused by a shock wave, organisms could be killed in an area of cavitation that forms near the surface above large underwater detonations. Cavitation is where the reflected shock wave creates a region of negative pressure followed by a collapse, or water hammer (see Section 3.0.4, Acoustic and Explosives Primer).

Some charges are detonated in shallow water or near the seafloor, including explosive ordnance demolition charges and some explosions associated with mine warfare. In addition to injuring nearby organisms, a blast near the bottom could potentially disturb hard substrate suitable for colonization (see Section 3.3.3.1, Acoustic Stressors). An explosion in the near vicinity of hard corals could cause fragmentation and siltation of the corals. Shallow coral reefs are avoided during all activities involving explosives. Hardbottom substrates are protected during mine warfare exercises and precision anchoring exercises. Hardbottom areas are used for some explosives training, but these occur in the same designated locations within Silver Strand Training Complex (SSTC) (see Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring). It should be noted that coral species proposed for ESA listing do not occur in areas that are used for shallow water explosives training.

Impulses from pile driving and removal are broadband and carry most of their energy in the lower frequencies (see Section 3.0.5.3.1.3, Pile Driving, for a discussion of sounds produced during impact pile driving and vibratory pile removal). Impact pile driving can produce a shock wave that is transmitted to the sediment and water column (Reinhall and Dahl 2011). Nearby marine invertebrates could be killed or injured by the physical placement of the pile or by the impulses. Marine invertebrates in the area around a pile driving and vibratory removal site would be exposed to multiple impulsive sounds over an estimated 13 days. Repeated exposures to impulsive noise, such as pile driving, could damage structures used by some marine invertebrates to sense water motion, although studies have shown crustaceans may withstand repeated impulsive exposures without sensory damage.

Air guns have slower rise times and lower peak pressures than many explosives. Studies of airgun impacts on marine invertebrates have used seismic airguns, which are more powerful than any swimmer defense airguns proposed for use during Navy testing. Studies of crustaceans have shown that adult crustaceans were not noticeably physically affected by exposures to intense seismic airgun use (Christian et al. 2003; Payne et al. 2007). Snow crab eggs repeatedly exposed to airgun firings had slightly increased mortality and apparent delayed development (Christian et al. 2003), but Dungeness crab (*Metacarcinus magister*) zoeae were not affected by repeated exposures (Pearson et al. 1993). Some squid showed strong startle responses, including inking, when exposed to the first shot of broadband sound from a nearby seismic airgun (sound exposure level of 163 dB re 1 μPa^2-s), but strong startle responses were not seen when sounds were gradually increased (McCauley et al. 2000a; McCauley et al. 2000b). Seismic airguns were implicated in giant squid strandings in unpublished reports (Guerra and Gonzales 2006; Guerra et al. 2004). Although analyses of the damage to the stranded squid were inconclusive and proximity to the airguns was unknown, the report hypothesized that the squid may have become disoriented due to statolith damage or may have been close enough to experience shock wave impacts. Airguns used during testing of swimmer defense systems are intended to be nonlethal swimmer deterrents, and are substantially less powerful than those used in seismic studies. It is unlikely that they would injure marine invertebrates. Some pelagic invertebrates such as squid within a short distance may startle and swim away from these swimmer defense airguns.

Firing weapons on a ship generates sound by firing the gun (muzzle blast), the shell flying through the air, and vibration from the blast propagating through the ship's hull (see Section 3.0.5.3.1.5, Weapons Firing, Launch, and Impact Noise). In addition, larger non-explosive munitions and targets could produce loud impulsive noise when hitting the water, depending on the size, weight, and speed of the object at impact (McLennan 1997). Small- and medium-caliber munitions are not expected to produce substantial impact noise.

Based on studies with airguns, some marine invertebrates exposed to impulsive sounds from swimmer defense airguns and weapons firing may exhibit startle reactions, such as inking by a squid or changes in swim speed. Similarly, marine invertebrates beyond the range to any injurious effects from exposure to explosions or pile driving may also exhibit startle reactions. Repetitive impulses during pile driving or multiple explosions, such as during a firing exercise, may be more likely to have injurious effects or cause avoidance reactions. However, impulsive sounds produced in water during testing and training are single impulses or multiple impulses over a limited duration (e.g., gun firing or driving a pile). Any auditory masking, in which the sound of an impulse could prevent detection of other biologically relevant sounds, would be very brief.

At a distance, impulses lose their high pressure peak and take on characteristics of non-impulsive acoustic waves. Similar to the impacts expected for non-impulsive sounds discussed previously, it is expected these exposures would cause no more than brief startle reactions in some marine invertebrates.

3.8.3.1.2.1 No Action Alternative

Training Activities

Under the No Action Alternative, marine invertebrates would be exposed to explosions at or beneath the water surface and underwater impulsive noise from weapons firing, launches, impacts of non-explosive munitions, and pile driving during training activities. Noise could be produced by explosions, weapons firing, launches, and impacts of non-explosive munitions throughout the Study Area, including HRC, SOCAL, and SSTC. The number of training events using explosives, weapons firing, launches, and non-explosive munitions and their proposed locations are presented in Table 2.8-1 of Chapter 2 (Description of Proposed Action and Alternatives). A discussion of explosives and the number of detonations in each source class are provided in Section 3.0.5.3.1.2 (Explosions). The largest source class proposed for training under the No Action Alternative is E13 (greater than 1,000 pounds [lb.] net explosive weight), used during bombing exercises (air-to-surface) and sinking exercises. Under the No Action Alternative, up to nine detonations of this size may occur. The types of noise produced during weapons firing, launches, and non-explosive munitions impact are discussed in Section 3.0.5.3.1.5 (Weapons Firing, Launch, and Impact Noise). Pile driving noise is discussed in Section 3.0.5.3.1.3 (Pile Driving).

In general, explosive events would consist of a single explosion or a few smaller explosions over a short period. Some marine invertebrates close to a detonation would likely be killed, injured, broken, or displaced. Most detonations would occur greater than 3 nautical miles (nm) from shore. As water depth increases away from shore, benthic and pelagic invertebrates would be less likely to be impacted by detonations at or near the surface. In addition, detonations near the surface would release a portion of their explosive energy into the air, reducing the explosive impacts in the water.

Many corals and hardbottom invertebrates are sessile, fragile, and particularly vulnerable to shock wave impacts. Many of these organisms are slow-growing and could require decades to recover (Precht et al. 2001). Explosive impacts on benthic invertebrates are more likely when an explosive is large compared to the water depth or when an explosive is detonated at or near the bottom; however, most explosions would occur at or near the water surface, reducing the likelihood of bottom impacts.

Black abalone and, to an even lesser extent, white abalone, could be exposed to underwater detonations associated with training exercises; however, because the number of underwater detonations is very small (no more than 18 per year; see Table 2.8-1), and because of the Navy's avoidance of rocky habitat and the very low population densities of black abalone, the probability of black abalone being exposed to these activities is sufficiently small to be discountable. Similarly, the Navy has committed to restrict activities such as amphibious assaults, insertion and extraction, and Naval Fire Support to areas that would not support black abalone, so black abalone or white abalone are not likely to be exposed to stressors associated with these activities. As a result, black abalone and white abalone may be affected by the training exercises and testing activities the Navy proposes to conduct in the SOCAL Range Complex portion of the Study Area, but is not likely to be adversely affected by those activities. There is no designated critical habitat for ESA-listed black or white abalone on San Clemente Island, and other underwater explosions would not overlap with critical habitat.

The four species of coral currently proposed for ESA listing are not known to be located where underwater explosives trainings occur. As described in Section 3.8.2.5 and Section 3.8.2.8, fuzzy table coral and sandpaper rice coral are found within Papahanaumokuakea Marine National Monument around French Frigate Shoals. As described in Section 3.8.2.6, irregular rice coral is only known to occur in Kaneohe Bay. Blue rice coral has a wider distribution in the Hawaiian Islands (see Section 3.8.2.7). However, these nearshore locations do not coincide with training activities that use underwater explosions. Therefore, the four coral species currently proposed for listing under the ESA would not be affected by training activities that use explosives. NMFS has not designated critical habitat for these coral species.

Pile driving could cause additional injury, mortality, displacement, or disturbance of marine invertebrates in the vicinity of the construction area; however, impacts at the proposed sandy beach and San Diego Bay locations would be recoverable. Because impulsive exposures are brief, limited in number, spread over a large area, no long-term impacts due to startle reactions or short-term behavioral changes would be expected.

Noise produced by weapons firing, launches, and impacts of non-explosive munitions would consist of a single or several impulses over a short period and would likely not be injurious.

Some marine invertebrates may be sensitive to the low-frequency component of impulsive sound, and they may exhibit startle reactions or temporary changes in swim speed in response to an impulsive exposure. Because exposures are brief, limited in number, and spread over a large area, no long-term impacts due to startle reactions or short-term behavioral changes are expected. Although individual marine invertebrates may be injured or killed during an explosion, no long-term impacts on the survival, growth, recruitment, or reproduction of marine invertebrate populations are expected.

Pursuant to the ESA, the use of explosives and other impulsive sources during training activities as described under the No Action Alternative:

- *may affect, but is not likely to adversely affect, ESA-listed abalone species,*
- *would have no effect on any of the four coral species currently proposed for ESA listing, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

Under the No Action Alternative, marine invertebrates would be exposed to explosions at or beneath the water surface and underwater impulsive sounds from swimmer defense airguns, weapons firing, launches, and impacts of non-explosive munitions during testing activities. Testing activities under the No Action Alternative would not include pile driving. Noise could be produced by explosions, weapons firing, launches, and impacts of non-explosive munitions throughout the Study Area, including HRC, SOCAL, and SSTC. The number of testing events using explosives, swimmer defense airguns, weapons firing, launches, and non-explosive munitions and their proposed locations are presented in Tables 2.8-2 through 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives). A discussion of explosives and the number of detonations in each source class are provided in Section 3.0.5.3.1.2 (Explosions). The types of noise produced during weapons firing, launches, and non-explosive munitions impact are discussed in Section 3.0.5.3.1.5 (Weapons Firing, Launch, and Impact Noise). Noise produced by the firing of swimmer defense airguns is discussed in Section 3.0.5.3.1.4 (Swimmer Defense Airguns). The largest source class proposed for testing under the No Action Alternative is E11 (651–1,000 lb. net explosive weight).

Many corals and hardbottom invertebrates are sessile, fragile, and particularly vulnerable to shock wave impacts. Many of these organisms are slow-growing and could require decades to recover (Precht et al. 2001). Explosive impacts on benthic invertebrates and pelagic invertebrates (e.g., squid) are more likely when an explosive is large compared to the water depth or when an explosive is detonated at or near the bottom; however, most explosions would occur at or near the water surface, reducing the likelihood of bottom impacts.

Explosions from underwater detonations during mine warfare activities could create shock waves that may affect ESA-listed black and white abalone. Underwater detonations, however, would typically occur over soft-bottom substrate and not near abalone habitat areas, which is not considered black or white abalone habitat. There is no designated critical habitat for ESA-listed black or white abalone on San Clemente Island, and other underwater explosions would not overlap with critical habitat.

The four species of coral currently proposed for ESA listing are not known to be located where underwater explosives testing activities occur. As described in Section 3.8.2.5 and Section 3.8.2.8, fuzzy table coral and sandpaper rice coral are found within Papahanaumokuakea Marine National Monument around French Frigate Shoals. As described in Section 3.8.2.6, irregular rice coral is only known to occur in Kaneohe Bay. Blue rice coral has a wider distribution in the Hawaiian Islands (see Section 3.8.2.7). However, these nearshore locations do not coincide with testing activities that use underwater explosions. Therefore, the four coral species currently proposed for listing under the ESA would not be affected by testing activities that use explosives. NMFS has not designated critical habitat for these coral species.

Noise produced by swimmer defense airguns, weapons firing, launches, and impacts of non-explosive munitions would consist of a single or several impulses over a short period and would likely not be injurious.

Some marine invertebrates may be sensitive to the low-frequency component of impulsive sound, and they may exhibit startle reactions or temporary changes in swim speed in response to an impulsive exposure. Because impulsive exposures are brief, limited in number, and spread over a large area, no long-term impacts due to startle reactions or short-term behavioral changes are expected. Although individual marine invertebrates may be injured or killed during an explosion, no long-term impacts on the survival, growth, recruitment, or reproduction of marine invertebrate populations are expected.

Pursuant to the ESA, the use of explosives and other impulsive sources during testing activities as described under the No Action Alternative:

- *may affect, but is not likely to adversely affect, ESA-listed abalone species;*
- *would have no effect on any of the four coral species currently proposed for ESA listing; and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.1.2.2 Alternative 1

Training Activities

Under Alternative 1, marine invertebrates would be exposed to explosions at or beneath the water surface and underwater impulsive noise from weapons firing, launches, impacts of non-explosive munitions, and pile driving during training activities. Although training would increase, it would generally occur in the same areas as under the No Action Alternative, with the addition of explosives used during mine neutralization-explosive ordnance demolition. The largest source class proposed for training under Alternative 1 is E13, used during bombing exercises (air-to-surface) and sinking exercises. The number of training events using explosives, weapons firing, launches, and non-explosive munitions and their proposed locations are presented in Table 2.8-1 of Chapter 2 (Description of Proposed Action and Alternatives). A discussion of explosives and the number of detonations in each source class are provided in Section 3.0.5.3.1.2 (Explosions). The types of noise produced during weapons firing, launches, and non-explosive munitions impact are discussed in Section 3.0.5.3.1.5 (Weapons Firing, Launch, and Impact Noise). Pile driving noise is discussed in Section 3.0.5.3.1.3 (Pile Driving).

Although more marine invertebrates could be exposed to explosions at or near the water surface and underwater impulsive noise due to weapons firing, launches, and non-explosive munitions impacts, the type of impacts to individual marine invertebrates are expected to remain the same as those described under the No Action Alternative (Section 3.8.3.1.2.1, No Action Alternative). Although individual marine invertebrates may be injured or killed during an explosion or during pile driving, no long-term impacts on the survival, growth, recruitment, or reproduction of marine invertebrate populations are expected.

Explosions from underwater detonations during mine warfare activities could create shock waves that may affect ESA-listed black and white abalone. Underwater detonations, however, would typically occur over soft-bottom substrate, which is not considered black or white abalone habitat. These explosions would not occur near abalone habitats, so the likelihood of shock waves from explosions affecting abalone is sufficiently small to be discountable. There is no designated critical habitat for ESA-listed black or white abalone on San Clemente Island, and other underwater explosions would not overlap with critical habitat.

The four species of coral currently proposed for ESA listing are not known to be located where underwater explosives training activities occur under Alternative 1. As described in Section 3.8.2.5 and Section 3.8.2.8, fuzzy table coral and sandpaper rice coral are found within Papahanaumokuakea Marine National Monument around French Frigate Shoals. As described in Section 3.8.2.6, irregular rice coral is only known to occur in Kaneohe Bay. Blue rice coral has a wider distribution in the Hawaiian Islands (see Section 3.8.2.7). However, these nearshore locations do not coincide with testing activities that use underwater explosions. Therefore, the four coral species currently proposed for listing under the ESA would not be affected by training activities that use explosives. NMFS has not designated critical habitat for these coral species.

Pursuant to the ESA, the use of explosives and other impulsive sources during training activities as described under Alternative 1:

- *may affect, but is not likely to adversely affect, ESA-listed abalone species;*
- *would have no effect on any of the four coral species currently proposed for ESA listing; and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

Under Alternative 1, marine invertebrates would be exposed to additional explosions at or beneath the water surface and increased amounts of underwater impulsive sounds due to swimmer defense airguns, weapons firing, launch, and impacts of non-explosive munitions during testing activities. It should be noted that the number of activities using swimmer defense airguns as part of testing activities would decrease from five events under the No Action Alternative to four events under Alternative 1. Testing activities under Alternative 1 would not include pile driving. The description, number, and proposed locations of testing activities are presented in Tables 2.8-2 through 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives).

Testing activities under Alternative 1 that produce in-water noise from weapons firing, launch, and impacts of non-explosive munitions with the water's surface would increase compared to the No Action Alternative. The types of noise produced during weapons firing, launches, and non-explosive munitions impact are discussed in Section 3.0.5.3.1.5 (Weapons Firing, Launch, and Impact Noise).

Although more marine invertebrates could be exposed to explosions and impulsive noise due to swimmer defense airguns, weapons firing, launches, and non-explosive munitions impacts, the type of impacts to individual marine invertebrates are expected to remain the same as those described under the No Action Alternative (Section 3.8.3.1.2.1, No Action Alternative). Because impulsive exposures are brief, limited in number, and spread over a large area, no long-term impacts due to startle reactions or short-term behavioral changes are expected. Although individual marine invertebrates may be injured or killed during an explosion, no long-term impacts on the survival, growth, recruitment, or reproduction of marine invertebrate populations are expected.

Explosions from underwater detonations during mine warfare activities could create shock waves that may affect ESA-listed black and white abalone. Underwater detonations, however, would typically occur over soft-bottom substrate, which is not considered black or white abalone habitat. These explosions would not occur near abalone habitats, so the likelihood of shock waves from explosions affecting abalone is sufficiently small to be discountable. There is no designated critical habitat for ESA-listed black or white abalone on San Clemente Island, and other underwater explosions would not overlap with critical habitat.

The four species of coral currently proposed for ESA listing are not known to be located where underwater explosives testing activities occur under Alternative 1. As described in Section 3.8.2.5 and Section 3.8.2.8, fuzzy table coral and sandpaper rice coral are found within Papahanaumokuakea Marine National Monument around French Frigate Shoals. As described in Section 3.8.2.6, irregular rice coral is only known to occur in Kaneohe Bay. Blue rice coral has a wider distribution in the Hawaiian Islands (see Section 3.8.2.7). However, these nearshore locations do not coincide with testing activities that use underwater explosions. Therefore, the four coral species currently proposed for listing under the ESA would not be affected by testing activities that use explosives under Alternative 1.

Pursuant to the ESA, the use of explosives and other impulsive sources during testing activities as described under Alternative 1:

- *may affect, but is not likely to adversely affect, ESA-listed abalone species;*
- *would have no effect on any of the four coral species currently proposed for ESA listing; and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.1.2.3 Alternative 2

Training Activities

Under Alternative 2, the number of training activities and number of underwater explosions would be the same as under Alternative 1 (see Table 3.0-9). The locations of explosions would be the same as under Alternative 1. Therefore, Alternative 2 would have the same effects as under Alternative 1.

Pursuant to the ESA, the use of explosives and other impulsive sources during training activities as described under Alternative 2:

- *may affect, but is not likely to adversely affect, ESA-listed abalone species;*
- *would have no effect on any of the four coral species currently proposed for ESA listing; and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

Under Alternative 2, marine invertebrates would be exposed to additional explosions at or beneath the water surface and increased amounts of underwater impulsive sounds due to weapons firing, launch, and impacts of non-explosive munitions during testing activities. The number of testing activities that use swimmer defense airguns would not change relative to the No Action Alternative. Testing activities under Alternative 2 would not include pile driving. The description, number, and proposed locations of testing activities are presented in Tables 2.8-2 through 2.8-5 of Chapter 2 (Description of Proposed Action and Alternatives).

Testing activities under Alternative 2 that produce in-water noise from weapons firing, launch, and impacts of non-explosive munitions with the water's surface would increase compared to the No Action Alternative. The types of noise produced during weapons firing, launches, and non-explosive munitions impact are discussed in Section 3.0.5.3.1.5 (Weapons Firing, Launch, and Impact Noise).

Although more marine invertebrates could be exposed to explosions and impulsive noise due to swimmer defense airguns, weapons firing, launches, and non-explosive munitions impacts, the type of impacts to individual marine invertebrates are expected to remain the same as those described under the No Action Alternative (Section 3.8.3.1.2.1, No Action Alternative). Because impulsive exposures are brief, limited in number, and spread over a large area, no long-term impacts due to startle reactions or short-term behavioral changes are expected. Although individual marine invertebrates may be injured or killed during an explosion, no long-term impacts on the survival, growth, recruitment, or reproduction of marine invertebrate populations are expected.

Explosions from underwater detonations during mine warfare activities could create shock waves that may affect ESA-listed black and white abalone. Underwater detonations, however, would typically occur over soft-bottom substrate, which is not considered black or white abalone habitat. These explosions would not occur near abalone habitats, so the likelihood of shock waves from explosions affecting abalone is sufficiently small to be discountable. There is no designated critical habitat for ESA-listed black or white abalone on San Clemente Island, and other underwater explosions would not overlap with critical habitat.

The four species of coral currently proposed for ESA listing are not known to be located where underwater explosives testing activities occur under Alternative 2. As described in Section 3.8.2.5 and Section 3.8.2.8, fuzzy table coral and sandpaper rice coral are found within Papahanaumokuakea Marine National Monument around French Frigate Shoals. As described in Section 3.8.2.6, irregular rice coral is only known to occur in Kaneohe Bay. Blue rice coral has a wider distribution in the Hawaiian Islands (see Section 3.8.2.7). However, these nearshore locations do not coincide with testing activities that use underwater explosions. Therefore, the four coral species currently proposed for listing under the ESA would not be affected by testing activities that use explosives under Alternative 2.

Pursuant to the ESA, the use of explosives and other impulsive sources during testing activities as described under Alternative 2:

- *may affect, but is not likely to adversely affect, ESA-listed abalone species;*
- *would have no effect on any of the four coral species currently proposed for ESA listing; and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.1.2.4 Substressor Impacts on Sedentary Invertebrate Beds or Reefs as Essential Fish Habitat

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of explosives and other impulsive sources during training and testing activities may have an adverse effect on Essential Fish Habitat by reducing the quality or quantity of sedentary invertebrate beds or reefs that constitute Essential Fish Habitat or Habitat Areas of Particular Concern (U.S. Department of the Navy 2013). The use of other impulsive sources (pile driving; swimmer defense airguns; and weapons firing, launch, and impact noise) during training and testing activities will not have an adverse effect on Essential Fish Habitat by reducing the quality or quantity of sedentary invertebrate beds or offshore reefs that constitute Essential Fish Habitat or Habitat Areas of Particular Concern within the Study Area.

3.8.3.2 Energy Stressors

This section analyzes the potential impacts of the various types of energy stressors that can occur during training and testing activities within the Study Area. This section includes analysis of the potential impacts from electromagnetic devices.

3.8.3.2.1 Impacts from Electromagnetic Devices

Several different types of electromagnetic devices are used during training and testing activities. For a discussion of the types of activities that use electromagnetic devices, where they are used, and how many activities would occur under each alternative, please see Section 3.0.5.3.2.1 (Electromagnetic Devices). Aspects of electromagnetic stressors that are applicable to marine organisms in general are presented in Section 3.0.5.7.2 (Conceptual Framework for Assessing Effects from Energy-Producing Activities).

Little information exists about marine invertebrates' susceptibility to electromagnetic fields. Most corals are thought to use water temperature, day length, lunar cycles, and tidal fluctuations as cues for spawning. Magnetic fields are not known to control coral spawning release or larval settlement. Some arthropods (e.g., spiny lobster and American lobster) can sense magnetic fields, and this ability is thought to assist the animal with navigation and orientation (Lohmann et al. 1995; Normandeau et al. 2011). These animals travel relatively long distances during their lives, and magnetic field sensation may exist in other invertebrates that travel long distances. Marine invertebrates, including several commercially important species and federally managed species, could use magnetic cues (Normandeau et al. 2011). Susceptibility experiments have focused on arthropods, but several mollusks and echinoderms are also susceptible. However, because susceptibility is variable within taxonomic groups it is not possible to make generalized predictions for groups of marine invertebrates. Sensitivity thresholds vary by species ranging from 0.3–30 milliteslas, and responses included non-lethal physiological and behavioral changes (Normandeau et al. 2011). The primary use of magnetic cues seems to be navigation and orientation. Human-introduced electromagnetic fields could disrupt these cues and interfere with navigation, orientation, or migration. Because electromagnetic fields weaken exponentially with increasing distance from their source, large and sustained magnetic fields present greater exposure risks than small and transient fields, even if the small field is many times stronger than the earth's magnetic field (Normandeau et al. 2011). Transient or moving electromagnetic fields may cause temporary disturbance to susceptible organisms' navigation and orientation.

Important physical and biological characteristics of habitat for ESA-listed black and white abalone are defined in Sections 3.8.2.3.2 and 3.8.2.4.2 (Habitat and Geographic Range), respectively. There is no established mechanism for energy stressors to affect important characteristics of this critical habitat. Therefore; it is not probable that energy stressors could degrade the quality or quantity of black and white abalone habitat.

3.8.3.2.1.1 No Action Alternative

Training Activities

Table 3.0-18 lists the number and location of training activities that use electromagnetic devices. As indicated in Section 3.0.5.3.2.1 (Electromagnetic Devices), under the No Action Alternative, training activities involving electromagnetic devices occur during magnetic influence mine sweeping activities as part of mine warfare. No training activities involving electromagnetic devices would occur in HRC under the No Action Alternative.

Species that do not occur within these specific areas—including ESA-listed black and white abalone and coral species currently proposed for ESA listing—would not be exposed to electromagnetic fields associated with Navy training activities. Species that do occur within the areas listed above could be exposed to electromagnetic fields. Electromagnetic devices associated with training activities would not be used in habitat for black and white abalone. Therefore, electromagnetic devices would not affect black abalone or white abalone habitats or black abalone critical habitat. Critical habitat has not been designated for the four species of coral currently proposed for ESA listing.

The impact of electromagnetic fields on marine invertebrates would be inconsequential because: (1) the area exposed to the stressor is extremely small relative to most marine invertebrates' ranges, (2) the number of activities involving the stressor is low, (3) exposures would be localized, temporary, and would cease with the conclusion of the activity, and (4) even for susceptible organisms invertebrates (e.g., some species of arthropods, mollusks, and echinoderms) the consequences of exposure are limited to temporary disruptions to navigation and orientation.

Pursuant to the ESA, the use of electromagnetic devices during training activities as described under the No Action Alternative:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed white abalone or black abalone critical habitats.*

Testing Activities

Table 3.0-18 lists the number and location of testing activities that use electromagnetic devices. As indicated in Section 3.0.5.3.2.1 (Electromagnetic Devices), under the No Action Alternative, testing activities involving electromagnetic devices occur during airborne towed minesweeping systems testing activities in SOCAL; no testing activities involving electromagnetic devices would occur in HRC under the No Action Alternative.

Species that do not occur within these specified areas—including ESA-listed black and white abalone and the four species of coral currently proposed for ESA listing—would not be exposed to electromagnetic fields. Species that do occur within the areas listed above could be exposed to electromagnetic fields. Electromagnetic devices associated with training activities would not be used in black or white abalone habitat areas. Therefore, electromagnetic devices would not affect black abalone or white abalone habitats or black abalone critical habitat. Critical habitat has not been designated for the four species of coral currently proposed for ESA listing.

The impact of electromagnetic fields on marine invertebrates would be inconsequential because: (1) the area exposed to the stressor is extremely small relative to most marine invertebrates' ranges; (2) the number of activities involving the stressor is low; (3) exposures would be localized, temporary, and would cease with the conclusion of the activity; and (4) even for susceptible organisms invertebrates (e.g., some species of arthropods, mollusks, and echinoderms) the consequences of exposure are limited to temporary disruptions to navigation and orientation.

Pursuant to the ESA, the use of electromagnetic devices during testing activities as described under the No Action Alternative:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.2.1.2 Alternative 1

Training Activities

Table 3.0-18 lists the number and location of training activities that use electromagnetic devices. As indicated in Section 3.0.5.3.2.1 (Electromagnetic Devices), under Alternative 1, training activities involving electromagnetic devices occur during magnetic influence mine sweeping activities as part of mine warfare. The number of mine countermeasures activities in SOCAL would remain the same. No training activities involving electromagnetic devices would occur in HRC under Alternative 1.

Species that do not occur within these specified areas—including ESA-listed black and white abalone and the four species of coral currently proposed for ESA listing—would not be exposed to electromagnetic fields. Species that do occur within the areas listed above could be exposed to electromagnetic fields. Electromagnetic devices associated with training activities would not be used in black or white abalone habitat areas or designated black abalone habitat. Critical habitat has not been designated for the four species of coral currently proposed for ESA listing.

As with the No Action Alternative, these training events would occur in open waters where the depth to the seafloor allows for the dissipation of electromagnetic waves. Therefore, since electromagnetic devices would be used less often under Alternative 1, individual impacts would be the same, but the likelihood of exposure would be reduced.

Pursuant to the ESA, the use of electromagnetic devices during training activities as described under Alternative 1:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

Table 3.0-18 lists the number and location of testing activities that use electromagnetic devices. As indicated in Section 3.0.5.3.2.1 (Electromagnetic Devices), under Alternative 1, testing activities involving electromagnetic devices occur during airborne towed minesweeping systems testing activities in the open ocean portions of SOCAL; no testing activities involving electromagnetic devices would occur in HRC or within SSTC under Alternative 1. The number of testing activities that use electromagnetic devices would increase under from 15 under the No Action Alternative to 27 events under Alternative 1.

Species that do not occur within these specified areas—including ESA-listed black and white abalone and the four species of coral currently proposed for ESA listing—would not be exposed to electromagnetic fields. Species that do occur within the areas listed above could be exposed to electromagnetic fields. Electromagnetic devices associated with testing activities would not be used in black abalone or white habitat or designated black abalone critical habitat. Therefore, electromagnetic devices would not affect black abalone critical habitat. Critical habitat has not been proposed for the four species of coral currently proposed for ESA listing.

As with the No Action Alternative, testing activities under Alternative 1 would occur in open waters, where depth to the seafloor allows for the dissipation of electromagnetic waves. Therefore, since electromagnetic devices would used in the same number of testing activities, effects of electromagnetic stressors under Alternative 1 would have no impact, as under the No Action Alternative.

Pursuant to the ESA, the use of electromagnetic devices during testing activities as described under Alternative 1:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.2.1.3 Alternative 2

Training Activities

Under Alternative 2, training activities would be consistent with Alternative 1. Therefore, Alternative 2 would have the same effects as under Alternative 1.

Pursuant to the ESA, the use of electromagnetic devices during training activities as described under Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

Table 3.0-18 lists the number and location of testing activities that use electromagnetic devices. As indicated in Section 3.0.5.3.2.1 (Electromagnetic Devices), under Alternative 2, testing activities involving electromagnetic devices occur during airborne towed minesweeping systems testing activities in the open ocean portions of SOCAL; no testing activities involving electromagnetic devices would occur in HRC or within SSTC under Alternative 2. The number of testing activities that use electromagnetic devices would increase under from 15 under the No Action Alternative to 31 events under Alternative 2. This represents a slight increase relative to Alternative 1 (two additional events).

Pursuant to the ESA, the use of electromagnetic devices during testing activities as described under Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.2.1.4 Substressor Impacts on Sedentary Invertebrate Beds or Reefs as Essential Fish Habitat

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of electromagnetic devices during training and testing activities will have minimal and temporary adverse effects on invertebrates that occupy water column Essential Fish Habitat or Habitat Areas of Particular Concern, and will have no adverse effect on sedentary invertebrate beds or reefs that constitute Essential Fish Habitat or Habitat Areas of Particular Concern within the Study Area.

3.8.3.3 Physical Disturbance and Strike Stressors

This section analyzes the potential impacts of the various types of physical disturbance and strike stressors used by Navy during training and testing activities within the Study Area. For a list of locations and numbers of activities that may cause physical disturbance and strikes refer to Section 3.0.5.3.3 (Physical Disturbance and Strike Stressors). The physical disturbance and strike stressors that may impact marine invertebrates include (1) vessels and in-water devices, (2) military expended materials, and (3) seafloor devices.

Most marine invertebrate populations extend across wide areas containing hundreds or thousands of discrete patches of suitable habitat. Sessile (attached to the seafloor) invertebrate populations may be maintained by complex currents that carry adults and young from place to place. Such widespread populations are difficult to evaluate in terms of Navy training and testing activities that occur in relatively small areas of the Study Area. In this context, a physical strike or disturbance would impact individual organisms directly or indirectly, but not to the extent that the viability of populations or species would be impacted.

With few exceptions, activities involving vessels and in-water devices are not intended to contact the seafloor. Except for amphibious activities and bottom-crawling unmanned underwater vehicles, there is no potential strike impact and limited potential disturbance impact on benthic or habitat-forming marine invertebrates.

With the exception of corals and other sessile benthic invertebrates, most invertebrate populations recover quickly from disturbance. Many large invertebrates, such as crabs, shrimps, and clams, undergo massive disturbance during commercial and recreational harvests or during disturbances within the surf zone. Other invertebrates, such as the small soft-bodied organisms that live in the bottom sediment, are thought to be well-adapted to natural physical disturbances, although recovery from human-induced disturbance is delayed by decades or more (Lindholm et al. 2011). These populations would recover from a strike or other disturbance on scales of weeks to years. Biotic habitats, such as coral reefs, deep-sea coral, and sponge communities, may take decades to re-grow following a strike or disturbance (Precht et al. 2001).

3.8.3.3.1 Impacts from Vessels and In-Water Devices

The majority of the training and testing activities under all the alternatives involve vessels, and a few of the activities involve the use of in-water devices. For a discussion of the types of activities that use vessels and in-water devices, where they are used, and how many events would occur under each alternative, see Tables 3.0-30 and 3.0-38. See Table 3.0-19 for a representative list of Navy vessel sizes and speeds and Table 3.0-31 for the types, sizes, and speeds of Navy in-water devices used in the Study Area.

Vessels and in-water devices could impact marine invertebrates by disturbing the water column or sediments, or directly striking organisms (Bishop 2008). The propeller wash (water displaced by propellers used for propulsion) from vessel movement and water displaced from vessel hulls could disturb marine invertebrates in the water column, and is a likely cause of zooplankton mortality (Bickel et al. 2011). This local and short-term exposure to vessel and propeller movements could displace, injure, or kill zooplankton, invertebrate eggs or larvae, and macro-invertebrates in the upper portions of the water column. It should be noted that the Navy avoids known abalone beds (as well as critical habitat designations) in waters off California and coral reefs that are known to support corals proposed for ESA listing within waters off Hawaii.

Few sources of information are available on the impact of non lethal chronic disturbance on marine invertebrates. One study of seagrass-associated marine invertebrates, such as amphipods and polychaetes, found that chronic disturbance from vessel wakes resulted in the long-term displacement of some marine invertebrates from the impacted area (Bishop 2008). Impacts of this type resulting from repeated exposure in shallow water are not likely to result from Navy training and testing activities because (1) most vessel movements occur in relatively deep water, and (2) vessel movements are concentrated in well-established port facilities and associated channels (Mintz and Parker 2006).

Vessels and towed in-water devices do not normally collide with invertebrates that inhabit the seafloor because Navy vessels are operated in relatively deep waters and have navigational capabilities to avoid contact with these habitats. A consequence of vessel operation in shallow water is increased turbidity from stirring-up bottom sediments. Turbidity can impact corals and invertebrate communities on hardbottom areas by reducing the amount of light that reaches these organisms and by clogging siphons for filter feeding organisms. Reef-building corals are sensitive to water clarity because they host symbiotic algae that require sunlight to live. Encrusting organisms residing on hardbottom can be impacted by persistent silting from increased turbidity. In addition, propeller wash and physical contact with coral and hardbottom areas can cause structural damage to the substrate as well as mortality to encrusting organisms. While information on the frequency of vessel operations in shallow water is not adequate to support a specific risk assessment, typical navigational procedures minimize the likelihood of contacting the seafloor, and most Navy vessel movements in nearshore waters are confined to established channels and ports, or predictable transit lanes within the Hawaiian Islands or between San Diego Bay and San Clemente Island.

Amphibious vessels would contact the seafloor in the surf zone during Amphibious Assault and Amphibious Raid operations. Benthic invertebrates within the disturbed area, such as crabs, clams, and polychaete worms, could be displaced, injured, or killed during amphibious operations. Benthic invertebrates inhabiting these areas are adapted to a highly variable environment and are expected to rapidly re-colonize disturbed areas by immigration and larval recruitment. Studies indicate that benthic communities of high energy, sandy beaches recover relatively quickly (typically within 2 to 7 months) following beach nourishment (U.S. Army Corps of Engineers 2001). Schoeman et al. (2000) found that the macrobenthic (visible organisms on the seafloor) community required between 7 and 16 days to recover, following excavation and removal of sand from a 2,150 $ft.^2$ (200 m^2) quadrant in the mid-intertidal zone of a sandy beach. The impacts of amphibious vehicle operations on benthic communities would be relatively minor, short-term, and local.

Unmanned underwater vehicles travel at relatively low speeds, and are smaller than most vessels, making the risk of strike or physical disturbance to marine invertebrates very low. Zooplankton, invertebrate eggs or larvae, and macro-invertebrates in the water column could be displaced, injured, or killed by unmanned underwater vehicle movements.

3.8.3.3.1.1 No Action Alternative

<u>Training Activities</u>

As indicated in Sections 3.0.5.3.3.1 (Vessels) and 3.0.5.3.3.2 (In-Water Devices), the majority of the training activities include vessels, and a few of the activities involve the use of in-water devices. These activities could be widely dispersed throughout the Study Area, but would be more concentrated near naval ports, piers and ranges. Amphibious landings could occur in SSTC, SOCAL, and HRC. Amphibious landings in HRC would be restricted to designated beaches. Hydrographic surveys have supported the mapping of precise transit routes through sandy bottom areas to avoid potential vessel strikes of coral reefs. In addition, during landings, crews follow procedures to identify obstructions to navigation, which would include coral reefs.

Species that do not occur near the surface within the Study Area—including ESA-listed black and white abalone—would not be exposed to vessel strikes. In addition, these species would not be affected by amphibious landings since ESA-listed black and white abalone inhabit rocky shores and hardbottom, which are not used for amphibious landings. There is no designated critical habitat on San Clemente Island, where the majority of amphibious landings would occur, and the majority of vessel movements would occur in the open ocean. Coral species that are currently proposed for ESA listings are located in discrete areas where vessel movements and amphibious landings do not occur. Therefore, these corals will not be affected by vessel movements or in-water devices.

Species that do occur near the surface within the Study Area would have the potential to be exposed to vessel strikes. Large, slow vessels would pose little risk to marine invertebrates in the open ocean although, in coastal waters, currents from large vessels may cause resuspension and settlement of sediment onto sensitive invertebrate communities. Vessels travelling at high speeds would generally pose more of a risk through propeller action in shallow waters. Under the No Action Alternative, these shallow-water vessels would continue to operate in defined boat lanes with sufficient depths to avoid propeller or hull strikes of benthic invertebrates.

There would be a higher likelihood of vessel strikes over the continental shelf portions of the Study Area because of the concentration of vessel movements in those areas. Exposure of marine invertebrates to vessel disturbance and strikes is limited to organisms in the uppermost portions of the water column. Pelagic marine invertebrates are generally disturbed, rather than struck, as the water flows around the vessel or in-water device. Invertebrates that occur on the seafloor, including shallow-water corals, hardbottom, and deep-water corals, are not likely to be exposed to this stressor because they typically occur at depths greater than that potentially impacted by vessels.

The impact of vessels and in-water devices on marine invertebrates would be inconsequential because: (1) the area exposed to the stressor amounts to a small portion of each vessel's and in-water device's footprint, and is extremely small relative to most marine invertebrates' ranges; (2) the frequency of activities involving the stressor is low such that few individuals could be exposed to more than one event; and (3) exposures would be localized, temporary, and would cease with the conclusion of the activity. Activities involving vessels and in-water devices are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at the population level.

Pursuant to the ESA, the use of vessels or in-water devices during training activities as described under the No Action Alternative:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

As indicated in Sections 3.0.5.3.3.1 (Vessels) and 3.0.5.3.3.2 (In-Water Devices), Navy vessel movements and in-water devices would occur throughout the Study Area during testing activities. Vessel movements and in-water devices during testing activities would be similar to those described previously under training activities for the No Action Alternative.

Species that do not occur near the surface within the Study Area—including ESA-listed black and white abalone—would not be exposed to vessel strikes. In addition, these species would not be affected by amphibious landings since ESA-listed black and white abalones inhabit rocky shores and hardbottom, which are not used for amphibious landings. There is no designated critical habitat on San Clemente Island, where the majority of amphibious landings would occur, and the majority of vessel movements would occur in the open ocean. Coral species that are currently proposed for ESA listings are located in discrete areas where vessel movements and amphibious landings do not occur. Therefore, these corals will not be affected by vessel movements or in-water devices.

The impact of vessels and in-water devices on marine invertebrates would be inconsequential because: (1) the area exposed to the stressor amounts to a small portion of each vessel's and in-water device's footprint, and is extremely small relative to most marine invertebrates' ranges; (2) the frequency of activities involving the stressor is low such that few individuals could be exposed to more than one event; and (3) exposures would be localized, temporary, and would cease with the conclusion of the activity. Activities involving vessels and in-water devices are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at the population level.

Pursuant to the ESA, the use of vessels or in-water devices during testing activities as described under the No Action Alternative:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.3.1.2 Alternative 1

Training Activities

As indicated in Sections 3.0.5.3.3.1 (Vessels) and 3.0.5.3.3.2 (In-Water Devices), the majority of the training activities include vessels, and a few of the activities involve the use of in-water devices. These activities could be widely dispersed throughout the Study Area, but would be more concentrated near naval ports, piers and ranges. Amphibious landings could occur in SSTC, SOCAL, and HRC. Amphibious landings in HRC would be restricted to designated beaches. Hydrographic surveys have supported the mapping of precise transit routes through sandy bottom areas to avoid potential vessel strikes of coral reefs. In addition, during landings, crews follow procedures to identify obstructions to navigation, which would include coral reefs.

The vessels and in-water devices used during training activities under Alternative 1 would be similar to those described under the No Action Alternative. Therefore, effects under Alternative 1 from vessel strikes and in-water devices would be similar to No Action Alternative.

Pursuant to the ESA, the use of vessels or in-water devices during training activities as described under Alternative 1:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

As indicated in Sections 3.0.5.3.3.1 (Vessels) and 3.0.5.3.3.2 (In-Water Devices), the majority of the testing activities include vessels, and a few of the activities involve the use of in-water devices. These activities could be widely dispersed throughout the Study Area, but would be more concentrated near naval ports, piers and ranges. Amphibious landings could occur in SSTC, SOCAL, and HRC.

The vessels and in-water devices used during testing activities under Alternative 1 would be similar to those described under the No Action Alternative. Therefore, effects under Alternative 1 from vessel strikes and in-water devices would be similar to No Action Alternative.

Pursuant to the ESA, the use of vessels or in-water devices during testing activities as described under Alternative 1:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.3.1.3 Alternative 2

Training

Under Alternative 2, training activities would be consistent with Alternative 1. Therefore, Alternative 2 would have the same effects as under Alternative 1.

Pursuant to the ESA, the use of vessels or in-water devices during training activities as described under Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing

As indicated in Sections 3.0.5.3.3.1 (Vessels) and 3.0.5.3.3.2 (In-Water Devices), the majority of the testing activities include vessels, and a few of the activities involve the use of in-water devices. These activities could be widely dispersed throughout the Study Area, but would be more concentrated near naval ports, piers and ranges. Amphibious landings could occur in SSTC, SOCAL, and HRC.

The vessels and in-water devices used during testing activities under Alternative 2 would be similar to those described under the No Action Alternative. Therefore, effects under Alternative 2 from vessel strikes and in-water devices would be similar to No Action Alternative.

Pursuant to the ESA, the use of vessels or in-water devices during testing activities as described under Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed white abalone or black abalone critical habitats.*

3.8.3.3.1.4 Substressor Impacts on Sedentary Invertebrate Beds or Reefs as Essential Fish Habitat

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of vessels and in-water devices during training and testing activities will have no effect on sedentary invertebrate beds or reefs that constitute Essential Fish Habitat or Habitat Areas of Particular Concern within the Study Area.

3.8.3.3.2 Impacts from Military Expended Materials

This section analyzes the strike potential to invertebrates from the following categories of military expended materials: (1) non-explosive practice munitions, (2) fragments from high-explosive munitions, and (3) expended materials other than ordnance, such as sonobuoys, vessel hulks, and expendable targets. For a discussion of the types of activities that use military expended materials, where they are used, and how many activities would occur under each alternative, see Section 3.0.5.3.3.3 (Military Expended Materials).

Military expended materials are deposited throughout the Study Area. However, the majority of military expended materials are deposited within the confines of established gunnery ranges and weapons testing areas. These areas of higher military expended materials deposition are generally away from the coastline but on the continental shelf and slope.

Chaff and flares include canisters, end-caps, and aluminum coated glass fibers. Chaff, in particular, may be transported great distances by the wind, beyond the areas where they are deployed before contacting the sea surface. These materials contact the sea surface and seafloor with very little kinetic energy, and their low buoyant weight makes them an inconsequential strike and abrasion risk. Aerial countermeasures, therefore, will not be addressed as potential strike and disturbance stressors.

Physical disturbances or strikes by military expended materials on marine invertebrates are possible at the water's surface, through the water column, and on the seafloor. Disturbance or strike impacts on marine invertebrates by military expended materials falling through the water column are possible, but not very likely because military expended materials do not generally sink rapidly enough to cause strike injury (i.e., as opposed to fragments propelled by high explosives); and exposed invertebrates would likely experience only temporary displacement as the object passes by. Therefore, the discussion of military expended materials disturbance and strikes will focus on military expended materials at the water's surface and on the seafloor. While marine invertebrates on the seafloor may be impacted by military expended materials propelled by high explosives, this event is not very likely except for mine warfare detonations, which typically occur at or near the seafloor.

Sessile marine invertebrates and infauna are particularly susceptible to military expended material strikes, including shallow-water corals, hardbottom, and deep-water corals. Most shallow-water coral reefs in the Study Area are within or adjacent HRC, where expended materials are primarily lightweight flares and chaff that have inconsequential strike potential.

3.8.3.3.2.1 Munitions

Small-, Medium-, and Large-Caliber Projectiles

Various types of projectiles could cause a temporary local impact when they strike the surface of the water. Navy training and testing in the Study Area, such as gunnery exercises, include firing a variety of weapons and using a variety of non-explosive training and testing rounds, including small-, medium-, and large-caliber projectiles. Large-caliber projectiles are primarily used in the open ocean beyond 20 nm.

Direct ordnance strikes from firing weapons are potential strike stressors to marine invertebrates. Military expended materials could impact the water with great force and produce a large impulse. Physical disruption of the water column is a local, temporary impact, and would be limited to a small area (within a radius of tens of meters) around the impact point, persisting for a few minutes. Physical and chemical properties of the surrounding water would be temporarily altered (e.g., slight heating or cooling and increased oxygen concentrations due to turbulent mixing with the atmosphere), but there would be no lasting change resulting in long-term impacts on marine invertebrates. Although the sea surface is rich with invertebrates, most are zooplankton and relatively few are large pelagic invertebrates (e.g., some jellyfish and some swimming crabs). Zooplankton, eggs and larvae, and larger pelagic organisms in the upper portions of the water column could be displaced, injured, or killed by military expended materials impacting the sea surface. Individual organisms would be impacted directly or indirectly, but not to the extent that the viability of populations or species would be impacted, primarily because the number of organisms exposed to these devices is extremely small relative to population sizes.

Marine invertebrates on the seafloor could be displaced, injured, or killed by military expended materials contacting the seafloor. While all marine invertebrates living on or in the seafloor are susceptible to disturbance, strikes, and burial by military expended materials, only sessile (attached to the seafloor) marine invertebrates are susceptible to impact by abrasion. Parachutes are the principal source of abrasion stressors to marine invertebrates, and these are addressed separately because the nature of their potential impacts is materially different than other military expended materials.

Potential impacts of projectiles on marine invertebrates, including shallow-water, hardbottom, or deep-water corals, present the greatest risk of long-term damage compared with other seafloor communities because (1) many corals and hardbottom invertebrates are sessile, fragile, and particularly vulnerable; (2) many of these organisms grow slowly and could require decades to recover (Precht et al. 2001); and (3) military expended materials are likely to remain mobile for a longer period because natural encrusting and burial processes are much slower on these habitats than on hardbottom habitats.

Bombs, Missiles, and Rockets

Bombs, missiles, and rockets are potential strike stressors to marine invertebrates. The nature of their potential impacts is the same as projectiles. However, they are addressed separately because they are larger than most projectiles, and because high-explosive bombs, missiles, and rockets are likely to produce a greater number of small fragments than projectiles. Propelled fragments are produced by high explosives. Close to the explosion, invertebrates could be injured by propelled fragments. However, studies of underwater bomb blasts have shown that fragments are larger than those produced during air blasts and decelerate much more rapidly (O'Keefe and Young 1984; Swisdak Jr. and Montaro 1992), reducing the risk to marine organisms. Bombs, missiles, and rockets are designed to explode within 3 ft. (1 m) of the sea surface where marine invertebrates are relatively infrequent. The fitness of individual organisms would be impacted directly or indirectly, but not to the extent that the viability of populations or species would be impacted, primarily because the number of organisms exposed to these devices would be extremely small relative to population sizes.

3.8.3.3.2.2 Military Expended Materials other than Munitions

Vessel Hulk

During a sinking exercise, aircraft, ship, and submarine crews deliver ordnance on a surface target, which is a clean (Section 3.1, Sediments and Water Quality), deactivated ship deliberately sunk using multiple weapon systems. Sinking exercises occur in specific open ocean areas, outside of the coastal range complexes. Ordnance strikes by the various weapons used in these exercises are a potential source of impacts. However, these impacts are discussed for each of those weapons categories in this section and are not repeated here. Therefore, the analysis of sinking exercises as a strike potential for benthic invertebrates is discussed in terms of the vessel hulk landing on the seafloor. The primary difference between a vessel hulk and other military expended materials as a strike potential for marine invertebrates is a difference in scale. As the vessel hulk settles on the seafloor, all marine invertebrates within the footprint of the hulk would be impacted by strike or burial, and invertebrates a short distance beyond the footprint of the hulk would be disturbed. A vessel hulk may also change ocean flow patterns, sediment transport, and benthic communities. Habitat-forming invertebrates (i.e., corals) are likely absent where sinking exercises are planned because this activity occurs in depths greater than the range of reef forming corals and most other habitat-forming invertebrates (approximately 10,000 ft. [3,050 m]) and away from hydrothermal vent communities. It is possible that deep-sea corals may be impacted by a sinking vessel hulk or fragments of a hulk, but the size of the impact on the seafloor relative to the relatively broad distribution of deep sea corals suggests that these impacts would seldom occur.

Parachutes

Parachutes of varying sizes are used during training and testing activities. For a discussion of the types of activities that use parachutes, physical characteristics of these expended materials, where they are used, and how many activities would occur under each alternative, see Section 3.0.5.3.4.2 (Parachutes). See Table 3.0-84 for information regarding the number and location of activities involving parachutes. Activities that expend sonobuoy and air-launched torpedo parachutes generally occur in water deeper than 183 m. Because they are in the air and water column for a time span of minutes (see Section 3.0.5.3.4.2, Parachutes), it is improbable that such a parachute deployed over water deeper than 183 m could travel far enough to affect shallow-water corals. Parachutes may impact marine invertebrates by disturbance, strikes, burial, smothering, or abrasion. Movement of parachutes in the water may break more fragile invertebrates such as deep-water corals.

3.8.3.3.2.3 No Action Alternative

Training Activities

The number of military expended materials and their impact footprints are detailed in Table 3.3-5. As indicated in Section 3.0.5.3.3.3 (Military Expended Materials), under the No Action Alternative, nearly all military expended materials would be expected in HRC and SOCAL.

The majority of military expended materials would be used in the open ocean. Some military expended materials may be expended in the nearshore waters of San Clemente Island during use of impact areas. The majority of fired ordnance would impact on land and would not be expected to affect ESA-listed black and white abalone. Military expended materials would not be expected to affect black and white abalone because of the limited amount of military expended materials in nearshore waters. There is no designated critical habitat on San Clemente Island. As for known offshore habitats known to support white abalone (such as the Tanner Banks), it is conceivable for military expended materials to fall in waters occupied by the white abalone; however, due to the low population density and the wide spread use of chaff and flares, the potential for strike is sufficiently small to discount adverse effects. The majority of military expended material in nearshore and offshore waters surrounding the Tanner Banks is chaff and flares, which are expended in waters away from critical habitat designations in waters off Santa Barbara and Santa Catalina islands (the Navy does not train in these nearshore areas off of these islands). Military expended materials are not deposited in areas that are known to support coral species proposed for ESA listing.

Military expended materials that are ordnance (e.g., bombs, missiles, rockets, projectiles, and associated fragments may strike marine invertebrates at the sea surface or on the seafloor. Consequences of strike or disturbance may include injury or mortality, particularly within the footprint of the object as it contacts the seafloor. Secondary impacts are possible if military expended materials are mobilized by currents or waves, and would cease when the military expended materials are incorporated into the seafloor by natural encrustation or burial processes. The fitness of individual organisms would be impacted directly or indirectly, but not to the extent that the viability of populations or species would be impacted primarily because the number of organisms exposed to these devices would be extremely small relative to population sizes.

During sinking exercises, pelagic invertebrates present near the water's surface in the immediate vicinity of the exercise have the potential to be injured or killed. Sinking exercise vessel hulks contacting the seafloor would result in mortality of marine invertebrates within the footprint of the hulk and disturbance of marine invertebrates near the footprint of the hulk. Sinking exercises may result in injury or mortality of marine invertebrates near the footprint of the hulk. Though the footprint of a sinking exercise is large relative to other military expended materials, the impacted area is extremely small relative to the spatial distribution of marine invertebrate populations. Sinking exercises would impact the fitness of individual organisms directly or indirectly, but not to the extent that the viability of populations or species would be impacted.

Activities occurring at depths less than 2,600 ft. (800 m) may impact deep-water corals and other marine invertebrate assemblages. Consequences from impacts of military expended materials on marine invertebrate assemblages may include breakage, injury, or mortality. Parachutes and fiber optic cables may cause abrasion injury or mortality, or breakage. The fitness of individual organisms would be impacted directly or indirectly, to the extent that the viability of populations or species would be impacted.

The impact of military expended materials on marine invertebrates is likely to cause injury or mortality to individuals, but impacts to populations would be inconsequential because: (1) the area exposed to the stressor is extremely small relative to most marine invertebrates' ranges, (2) the activities are dispersed such that few individuals could conceivably be exposed to more than one event, and (3) exposures would be localized and would cease when the military expended material stops moving. Activities involving military expended material are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at the population level. However, the combined consequences of all military expended materials could degrade habitat quality.

Pursuant to the ESA, the use of military expended materials during training activities as described under the No Action Alternative:

- *would have no effect on any of the four coral species currently proposed for ESA listing;*
- *may affect, but is not likely to adversely affect, ESA-listed white abalone or black abalone species; and*
- *would have no effect on ESA-listed white abalone or black abalone critical habitats.*

Testing Activities

The number of military expended materials and their impact footprints are detailed in Table 3.3-5. As indicated in Section 3.0.5.3.3.3 (Military Expended Materials), under the No Action Alternative, nearly all of the military expended materials are expected in HRC and SOCAL.

The majority of military expended materials would be used in the open ocean. Some military expended materials may be expended in the nearshore waters of San Clemente Island during use of impact areas. Military expended materials deposited in this area may sink to the seafloor and have localized impacts on corals surrounding San Clemente Island. Military expended materials would not be expected to affect black and white abalone because of the limited amount of military expended materials in nearshore waters. There is no designated critical habitat on San Clemente Island. As for known offshore habitats known to support white abalone (such as the Tanner Banks), it is conceivable for military expended materials to fall in waters occupied by the white abalone during testing activities; however, due to the low population density and the wide spread use of chaff and flares, the potential for strike is sufficiently small to discount adverse effects. The majority of military expended material in nearshore and offshore waters surrounding the Tanner Banks is chaff and flares, which pose a negligible risk to critical habitat. It should be noted that chaff and flares are generally not deposited near shorelines, as to not interfere with regional commercial and private aviation.

Bombs, missiles, rockets, projectiles, and associated fragments may strike marine invertebrates at the sea surface or on the seafloor. Consequences of strikes or disturbances may include injury or mortality, particularly within the footprint of the object as it contacts the seafloor. Individual organisms would be impacted directly or indirectly, but not to the extent that the viability of populations or species would be impacted primarily, because the number of organisms exposed to these devices would be extremely small relative to population sizes.

Activities occurring at depths less than 2,600 ft. (800 m) may impact deep-water corals and other marine invertebrate assemblages. Consequences may include breakage, injury, or mortality for each projectile or munitions (see Section 3.3, Marine Habitats). Parachutes and cables may cause abrasion injury or mortality and breakage. The fitness of individual organisms would be impacted directly or indirectly to the extent that the viability of populations or species would be impacted.

The impact of military expended materials on marine invertebrates is likely to cause injury or mortality to individuals, but impacts to populations would be inconsequential because: (1) the area exposed to the stressor is extremely small relative to most marine invertebrates' ranges, (2) the activities are dispersed such that few individuals could conceivably be exposed to more than one event, and (3) exposures would be localized and would cease when the military expended material stops moving. Activities involving military expended materials are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at the population level. However, the combined consequences of all military expended materials could degrade habitat quality.

Pursuant to the ESA, the use of military expended materials during testing activities as described under the No Action Alternative:

- *would have no effect on any of the four coral species currently proposed for ESA listing;*
- *may affect, but is not likely to adversely affect, ESA-listed white abalone or black abalone species; and*
- *would have no effect on ESA-listed white abalone or black abalone critical habitats.*

3.8.3.3.2.4 Alternative 1

Training Activities

The number of military expended materials and their impact footprints are detailed in Table 3.3-6. As indicated in Section 3.0.5.3.3.3 (Military Expended Materials), under Alternative 1, nearly all of the military expended materials are expected in HRC and SOCAL. Alternative 1 would include substantial increases in the use of small- and medium-caliber projectiles. The use of bombs, missiles, rockets, projectiles, and associated fragments would also increase incrementally.

The majority of military expended materials would be used in the open ocean. Some military expended materials may be expended in the nearshore waters of San Clemente Island during use of impact areas. The majority of fired ordnance would impact on land and would not be expected to affect ESA-listed black and white abalone. Military expended materials would not be expected to affect black and white abalone because of the limited amount of military expended materials in nearshore waters. There is no designated critical habitat on San Clemente Island. As for known offshore habitats known to support white abalone (such as the Tanner Banks), it is conceivable for military expended materials to fall in waters occupied by the white abalone; however, due to the low population density and the wide spread use of chaff and flares, the potential for strike is sufficiently small to discount adverse effects. The majority of military expended material in nearshore waters is chaff and flares, which pose a negligible risk to benthic organisms. Use of military expended materials will not affect critical habitat. None of the expended materials are expected to be deposited in areas known to support corals proposed for ESA listing.

Although the number of military expended materials would increase under Alternative 1 compared to the No Action Alternative, the types of impacts would be similar to those described under the No Action Alternative. The probability of military expended material strikes on marine invertebrates, however, would increase because of the increase in the number of military expended materials. Activities involving military expended materials are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at the population level. However, the combined consequences of all military expended materials could degrade habitat quality.

Pursuant to the ESA, the use of military expended materials during training activities as described under Alternative 1:

- *would have no effect on any of the four coral species currently proposed for ESA listing;*
- *may affect, but is not likely to adversely affect, ESA-listed white abalone or black abalone species; and*
- *would have no effect on ESA-listed white abalone or black abalone critical habitats.*

Testing Activities

The number of military expended materials and their impact footprints are detailed in Table 3.3-6 (in Section 3.3, Marine Habitats). As indicated in Section 3.0.5.3.3.3 (Military Expended Materials), under Alternative 1, nearly all of the military expended materials are expected in HRC and SOCAL. Alternative 1 would include substantial increases in the use of small- and medium-caliber projectiles, bombs, missiles, rockets, projectiles, and associated fragments because of the introduction of new testing activities.

The majority of military expended materials would be used in the open ocean. Some military expended materials may be expended in the nearshore waters of San Clemente Island during use of impact areas. Military expended materials would not be expected to affect black and white abalone because of the limited amount of military expended materials in nearshore waters. There is no designated critical habitat on San Clemente Island. As for known offshore habitats known to support white abalone (such as the Tanner Banks), it is conceivable for military expended materials to fall in waters occupied by the white abalone; however, due to the low population density and the wide spread use of chaff and flares, the potential for strike is sufficiently small to discount adverse effects. The majority of military expended material in nearshore waters is chaff and flares, which pose a negligible risk to benthic organisms. Use of military expended materials will not affect critical habitat.

Although the number of military expended materials would increase under Alternative 1 compared to the No Action Alternative, the types of impacts would be similar to those described under the No Action Alternative. The probability of military expended material strikes on marine invertebrates, however, would increase because of the increase in the number of military expended materials. Activities involving military expended materials are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at the population level. However, the combined consequences of all military expended materials could degrade habitat quality.

Pursuant to the ESA, the use of military expended materials during testing activities as described under Alternative 1:

- *would have no effect on any of the four coral species currently proposed for ESA listing;*
- *may affect, but is not likely to adversely affect, ESA-listed white abalone or black abalone species; and*
- *would have no effect on ESA-listed white abalone or black abalone critical habitats.*

3.8.3.3.2.5 Alternative 2

Training Activities

Under Alternative 2, the Navy proposes the same numbers and types of military expended materials as described in Alternative 1. Therefore, the impacts of Alternative 2 training activities on marine invertebrates would be the same as for Alternative 1.

Pursuant to the ESA, the use of military expended materials during training activities as described under Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing;*
- *may affect, but is not likely to adversely affect, ESA-listed white abalone or black abalone species; and*
- *would have no effect on ESA-listed white abalone or black abalone critical habitats.*

Testing Activities

The number of military expended materials and their impact footprints are detailed in Table 3.3-7. As indicated in Section 3.0.5.3.3.3 (Military Expended Materials), under Alternative 2, nearly all of the military expended materials are expected in HRC and SOCAL. Alternative 2 would include substantial increases in the use of small- and medium-caliber projectiles, bombs, missiles, rockets, projectiles, and associated fragments because of the introduction of new testing activities.

The majority of military expended materials would be used in the open ocean. Some military expended materials may be expended in the nearshore waters of San Clemente Island during use of impact areas. Military expended materials would not be expected to affect black and white abalone because of the limited amount of military expended materials in nearshore waters. There is no designated critical habitat on San Clemente Island. As for known offshore habitats known to support white abalone (such as the Tanner Banks), it is conceivable for military expended materials to fall in waters occupied by the white abalone; however, due to the low population density and the wide spread use of chaff and flares, the potential for strike is sufficiently small to discount adverse effects. The majority of military expended material in nearshore waters is chaff and flares, which pose a negligible risk to critical habitat.

Although the number of military expended materials would increase under Alternative 2 compared to the No Action Alternative, the types of impacts would be similar to those described under the No Action Alternative. The probability of military expended material strikes on marine invertebrates, however, would increase because of the increase in the number of military expended materials. Activities involving military expended materials are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at the population level. However, the combined consequences of all military expended materials could degrade habitat quality.

Pursuant to the ESA, the use of military expended materials during testing activities as described under Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing;*
- *may affect, but is not likely to adversely affect, ESA-listed white abalone or black abalone species; and*
- *would have no effect on ESA-listed white abalone or black abalone critical habitats.*

3.8.3.3.2.6 Substressor Impacts on Sedentary Invertebrate Beds or Reefs as Essential Fish Habitat

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of military expended materials during training and testing activities may have an adverse effect on Essential Fish Habitat by reducing the quality or quantity of sedentary invertebrate beds or reefs that constitute Essential Fish Habitat or Habitat Areas of Particular Concern. The HSTT Essential Fish Habitat Assessment states that the impact to sedentary invertebrate beds would be minimal and long-term to permanent in duration (based on substrate impacts), whereas impacts to reefs would be individually minimal and permanent in duration within the Study Area.

3.8.3.3.3 Impacts from Seafloor Devices

For a discussion of the types of activities that use seafloor devices, where they are used, and how many activities would occur under each alternative, see Section 3.0.5.3.3.4 (Seafloor Devices). Seafloor devices include items that are placed on, dropped on, or moved along the seafloor, such as mine shapes, anchor blocks, surface vessel anchors, bottom-placed instruments, bottom-crawling unmanned underwater vehicles, and bottom-placed targets that are recovered (not expended).

Deployment of seafloor devices would cause disturbance, injury, or mortality within the footprint of the device, may disturb marine invertebrates outside the footprint of the device, and would cause temporary local increases in turbidity near the ocean bottom. Objects placed on the seafloor may attract invertebrates, or provide temporary attachment points for invertebrates. Some invertebrates attached to the devices would be removed from the habitat when the devices are recovered. A shallow depression may remain in the soft bottom sediment where an anchor was dropped. This analysis assumes a 1:1 relationship between high-explosive mines and their moorings; and a 1:1 relationship between high-explosive mine neutralizers and moorings for their targets.

3.8.3.3.3.1 No Action Alternative

Training Activities

Table 3.0-70 lists the number and location where seafloor devices are used. As indicated in Section 3.0.5.3.3.4 (Seafloor Devices), under the No Action Alternative, seafloor devices used during training activities would occur in HRC, SOCAL, and SSTC.

Seafloor devices could occur within potential ESA-listed black and white abalone habitat off San Clemente Island, but would not be expected to affect either species because seafloor devices are typically placed in soft-bottom areas. There is no designated critical habitat for ESA-listed black and white abalone off San Clemente Island and seafloor devices would not occur in areas of designated critical habitat within the Study Area.

Under the No Action Alternative, four elevated causeway systems training events would occur every year, primarily in SSTC oceanside Boat Lanes 1 through 10, but also periodically in the bayside Bravo training area (see Figure 2.1-10). Boat Lanes 1 through 10 have sand (5,300 acres [ac.] [22 square kilometers {km^2}]) or cobble (510 ac. [2.5 km^2]) substrates, with a small amount of understory algae (3.26 ac. [0.013 km^2]) (U.S. Department of the Navy 2011). The bayside Bravo training area contains an estimated 1.13 ac. (0.5 ha) of sandy substrates that support benthic invertebrate communities. Elevated causeway systems training in Bravo would remove surface substrate within the footprint of the pile, but the effects are expected to be short in duration.

Potential impacts of precision anchoring are qualitatively different than other seafloor devices because the activity involves repeated disturbance to the same area of seafloor. Precision anchoring occurs in long-established soft-bottom areas that have a history of disturbance by anchors, and continued exposure is likely to be inconsequential and not detectable.

Salvage operations under the No Action Alternative would occur three times per year in Puuloa Underwater Range, Naval Defensive Sea Area, Keehi Lagoon, or training areas in Pearl Harbor. These locations do not support coral species currently proposed for ESA listing found in waters off Hawaii. Training activities would consist of lowering and raising a vessel from the seafloor. The infrastructure to keep the vessel in place was implemented after in 2009. Potential impacts to marine invertebrates would be limited to area directly below the vessel, but this area would experience repeated impacts from raising and lowering the vessel during each training activity.

The impact of seafloor devices on marine invertebrates is likely to cause injury or mortality to individuals, but impacts to populations would be inconsequential because: (1) the area exposed to the stressor is extremely small relative to most marine invertebrates' ranges, (2) the activities are dispersed such that few individuals could conceivably be exposed to more than one event, and (3) exposures would be localized. Activities involving seafloor devices are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at the population level.

Pursuant to the ESA, the use of seafloor devices during training activities as described under the No Action Alternative:

- *would have no effect on any of the four coral species currently proposed for ESA listing;*
- *may affect, but is not likely to adversely affect, ESA-listed white abalone or black abalone species; and*
- *would have no effect on ESA-listed white abalone or black abalone critical habitats.*

Testing Activities

Table 3.0-70 lists the number and location where seafloor devices are used. As indicated in Section 3.0.5.3.3.4 (Seafloor Devices), under the No Action Alternative, seafloor devices used during testing activities would occur in SOCAL. Testing activities under the No Action Alternative include anti-terrorism/force protection underwater surveillance testing events and fixed intelligence, surveillance, and reconnaissance sensor system testing events. Anti-terrorism/force protection underwater surveillance testing events typically last 5 days, and day activities could range from 8 to 24 hours per testing day. These testing activities would involve placing clump anchors around existing piers and ships. These areas are characterized as deep subtidal habitats greater than 20 ft. (6 m) in depth, subject to periodic dredging since the 1940s (U.S. Department of the Navy 2011). These areas may support various hard-shelled marine invertebrates.

Fixed intelligence, surveillance, and reconnaissance sensor system testing events would occur in waters off Point Loma and San Clemente Island. Fixed intelligence, surveillance, and reconnaissance sensor system testing involves the temporary installation of several arrays on the seafloor in sandy seafloor substrates or suspended in the water column with a mooring structure. Arrays may stay in the water for several months.

Seafloor devices could occur within potential ESA-listed black and white abalone habitat off San Clemente Island, but would not be expected to affect either species because seafloor devices are typically placed in soft-bottom areas. There is no designated critical habitat for ESA-listed black and white abalone off San Clemente Island and seafloor devices would not occur in areas of designated critical habitat within the Study Area. There are no testing activities that would occur under the No Action Alternative in the HRC; therefore, coral species proposed for ESA listing would not be affected by seafloor device testing.

The impact of seafloor devices on marine invertebrates is likely to cause injury or mortality to individuals, but impacts to populations would be inconsequential because: (1) the area exposed to the stressor is extremely small relative to most marine invertebrates' ranges, (2) the activities are dispersed such that few individuals could conceivably be exposed to more than one event, and (3) exposures would be localized. Activities involving seafloor devices are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at the population level.

Pursuant to the ESA, the use of seafloor devices during testing activities as described under the No Action Alternative:

- *would have no effect on any of the four coral species currently proposed for ESA listing;*
- *may affect, but is not likely to adversely affect, ESA-listed white abalone and black abalone species; and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.3.3.2 Alternative 1

Training Activities

Table 3.0-70 lists the number and location where seafloor devices are used. As indicated in Section 3.0.5.3.3.4 (Seafloor Devices), under Alternative 1, seafloor devices used during training activities would occur in HRC, SOCAL, and SSTC. Under Alternative 1, the number of training activities that use seafloor devices would remain the same as under the No Action Alternative. Because there would be no changes in the seafloor devices used for training activities under Alternative 1 relative to the No Action Alternative, the effects of Alternative 1 training activities would be the same as for the No Action Alternative.

Pursuant to the ESA, the use of seafloor devices during training activities as described under Alternative 1:

- *would have no effect on any of the four coral species currently proposed for ESA listing;*
- *may affect, but is not likely to adversely affect ESA-listed white abalone or black abalone species; and*
- *would have no effect on ESA-listed white abalone or black abalone critical habitats.*

Testing Activities

Table 3.0-70 lists the number and location where seafloor devices are used. As indicated in Section 3.0.5.3.3.4 (Seafloor Devices), under Alternative 1, seafloor devices used during testing activities would increase within SOCAL (from 35 to 59) and new testing activities would be introduced within the open ocean portions of the HRC (15 new events).

The increase in fixed intelligence, surveillance, and reconnaissance sensor testing activities in waters off Point Loma and San Clemente Island would increase the number of installed devices on the seafloor, and therefore could directly impact benthic invertebrates or remove portions of the seafloor from available habitat for benthic invertebrate species. Although the Navy would increase the number of testing activities involving the installation or removal of seafloor devices, the Navy would continue to minimize impacts on the marine invertebrate community by using previously disturbed areas whenever operationally feasible. The types of impacts from seafloor devices under Alternative 1 would be similar to those described under the No Action Alternative because the same seafloor devices would be used. There would be an increased likelihood of strikes from seafloor devices, however, because of the increased number of testing activities. The testing activities that occur within the HRC occur in open ocean locations and do not overlap with areas known to support corals proposed for ESA listing.

Pursuant to the ESA, the use of seafloor devices during testing activities as described under Alternative 1:

- *would have no effect on any of the four coral species currently proposed for ESA listing;*
- *may affect, but is not likely to adversely affect, ESA-listed white abalone or black abalone species; and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.3.3.3 Alternative 2

Training Activities

Under Alternative 2, training activities would be consistent with Alternative 1. Therefore, Alternative 2 would have the same effects as under Alternative 1.

Pursuant to the ESA, the use of seafloor devices during training activities as described under Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing;*
- *may affect, but is not likely to adversely affect, ESA-listed white abalone or black abalone species; and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

Table 3.0-70 lists the number and location where seafloor devices are used. As indicated in Section 3.0.5.3.3.4 (Seafloor Devices), under Alternative 2, seafloor devices used during testing activities would increase within SOCAL (from 35 to 65) and new testing activities would be introduced within the open ocean portions of the HRC (17 new events).

The increase in fixed intelligence, surveillance, and reconnaissance sensor testing activities in waters off Point Loma and San Clemente Island would increase the number of installed devices on the seafloor, and therefore could directly impact benthic invertebrates or remove portions of the seafloor from available habitat for benthic invertebrate species. Although the Navy would increase the number of testing activities involving the installation or removal of seafloor devices, the Navy would continue to minimize impacts on the marine invertebrate community by using previously disturbed areas whenever operationally feasible. The types of impacts from seafloor devices under Alternative 2 would be similar to those described under the No Action Alternative because the same seafloor devices would be used. There would be an increased likelihood of strikes from seafloor devices, however, because of the increased number of testing activities. The testing activities proposed within the HRC under Alternative 2 would occur in open ocean locations and do not overlap with areas known to support corals proposed for ESA listing.

Pursuant to the ESA, the use of seafloor devices during testing activities as described under Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing;*
- *may affect, but is not likely to adversely affect, ESA-listed white abalone or black abalone species; and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.3.3.4 Substressor Impacts on Sedentary Invertebrate Beds or Reefs as Essential Fish Habitat

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of seafloor devices during training and testing activities could have an adverse effect on sedentary invertebrate beds or reefs that constitute Essential Fish Habitat or Habitat Areas of Particular Concern. The HSTT Essential Fish Habitat Assessment states that the impact to sedentary invertebrate beds (e.g., amphipod tubes, bryozoans) may be minimal and long-term.

3.8.3.4 Entanglement Stressors

This section analyzes the potential entanglement impacts of the various types of expended materials used by the Navy during training and testing activities within the Study Area. Included are potential impacts from two types of military expended materials: (1) fiber optic cables and guidance wires, and (2) parachutes. Aspects of entanglement stressors that are applicable to marine organisms in general are presented in Section 3.0.5.3.4 (Entanglement Stressors).

Most marine invertebrates are less susceptible to entanglement than fishes, sea turtles, and marine mammals due to their size, behavior, and morphology. Because even fishing nets which are designed to take marine invertebrates operate by enclosing rather than entangling, marine invertebrates seem to be somewhat less susceptible than vertebrates to entanglement (Chuenpagdee et al. 2003). A survey of marine debris entanglements found that marine invertebrates composed 16 percent of all animal entanglements (Ocean Conservancy 2010). The same survey cites potential entanglement in military items only in the context of waste-handling aboard ships, and not for military expended materials. Nevertheless, it is conceivable that marine invertebrates, particularly arthropods and echinoderms with rigid appendages, might become entangled in fiber optic cables and guidance wires, and in parachutes.

3.8.3.4.1 Impacts from Fiber Optic Cables and Guidance Wires

Fiber optic cables are only expended during airborne mine neutralization testing activities and torpedo guidance wires are used in training and testing activities. For a discussion of the types of activities that use guidance wires and fiber optic cables, physical characteristics of these expended materials, where they are used, and how many activities would occur under each alternative, please see Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires). Abrasion and shading-related impacts on sessile benthic (attached to the seafloor) marine invertebrates that may result from entanglement stressors are discussed with physical impacts in Section 3.8.3.3 (Physical Disturbance and Strike Stressors).

A marine invertebrate that might become entangled could be only temporarily confused and escape unharmed, it could be held tightly enough that it could be injured during its struggle to escape, it could be preyed upon while entangled, or it could starve while entangled. The likelihood of these outcomes cannot be predicted with any certainty because interactions between invertebrate species and entanglement hazards are not well known. The potential entanglement scenarios are based on observations of how marine invertebrates are entangled in marine debris, which is far more prone to tangling than guidance wire or fiber optic cable (Environmental Sciences Group 2005; Ocean Conservancy 2010). The small number of guidance wires and fiber optic cables expended across the Study Area results in an extremely low rate of potential encounter for marine invertebrates.

3.8.3.4.1.1 No Action Alternative

Training Activities

Table 3.0-80 and Table 3.0-83 list the number and locations of activities that expend fiber optic cables and guidance wires under the No Action Alternative. As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), under the No Action Alternative, airborne mine neutralization activities, with HE neutralizers, that expend fiber optic cables could occur in the SOCAL Range Complex. Torpedoes expending guidance wire would occur in HRC and SOCAL Range Complex.

ESA-listed black and white abalone do not occur in areas offshore where torpedo launches would occur, and would not be exposed to fiber optic cables and guidance wires. Airborne mine neutralization activities and fiber optic cables expended during training activities could occur in the nearshore areas of SOCAL, where ESA-listed abalone species are present. ESA-listed abalone species, however, would not be affected by fiber optic cables because fiber optic cables would not be expected to entangle ESA-listed abalone species since they are relatively sessile marine invertebrates. No effect would be expected on critical habitat from entanglement; potential physical disturbance on critical habitat by fiber optic cables and guidance wires are discussed as a physical impact in Section 3.8.3.3.2 (Impacts from Military Expended Materials). In the HRC, locations where expended materials are deposited do not support coral species currently proposed for ESA listing.

Given the low numbers used, most marine invertebrates would never be exposed to a fiber optic cable or guidance wire. The impact of cables and guidance wires on marine invertebrates is not likely to cause injury or mortality to individuals, and impacts would be inconsequential because: (1) the area exposed to the stressor is extremely small relative to most marine invertebrates' ranges; (2) the activities are dispersed such that few individuals could conceivably be exposed to more than one event; (3) exposures would be localized; and (4) marine invertebrates are not particularly susceptible to entanglement stressors, most would avoid entanglement and simply be temporarily disturbed. Activities involving fiber optic cables and guidance wires are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at individual or population levels.

Pursuant to the ESA, the use of fiber optic cables and guidance wires expended during training activities described under the No Action Alternative:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

Table 3.0-80 and Table 3.0-83 list the number and locations of activities that expend fiber optic cables and guidance wires under the No Action Alternative. As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), 240 guidance wires and 15 fiber optic cables would be expended within SOCAL Range Complex under the No Action Alternative. Within HRC, 160 guidance wires would be expended under the No Action Alternative testing activities (no fiber optic cables would be expended as part of testing activities under the No Action Alternative).

ESA-listed black and white abalone do not occur in areas offshore where torpedo launches would occur, and would not be exposed to guidance wires. Airborne mine neutralization activities and fiber optic cables expended during testing activities could occur in the nearshore areas of SOCAL, where ESA-listed abalone species are present. ESA-listed abalone species, however, would not be affected by fiber optic cables because fiber optic cables would not be expected to entangle ESA-listed abalone species since they are relatively sessile marine invertebrates. No effect would be expected on critical habitat from entanglement; potential physical disturbance on critical habitat by fiber optic cables and guidance wires are discussed as a physical impact in Section 3.8.3.3.2 (Impacts from Military Expended Materials). In the HRC, locations where expended materials are deposited do not support coral species currently proposed for ESA listing.

Fiber optic cables and guidance wires expended during testing activities would be the same or similar types to those expended during training activities. Therefore, fiber optic cables and guidance wires expended during testing activities would have the same effects on marine invertebrates as those described for training activities under the No Action Alternative.

Pursuant to the ESA, the use of fiber optic cables and guidance wires expended during testing activities described under the No Action Alternative:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.4.1.2 Alternative 1

Training Activities

Table 3.0-80 and Table 3.0-83 list the number and locations of activities that expend fiber optic cables and guidance wires under Alternative 1. The activities using fiber optic cables under Alternative 1 would occur in the same geographic locations as the No Action Alternative. As indicated in Section 3.0.5.3.4.1

(Fiber Optic Cables and Guidance Wires), under Alternative 1, the number of training activities that expend fiber optic cables would be greater than that of the No Action Alternative. Under Alternative 1, the number of training activities that expend guidance wire is expected to increase 15 percent compared to the No Action Alternative. The torpedo activities using guidance wire under Alternative 1 would occur in the same geographic locations as the No Action Alternative.

As stated in Section 3.8.3.4.1.1 (No Action Alternative), cables and guidance wires would not be expected to cause injury or mortality to marine invertebrate individuals. Cables and guidance wires would not have an effect on ESA-listed species or species currently proposed for listing, and use of cables and guidance wires would not reduce the conservation value of critical habitat because overlap between the stressor and resource would not be anticipated. In comparison to the No Action Alternative, the increase in activities would not substantially increase the risk of exposure to cables and guidance wires.

Pursuant to the ESA, the use of fiber optic cables and guidance wires expended during training activities described under Alternative 1:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

Table 3.0-80 and Table 3.0-83 list the number and locations of testing activities that expend fiber optic cables and guidance wires under Alternative 1. As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), 248 guidance wires and 16 fiber optic cables would be expended within SOCAL Range Complex under Alternative 1. Within HRC, 232 guidance wires would be expended under Alternative 1 testing activities (no fiber optic cables would be expended as part of testing activities under the No Action Alternative). The testing activities using guidance wire under Alternative 1 would occur in the same geographic locations as the No Action Alternative.

As stated in Section 3.8.3.4.1.1 (No Action Alternative), fiber optic cables and guidance wires would not be expected to cause injury to or mortality of marine invertebrate individuals. Fiber optic cables and guidance wires would not affect ESA-listed species or species currently considered for ESA listing because the activities that expend fiber optic cables and guidance wires do not co-occur within areas known to support these species. The use of fiber optic cables and guidance wires would not reduce the conservation value of critical habitat because overlap between the stressor and resource is not anticipated. In comparison to the No Action Alternative, the increase in activities would not substantially increase the risk of exposure to fiber optic cables and guidance wires.

Pursuant to the ESA, the use of fiber optic cables and guidance wires expended during testing activities described under Alternative 1:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.4.1.3 Alternative 2

Training Activities

Under Alternative 2, the Navy proposes the same numbers and types of military expended materials as described in Alternative 1. Therefore, the impacts of Alternative 2 training activities on marine invertebrates would be the same as for Alternative 1.

Pursuant to the ESA, the use of fiber optic cables and guidance wires expended during training activities described under Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

Table 3.0-80 and Table 3.0-83 list the number and locations of activities that expend fiber optic cables and guidance wires under Alternative 2. The activities that expend fiber optic cables and guidance wires under Alternative 2 would occur in the same geographic locations as the No Action Alternative. As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), under Alternative 2, the number of airborne mine neutralization activities (with high explosive neutralizers) would increase to 17 testing activities per year, compared to 15 testing activities under the No Action Alternative. The number of torpedo activities that expend guidance wire under Alternative 2 would increase to nearly twice that of the No Action Alternative. The torpedo activities using guidance wire under Alternative 2 would occur in the same geographic locations as the No Action Alternative.

As stated in Section 3.8.3.4.1.1 (No Action Alternative), fiber optic cables and guidance wires would not be expected to cause injury or mortality marine invertebrate individuals. Fiber optic cables and guidance wires would not affect ESA-listed species or species currently considered for ESA listing, and use of cables and guidance wires would not reduce the conservation value of critical habitat because overlap between the stressor and resource is not anticipated. In comparison to the No Action Alternative, the increase in activities would not substantially increase the risk of exposure to fiber optic cables and guidance wires.

Pursuant to the ESA, the use of fiber optic cables and guidance wires expended during testing activities described under Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.4.2 Impacts from Parachutes

Parachutes of varying sizes are used during training and testing activities. For a discussion of the types of activities that use parachutes, physical characteristics of these expended materials, where they are used, and how many activities would occur under each alternative, please see Section 3.0.5.3.4.2 (Parachutes). Parachutes pose a potential, though unlikely, entanglement risk to susceptible marine invertebrates. The most likely method of entanglement would be a marine invertebrate crawling through the fabric or cord that would then tighten around it.

Abrasion and shading-related impacts on sessile benthic (attached to the seafloor) marine invertebrates that may result from entanglement stressors are discussed with physical impacts in Section 3.8.3.3 (Physical Disturbance and Strike Stressors). Potential indirect effects of the parachute being transported laterally along the seafloor are discussed in Section 3.8.3.5.3.3 (Secondary Stressors).

A marine invertebrate that might become entangled could be temporarily confused and escape unharmed, held tightly enough that it could be injured during its struggle to escape, preyed upon while entangled, or starved while entangled. The likelihood of these outcomes cannot be predicted with any certainty because interactions between invertebrate species and entanglement hazards are not well known. The potential entanglement scenarios are based on observations of how marine invertebrates are entangled in marine debris (Environmental Sciences Group 2005; Ocean Conservancy 2010). The number of parachutes expended across the Study Area is extremely small relative to the number of marine invertebrates, resulting in a low rate of potential encounter for marine invertebrates.

3.8.3.4.2.1 No Action Alternative

Training Activities

Table 3.0-84 lists the number and locations of expended parachutes. As indicated in Section 3.0.5.3.4.2 (Parachutes), under the No Action Alternative, activities involving parachute use would occur in HRC and SOCAL.

ESA-listed abalone species and coral species currently proposed for ESA listing are not susceptible to entanglement in parachutes since they are relatively sessile marine invertebrates. Similarly, entanglement cannot affect critical habitat; potential consequences of physical disturbance and strike stressors associated with these objects, however, is addressed in Section 3.8.3.3.2 (Impacts from Military Expended Materials).

Most marine invertebrates would never encounter a parachute. The impact of parachutes on marine invertebrates is not likely to cause injury or mortality to individuals, and impacts would be inconsequential because: (1) the area exposed to the stressor is extremely small relative to most marine invertebrates' ranges, (2) the activities are dispersed such that few individuals could conceivably be exposed to more than one event, (3) exposures would be localized, and (4) marine invertebrates are not particularly susceptible to entanglement stressors, most would avoid entanglement and simply be temporarily disturbed. Activities involving parachutes are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at individual or population levels.

Pursuant to the ESA, the use of parachutes expended during training activities described under the No Action Alternative:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

Table 3.0-84 lists the number and locations of expended parachutes. As indicated in Section 3.0.5.3.4.2 (Parachutes), under the No Action Alternative, activities involving parachute use would occur in HRC and SOCAL.

ESA-listed abalone species and coral species currently proposed for ESA listing are not susceptible to entanglement in parachutes since they are relatively sessile marine invertebrates. Similarly entanglement cannot affect critical habitat; potential consequences of physical disturbance and strike stressors associated with these objects, however, is addressed in Section 3.8.3.3.2 (Impacts from Military Expended Materials).

Most marine invertebrates would never encounter a parachute. Some individual marine invertebrates could be injured or killed in the unlikely event of exposure and entanglement, but most mobile marine invertebrates would avoid entanglement and simply be temporarily disturbed and would recover completely soon after exposure. The growth, survival, annual reproductive success, or lifetime reproductive success of populations would not be impacted directly or indirectly.

Pursuant to the ESA, the use of parachutes expended during testing activities described under the No Action Alternative:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.4.2.2 Alternative 1

Training Activities

Table 3.0-84 lists the number and locations of expended parachutes. As indicated in Section 3.0.5.3.4.2 (Parachutes), under Alternative 1, activities involving parachute use would occur in HRC and SOCAL. ESA-listed abalone species and coral species currently proposed for ESA listing are not susceptible to entanglement in parachutes since they are relatively sessile marine invertebrates. Despite the increase in number of expended parachutes, parachutes used under Alternative 1 would be the same as those used under the No Action Alternative, and would have the same effects as described under the No Action Alternative.

Most marine invertebrates would never encounter a parachute. Some individual marine invertebrates could be injured or killed in the unlikely event of exposure and entanglement, but most mobile marine invertebrates would avoid entanglement and simply be temporarily disturbed and would recover completely soon after exposure. The growth, survival, annual reproductive success, or lifetime reproductive success of populations would not be impacted directly or indirectly.

Pursuant to the ESA, the use of parachutes expended during training activities described under Alternative 1:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

Table 3.0-84 lists the number and locations of expended parachutes. As indicated in Section 3.0.5.3.4.2 (Parachutes), under Alternative 1, activities involving parachute use would occur in HRC and SOCAL. ESA-listed abalone species and coral species currently proposed for ESA listing are not susceptible to entanglement in parachutes since they are relatively sessile marine invertebrates. Despite the increase in number of expended parachutes, parachutes used under Alternative 1 would be the same as those used under the No Action Alternative, and would have the same effects as described under the No Action Alternative.

Pursuant to the ESA, the use of parachutes expended during testing activities described under Alternative 1:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.4.2.3 Alternative 2

Training Activities

Under Alternative 2, the Navy proposes the same numbers and types of parachutes as described in Alternative 1. Therefore, the impacts of Alternative 2 training activities on marine invertebrates would be the same as for Alternative 1.

Pursuant to the ESA, the use of parachutes expended during training activities described under Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

Testing Activities

Table 3.0-84 lists the number and locations of expended parachutes. As indicated in Section 3.0.5.3.4.2 (Parachutes), under Alternative 2, activities involving parachute use would occur in HRC and SOCAL. ESA-listed abalone species and coral species currently proposed for ESA listing are not susceptible to entanglement in parachutes since they are relatively sessile marine invertebrates. Despite the increase in number of expended parachutes, parachutes used under Alternative 2 would be the same as those used under the No Action Alternative, and would have the same effects as described under the No Action Alternative.

Pursuant to the ESA, the use of parachutes expended during testing activities described under Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.5 Ingestion Stressors

This section analyzes the potential ingestion impacts of the various types of military expended materials used by the Navy during training and testing activities within the Study Area. Expended materials could be ingested by marine invertebrates in all large marine ecosystems and open ocean areas. Ingestion could occur at the surface, in the water column, or on the seafloor, depending on the size and buoyancy of the expended object and the feeding behavior of the animal. Floating material is more likely to be eaten by animals that feed at or near the water surface, while materials that sink to the seafloor present a higher risk to bottom-feeding animals. Marine invertebrates are universally present in the water and the seafloor, but the majority of individuals are smaller than a few millimeters (e.g., zooplankton, most roundworms, and most arthropods). Most military expended materials and fragments of military expended materials are too large to be ingested by marine invertebrates. The potential for marine invertebrates to encounter fragments of ingestible size increases as the military expended materials degrades into smaller fragments.

If expended material is ingested by marine invertebrates, the primary risk is from a blocked digestive tract. Most military expended materials are relatively inert in the marine environment, and are not likely to cause injury or mortality via chemical effects (see Section 3.8.3.5.3.3, Secondary Stressors, for more information on the chemical properties of these materials).

The most abundant military expended material of ingestible size is chaff. The materials in chaff are generally nontoxic in the marine environment except in quantities substantially larger than those any marine invertebrate could reasonably be exposed to from normal usage. Chaff is similar in form to fine human hair, and somewhat analogous to the spicules of sponges or the siliceous cases of diatoms (Spargo 1999). Many invertebrates ingest sponges, including the spicules, without suffering harm (Spargo 1999). Marine invertebrates may occasionally encounter chaff fibers in the marine environment and may incidentally ingest chaff when they ingest prey or water. Literature reviews and controlled experiments suggest that chaff poses little environmental risk to marine organisms at concentrations that could reasonably occur from military training and testing (Arfsten et al. 2002; Spargo 1999). Studies were conducted to determine likely effects on marine invertebrates from ingesting chaff involving a laboratory investigation of crabs that were fed radiofrequency chaff. Blue crabs were force-fed a chaff-and-food mixture daily for a few weeks at concentrations 10 to 100 times predicted real-world exposure levels without a notable increase in mortality (Arfsten et al. 2002).

As described in Section 3.8.2 (Affected Environment), tens of thousands of marine invertebrate species inhabit the Study Area. There is little literature about the effects of debris ingestion on marine invertebrates; consequently, there is little basis for an evidence-based assessment of risks. It is not feasible to speculate on which invertebrates in which locations might ingest specific types of military expended materials. However, invertebrates that actively forage (e.g., worms, octopus, shrimp, and sea cucumbers) are at much greater risk of ingesting military expended materials than invertebrates that filter-feed (e.g., sponges, corals, oysters, and barnacles). Though ingestion is possible in some circumstances, based on the little scientific information available, it seems that negative impacts on individuals are unlikely and impacts on populations would be inconsequential and not detectable. Adverse consequences of marine invertebrates ingesting military expended materials are possible but not probable.

3.8.3.5.1 No Action Alternative

3.8.3.5.1.1 Training Activities

Under the No Action Alternative, a variety of potentially ingestible military expended materials, such as chaff, would be released to the marine environment by Navy training activities. Ingestion is not likely in the majority of cases because most military expended materials are too large to be ingested by most marine invertebrates. The fractions of military expended materials that are of ingestible size, or become ingestible after degradation, are unlikely to impact individuals.

Pursuant to the ESA, the use of military expended materials of ingestible size during training activities described under the No Action Alternative:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.5.1.2 Testing Activities

Under the No Action Alternative, a variety of potentially ingestible military expended materials would be released to the marine environment by Navy testing activities. No chaff canisters would be released during testing activities under the No Action Alternative. Ingestion is not likely in the majority of cases because most military expended materials are too large to be ingested by most marine invertebrates. The fractions of military expended materials that are of ingestible size, or become ingestible after degradation, are unlikely to impact individuals.

Pursuant to the ESA, the use of military expended materials of ingestible size during testing activities described under the No Action Alternative:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.5.2 Alternative 1

3.8.3.5.2.1 Training Activities

Under Alternative 1, a variety of potentially ingestible military expended materials, such as chaff, would be released to the marine environment by Navy training activities. Under Alternative 1, the expended chaff would increase to 228 canisters per year within HRC and 32 per year within SOCAL (260 canisters per year throughout the Study Area) compared with the No Action Alternative. As with the No Action Alternative, ingestion is not likely because most military expended materials are too large to be ingested by most marine invertebrates. The fraction of military expended materials that are of ingestible size, or that become ingestible after degradation, may impact individual marine invertebrates, but are unlikely to have impacts on populations or sub-populations.

Pursuant to the ESA, the use of military expended materials of ingestible size during training activities described under Alternative 1:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.5.2.2 Testing Activities

Testing activities under Alternative 1 would introduce 504 canisters of chaff per year in the Study Area, compared to no use of chaff under the No Action Alternative. Within HRC, 300 canisters would be released from ships or aircraft. Within SOCAL, 204 canisters would be released. As with the No Action Alternative, ingestion is not likely because most military expended materials are too large to be ingested by most marine invertebrates. The fractions of military expended materials that are of ingestible size, or that become ingestible after degradation, may impact individual marine invertebrates, but are unlikely to have impacts on populations or sub-populations.

Pursuant to the ESA, the use of military expended materials of ingestible size during testing activities described under Alternative 1:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.5.3 Alternative 2

3.8.3.5.3.1 Training Activities

Under Alternative 2, the Navy proposes the same numbers and types of chaff as described in Alternative 1. Therefore, the impacts of Alternative 2 training activities on marine invertebrates would be the same as for Alternative 1.

Pursuant to the ESA, the use of military expended materials of ingestible size during training activities described under Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.5.3.2 Testing Activities

Testing activities under Alternative 2 would introduce 554 canisters of chaff in the Study Area, compared to no use of chaff under the No Action Alternative. Within HRC, 300 canisters would be released from ships or planes. Within SOCAL, 254 canisters would be released. As with the No Action Alternative, ingestion is not likely because most military expended materials are too large to be ingested by most marine invertebrates. The fractions of military expended materials that are of ingestible size, or that become ingestible after degradation, may impact individual marine invertebrates, but are unlikely to have impacts on populations or sub-populations.

Pursuant to the ESA, the use of military expended materials of ingestible size during testing activities described under Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing,*
- *would have no effect on ESA-listed white abalone or black abalone species, and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.5.3.3 Secondary Stressors

This section analyzes potential impacts on marine invertebrates exposed to stressors indirectly through sediment and water. These two ecosystem constituents, sediment and water, are also primary constituents of marine invertebrate habitat and clear distinctions between indirect impacts and habitat impacts are difficult to maintain. For this analysis, indirect impacts on marine invertebrates via sediment or water that do not require trophic transfers (e.g., bioaccumulation) to be observed are considered here. The terms "indirect" and "secondary" do not imply reduced severity of environmental consequences, but instead describe how the impact may occur in an organism or its ecosystem.

Stressors from Navy training and testing activities could pose secondary or indirect impacts on marine invertebrates via habitat, sediment, or water quality. These include: (1) explosives and by-products, (2) metals, (3) chemicals, and (4) other materials such as targets, chaff, and plastics.

3.8.3.5.4 Explosives, Explosion By-Products, and Unexploded Ordnance

High-order explosions consume most of the explosive material, creating typical combustion products. In the case of royal demolition explosive, 98 percent of the combustion products are common seawater constituents, with the remainder rapidly diluted by ocean currents and circulation (Table 3.1-10 in Section 3.1, Sediments and Water Quality). Explosion by-products from high order detonations present no indirect stressors to marine invertebrates through sediment or water. Low-order detonations and unexploded ordnance present an elevated likelihood of effects on marine invertebrates, and the potential impacts of these on marine invertebrates will be analyzed. Explosive material not completely consumed during a detonation from ordnance disposal and mine clearance training are collected after training is complete; therefore, potential impacts are assumed to be inconsequential and not detectable for these training and testing activities. Marine invertebrates may be exposed by contact with the explosive, contact with contaminants in the sediment or water, and ingestion of contaminated sediments. Most marine invertebrates are very small relative to ordnance or fragments, and direct ingestion of unexploded ordnance is unlikely.

Indirect impacts of explosives and unexploded ordnance on marine invertebrates via sediment are possible near the ordnance. Degradation of explosives proceeds via several pathways discussed in Section 3.1.3.1 (Explosives and Explosion By-Products). Degradation products of royal demolition explosive are not toxic to marine organisms at realistic exposure levels (Rosen and Lotufo 2010). Trinitrotoluene and its degradation products impact developmental processes in marine invertebrates and are acutely toxic to adults at concentrations similar to real-world exposures (Rosen and Lotufo 2007b, 2010). The relatively low solubility of most explosives and their degradation products indicate that concentrations of these contaminants in the marine environment are relatively low and readily diluted. Furthermore, while explosives and their degradation products were detectable in marine sediment approximately 6 to 12 inches (15 to 30 centimeters) from degrading ordnance, the concentrations of these compounds were not statistically distinguishable from background beyond 3 to 6 ft. (1 to 2 m) from the degrading ordnance (Durrach et al. 1998; Section 3.1.3.1, Explosives and Explosion By-Products). Taken together, marine invertebrates, eggs, and larvae probably would be adversely impacted by the indirect effects of degrading explosives within a very small radius of the explosive (1 to 6 ft. [0.3 to 2 m]).

Indirect impacts of explosives and unexploded ordnance on marine invertebrates via water are likely to be inconsequential and not detectable for two reasons. First, most explosives and explosive degradation products have very low solubility in sea water (Table 3.1-13 in Section 3.1, Sediments and Water Quality). This means that dissolution occurs extremely slowly, and harmful concentrations of explosives and degradation are not likely to accumulate except within confined spaces. Second, a low concentration of contaminants, slowly delivered into the water column, is readily diluted to non-harmful concentrations. While marine invertebrates may be adversely impacted by the indirect effects of degrading explosives via water (Rosen and Lotufo 2007a, 2010), this is extremely unlikely in realistic scenarios.

Impacts on marine invertebrates, including zooplankton, eggs, and larvae, are likely within a very small radius of the ordnance (1 to 6 ft. [0.3 to 2 m]). These impacts may continue as the ordnance degrades over months to decades. Because most ordnance is deployed as projectiles, multiple unexploded or low-order detonations would not accumulate on spatial scales of 1 to 6 ft. (0.3 to 2 m); therefore, potential impacts are likely to remain local and widely separated. Given these conditions, the possibility of population-level impacts on marine invertebrates is inconsequential.

3.8.3.5.5 Metals

Certain metals are harmful to marine invertebrates at concentrations above background levels (e.g., cadmium, chromium, lead, mercury, zinc, copper, manganese, and many others) (Negri et al. 2002; Wang and Rainbow 2008). Metals are introduced into seawater and sediments as a result of training and testing activities involving vessel hulks, targets, ordnance, munitions, and other military expended materials (Section 3.1.3.2, Metals). Many metals bioaccumulate and physiological impacts begin to occur only after several trophic transfers concentrate the toxic metals. Indirect impacts of metals on marine invertebrates via sediment and water involve concentrations several orders of magnitude lower than concentrations achieved via bioaccumulation. Marine invertebrates may be exposed by contact with the metal, contact with contaminants in the sediment or water (e.g., from leached metals), and ingestion of contaminated sediments. Most marine invertebrates are very small relative to Navy military expended materials, and ingestion would be unlikely.

Because metals often concentrate in sediments, potential adverse indirect impacts are much more likely via sediment than via water. Despite the acute toxicity of some metals (e.g., hexavalent chromium or tributyltin) (Negri et al. 2002) concentrations above safe limits are rarely encountered even in live-fire areas of Vieques where deposition of metals from Navy activities is very high (see Section 3.1.3.2, Metals). Pait (2010) and others sampled in areas in which live ammunition and weapons were used. Other studies described in Section 3.1.3.2 (Metals) find no harmful concentrations of metals from deposition of military metals into the marine environment. Marine invertebrates (especially soft tissued marine invertebrates), eggs, or larvae could be indirectly impacted by metals via sediment within a few inches of the object.

Concentrations of metals in sea water are orders of magnitude lower than concentrations in marine sediments. Marine invertebrates probably would not be indirectly impacted by toxic metals via the water, or via sediment near the object (e.g., within a few inches); such impacts would be local and widely separated. Concentrations of metals in water are not likely to be high enough to cause injury or mortality to marine invertebrates. Therefore, indirect impacts of metals via water are likely to be inconsequential and not detectable. Given these conditions, population-level impacts on marine invertebrates are likely to be inconsequential and not detectable.

3.8.3.5.6 Chemicals

Several Navy training and testing activities introduce potentially harmful chemicals into the marine environment; principally, flares and propellants from rockets, missiles, and torpedoes. Properly functioning flares, missiles, rockets, and torpedoes combust most of their propellants, leaving benign or readily diluted soluble combustion by-products (e.g., hydrogen cyanide). Operational failures allow propellants and their degradation products to be released into the marine environment. The greatest risk to marine invertebrates from flares, missiles, and rocket propellants is perchlorate, which is highly soluble in water, persistent, and impacts metabolic processes in many plants and animals. Torpedo propellant poses little risk to marine invertebrates because the chemicals have relatively low toxicity (Section 3.1.3.3, Chemicals Other than Explosives). Marine invertebrates may be exposed by contact with the chemical, contact with chemical contaminants in the sediment or water, and ingestion of contaminated sediments. Most marine invertebrates are very small relative to Navy military expended materials or fragments of military expended materials, and ingestion of military expended materials would be unlikely.

The principal toxic component of missiles and rockets is perchlorate, which is highly soluble and does not readily adsorb to sediments. Therefore, missile and rocket fuel poses inconsequential risks of indirect impacts on marine invertebrates via sediment. In contrast, the principal toxic components of torpedo fuel, propylene glycol dinitrate and nitrodiphenylamine, adsorb to sediments, have relatively low toxicity, and are readily degraded by biological processes (Section 3.1.3.3, Chemicals Other than Explosives). Marine invertebrates, eggs, or larvae could be indirectly impacted by propellants via sediment near the object (e.g., within a few inches), but these potential impacts would diminish rapidly as the propellant degrades (see discussion in Section 3.1.3.3, Chemicals Other than Explosives).

In seawater, however, perchlorate, the principal ingredient of solid missile and rocket propellant, is highly soluble, persistent, and impacts metabolic processes in many plants and animals. Perchlorate contamination rapidly disperses throughout the water column and water within sediments. While it impacts biological processes at low concentrations (e.g., less than 10 parts per billion), toxic concentrations are unlikely to be encountered in seawater. The principal mode of perchlorate toxicity in the environment is bioaccumulation.

Torpedo propellants have relatively low toxicity and pose an inconsequential risk to marine invertebrates. Marine invertebrates, zooplankton, eggs, or larvae could be indirectly impacted by hydrogen cyanide produced by torpedo fuel combustion, but these impacts would diminish rapidly as the chemical becomes diluted below toxic levels. Chemicals are rapidly diluted and readily biodegraded, and concentrations high enough to be acutely toxic are unlikely in the marine environment (see Section 3.1.3.3, Chemicals Other than Explosives, for a discussion of these mechanisms). Concentrations of chemicals in sediment and water are not likely to cause injury or mortality to marine invertebrates; therefore; indirect impacts of chemicals via sediment and water are likely to be inconsequential and not detectable. Based on negligible impacts on individuals, population-level impacts on marine invertebrates are likely to be inconsequential and not detectable.

In the past, polychlorinated biphenyls (PCBs) were a concern because they were present in certain materials (e.g., insulation, sires, felts, and gaskets) on vessels used as targets during sinking exercises. PCBs have a variety of deleterious effects on marine organisms. PCBs persist in the tissues of organisms at the bottom of the food chain. Consumers of those species may accumulate PCBs at concentrations many times higher than the PCB concentration in the surrounding water or sediments. Vessels now used for sinking exercises are selected from a list of U.S. Navy-approved vessels that were cleaned in accordance with U.S. Environmental Protection Agency (USEPA) guidelines, but may contain PCBs that could not be removed during cleaning.

3.8.3.5.7 Other Materials

Military expended materials that are re-mobilized after their initial contact with the seafloor (e.g., by waves or currents) may continue to strike or abrade marine invertebrates. Secondary physical strike and disturbances are relatively unlikely because most expended materials are more dense than the surrounding sediments (i.e., metal), and are likely to remain in place as the surrounding sediment moves. The principal exception is likely to be parachutes, which are moved easily relative to projectiles and fragments. Potential secondary physical strike and disturbance impacts may cease only: (1) when the military expended materials is too massive to be mobilized by typical oceanographic processes, (2) when the military expended material becomes encrusted by natural processes and incorporated into the seafloor, or (3) when the military expended materials becomes permanently buried. The fitness of individual organisms would be impacted directly or indirectly, but not to the extent that the viability of populations or species would be impacted.

All military expended material, including targets and vessel hulks used for sinking exercises that contain materials other than metals, explosives, or chemicals, is evaluated for potential indirect impacts on marine invertebrates via sediment and water. Principal components of these military expended materials include: aluminized fiberglass (chaff); carbon or Kevlar fiber (missiles); and plastics (canisters, targets, sonobuoy components, parachutes, etc). Potential effects of these materials are discussed in Section 3.1.3.4 (Other Materials). Chaff has been extensively studied, and no indirect toxic effects are known to occur at realistic concentrations in the marine environment (Arfsten et al. 2002). Plastics contain chemicals, including persistent organic pollutants, which could indirectly affect marine invertebrates (Derraik 2002; Mato et al. 2001; Teuten et al. 2007). Marine invertebrates may be exposed by contact with the plastic, contact with associated plastic chemical contaminants in the sediment or water, or ingestion of contaminated sediments. Most marine invertebrates are very small relative to Navy military expended materials or fragments of military expended materials, and direct ingestion of military expended materials is unlikely.

The only material that could impact marine invertebrates via sediment is plastics. Harmful chemicals in plastics interfere with metabolic and endocrine processes in many plants and animals (Derraik 2002). Potentially harmful chemicals in plastics are not readily adsorbed to marine sediments; instead, marine invertebrates are most at risk via ingestion or bioaccumulation (Sections 3.8.3.5, Ingestion Stressors, and 3.3, Marine Habitats). Because plastics retain much of their chemical properties as they are physically degraded into microplastic particles (Singh and Sharma 2008), the exposure risks to marine invertebrates are dispersed over time. Marine invertebrates could be indirectly impacted by chemicals from plastics expended during training and testing activities but, these effects would be limited to direct contact with the material. Because of these conditions, population-level impacts on marine invertebrates are likely to be inconsequential and not detectable.

Pursuant to the ESA, secondary stressors from training and testing activities under the No Action Alternative, Alternative 1, and Alternative 2:

- *would have no effect on any of the four coral species currently proposed for ESA listing;*
- *may affect, but are not likely to adversely affect, ESA-listed white abalone or black abalone species; and*
- *would have no effect on ESA-listed black abalone critical habitat.*

3.8.3.5.8 Substressor Impacts on Sedentary Invertebrate Beds or Reefs as Essential Fish Habitats (Preferred Alternative)

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of metal, chemical, and other material contaminants, and secondary physical disturbances during training and testing activities, will have no adverse effect on sedentary invertebrate beds or reefs that constitute Essential Fish Habitat or Habitat Areas of Particular Concern. The use of explosives, explosive byproducts, and unexploded ordnance during training and testing activities may have an adverse effect on sedentary invertebrate beds or reefs that constitute Essential Fish Habitat or Habitat Areas of Particular Concern. The HSTT Essential Fish Habitat Assessment states that substressor impacts on invertebrate beds or reefs would be minimal and short-term within the Study Area.

3.8.4 SUMMARY OF POTENTIAL IMPACTS (COMBINED IMPACTS OF ALL STRESSORS) ON MARINE INVERTEBRATES

3.8.4.1 Combined Impacts of All Stressors

As described in Section 3.0.5.5 (Resource-Specific Impacts Analysis for Multiple Stressors), this section evaluates the potential for combined impacts of all the stressors from the proposed action. The analysis and conclusions for the potential impacts from each of the individual stressors are discussed in the sections above and summarized in Sections 3.8.4.2 (Endangered Species Act Determinations). Stressors associated with Navy training and testing activities do not typically occur in isolation but rather occur in some combination. For example, mine neutralization activities include elements of acoustic, physical disturbance and strike, entanglement, ingestion, and secondary stressors that are all coincident in space and time. An analysis of the combined impacts of all stressors considers the potential consequences of aggregate exposure to all stressors and the repetitive or additive consequences of exposure over multiple years. This analysis makes the reasonable assumption that the majority of exposures to stressors are non-lethal, and instead focuses on consequences potentially impacting the organism's fitness (e.g., physiology, behavior, reproductive potential).

It is unlikely that mobile or migratory marine invertebrates that occur within the water column would be exposed to multiple activities during their lifespan because they are relatively short-lived, and most Navy training and testing activities impact small widely-dispersed areas. It is much more likely that stationary organisms or those that only move over a small range (e.g., corals, worms, and sea urchins) would be exposed to multiple activities because many Navy activities recur in the same location (e.g., gunnery and mine warfare).

Multiple stressors can co-occur with marine invertebrates in two general ways. The first would be if a marine invertebrate were exposed to multiple sources of stress from a single event or activity. The second is exposure to a combination of stressors over the course of the organism's life. Both general scenarios are more likely to occur where training and testing activities are concentrated. The key difference between the two scenarios is the amount of time between exposures to stressors. Time is an important factor because some stressors develop over a long period while others occur and pass quickly (e.g., dissolution of secondary stressors into the sediment versus physical disturbance). Similarly, time is an important factor for the organism because subsequent disturbances or injuries often increase the time needed for the organism to recover to baseline behavior/physiology, extending the time that the organism's fitness is impacted.

Marine invertebrates are susceptible to multiple stressors (see Section 3.8.2.2, General Threats), and susceptibilities of many species are enhanced by additive or synergistic effects of multiple stressors (Section 3.8.2.11, Corals, Hydroids, Jellyfish [Phylum Cnidaria]). The global decline of corals, for example, is driven primarily by synergistic impacts of pollution, ecological consequences of overfishing, and climate change. As discussed in the analyses above, marine invertebrates are not particularly susceptible to energy, entanglement, or ingestion stressors resulting from Navy activities (Section 3.8.3.2, Energy Stressors, Section 3.8.3.4, Entanglement Stressors, and Section 3.8.3.5, Ingestion Stressors); therefore, the opportunity for Navy stressors to result in additive or synergistic consequences is most likely limited to acoustic, physical strike and disturbance, and secondary stressors.

Despite uncertainty in the nature of consequences resulting from combined impacts, the location of potential combined impacts can be predicted with more certainty because combinations are much more likely in locations that training and testing activities are concentrated. However, analyses of the nature of potential consequences of combined impacts of all stressors on marine invertebrates remain largely qualitative and speculative. Where multiple stressors coincide with marine invertebrates, the likelihood of a negative consequence is elevated but it is not feasible to predict the nature of the consequence or its likelihood because not enough is known about potential additive or synergistic interactions. Even for shallow-water coral reefs, an exceptionally well-studied resource, predictions of the consequences of multiple stressors are semi-quantitative and generalized predictions remain qualitative (Hughes and Connell 1999; Jackson 2008; Norström et al. 2009). It is also possible that Navy stressors will combine with non-Navy stressors, and this is qualitatively discussed in Chapter 4 (Cumulative Impacts).

3.8.4.2 Endangered Species Act Determinations

Table 3.8-5 summarizes the Navy's determination of effect on ESA-listed marine invertebrates for each stressor based on the previous analysis sections. Accordingly, the Navy is including black abalone and white abalone in the Section 7 ESA consultation with NMFS, along with the four species of corals currently proposed for ESA listing (fuzzy table coral, irregular rice coral, blue rice coral, and sandpaper rice coral). No other ESA-listed invertebrate species or species currently proposed for ESA listing occur within the Study Area. The Navy's determinations of effect of ESA-listed marine invertebrates are consistent with the current draft of the NMFS Biological Opinion (National Marine Fisheries Service 2013b).

3.8.4.3 Essential Fish Habitat Determinations

Pursuant to the Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations, the use of sonar and other acoustic sources, vessel noise, swimmer defense airguns, weapons firing noise, high energy lasers, vessel movement, in-water devices, and metal, chemical, or other material contaminants will have no adverse effect on sedentary invertebrate beds or reefs that constitute Essential Fish Habitat or Habitat Areas of Particular Concern. The use of explosives, pile driving, electromagnetic sources, military expended materials, seafloor devices, and explosives and explosive byproduct contaminants may have an adverse effect on Essential Fish Habitat by reducing the quality and quantity of sedentary invertebrate beds or reefs that constitute Essential Fish Habitat or Habitat Areas of Particular Concern. The HSTT Essential Fish Habitat Assessment states that individual stressor impacts were all either no-effect, or minimal and ranged in duration from temporary to permanent, depending on the stressor.

Table 3.8-5: Summary of Endangered Species Act Determinations for Marine Invertebrates for the Preferred Alternative

Stressor		Black Abalone	White Abalone	Fuzzy Table Coral	Irregular Rice Coral	Blue Rice Coral	Sandpaper Rice Coral
Acoustic Stressors							
Sonar and Other Acoustic Sources	Training Activities	No effect	No effect	No effect	No effect	No effect	No effect
	Testing Activities	No effect	No effect	No effect	No effect	No effect	No effect
Explosives and Other Impulsive Acoustic Sources	Training Activities	May Affect, Not Likely to Adversely Affect	May Affect, Not Likely to Adversely Affect	No effect	No effect	No effect	No effect
	Testing Activities	May Affect, Not Likely to Adversely Affect	May Affect, Not Likely to Adversely Affect	No effect	No effect	No effect	No effect
Energy Stressors							
Electromagnetic Devices	Training Activities	No effect	No effect	No effect	No effect	No effect	No effect
	Testing Activities	No effect	No effect	No effect	No effect	No effect	No effect
Physical Disturbance and Strike Stressors							
Vessels and In-water Devices	Training Activities	No effect	No effect	No effect	No effect	No effect	No effect
	Testing Activities	No effect	No effect	No effect	No effect	No effect	No effect
Military Expended Materials	Training Activities	May Affect, Not Likely to Adversely Affect	May Affect, Not Likely to Adversely Affect	No effect	No effect	No effect	No effect
	Testing Activities	May Affect, Not Likely to Adversely Affect	May Affect, Not Likely to Adversely Affect	No effect	No effect	No effect	No effect
Seafloor devices	Training Activities	May Affect, Not Likely to Adversely Affect	May Affect, Not Likely to Adversely Affect	No effect	No effect	No effect	No effect
	Testing Activities	May Affect, Not Likely to Adversely Affect	May Affect, Not Likely to Adversely Affect	No effect	No effect	No effect	No effect
Entanglement Stressors							
Fiber Optic Cables and Guidance Wires	Training Activities	No effect	No effect	No effect	No effect	No effect	No effect
	Testing Activities	No effect	No effect	No effect	No effect	No effect	No effect
Parachutes	Training Activities	No effect	No effect	No effect	No effect	No effect	No effect
	Testing Activities	No effect	No effect	No effect	No effect	No effect	No effect

Table 3.8-5: Summary of Endangered Species Act Determinations for Marine Invertebrates for the Preferred Alternative (continued)

Stressor		Black Abalone	White Abalone	Fuzzy Table Coral	Irregular Rice Coral	Blue Rice Coral	Sandpaper Rice Coral
Ingestion Stressors							
Military Expended Materials	Training Activities	No effect	No effect	No effect	No effect	No effect	No effect
	Testing Activities	No effect	No effect	No effect	No effect	No effect	No effect
Secondary Stressors							
Explosives, Explosion By-Products, Unexploded Ordnance, Metals, Chemicals, and Other Materials	Training Activities	May Affect, Not Likely to Adversely Affect	May Affect, Not Likely to Adversely Affect	No effect	No effect	No effect	No effect
	Testing Activities	May Affect, Not Likely to Adversely Affect	May Affect, Not Likely to Adversely Affect	No effect	No effect	No effect	No effect

REFERENCES

Andre, M. M. Solé, M. Lenoir, M. Durfort, C. Quero, A. Mas, A. Lombarte, M. van der Schaar, M. López-Bejar, M. Morell, S. Zaugg, and L. Houégnigan. (2011). Low-frequency sounds induce acoustic trauma in cephalopods. Frontiers in Ecology and the Environment 9: 489–493.

Aplin, J. A. (1947). The effect of explosives on marine life. California Fish and Game, 33, 23-30.

Appeltans, W., Bouchet, P., Boxshall, G. A., Fauchald, K., Gordon, D. P., Hoeksema, B. W., Costello, M. J. (2010). *World Register of Marine Species*. [Web page]. Retrieved from http://www.marinespecies.org/index.php, 06 September 2010.

Arfsten, D. P., Wilson, C. L. & Spargo, B. J. (2002). Radio Frequency Chaff: The Effects of Its Use in Training on the Environment. *Ecotoxicology and Environmental Safety, 53*(1), 1-11. DOI: 10.1006/eesa.2002.2197 Retrieved from http://www.sciencedirect.com/science/article/B6WDM-482XDXP-1/2/8251fde540591fc2c72f20159f9d62b3

Bickel, S. L., Malloy Hammond, J. D. & Tang, K. W. (2011). Boat-generated turbulence as a potential source of mortality among copepods. *Journal of Experimental Marine Biology and Ecology, 401*(1-2), 105-109. DOI: 10.1016/j.jembe.2011.02.038 Retrieved from http://www.sciencedirect.com/science/article/B6T8F-52C45PW-1/2/2106d981f9d27a288d7bfadd4c38e23eBrierley 2003, as accessed on 31 October 2011.

Bisby, F. A., Roskov, Y. R., Orrell, T. M., Nicolson, D., Paglinawan, L. E., Bailly, N., Baillargeon, G. (2010). *Species 2000 & ITIS Catalogue of Life: 2010 Annual Checklist*. [Online database] Species 2000. Retrieved from http://www.catalogueoflife.org/annual-checklist/2010/browse/tree, 05 September 2010.

Bishop, M. J. (2008, January). Displacement of epifauna from seagrass blades by boat wake. [Article]. *Journal of Experimental Marine Biology and Ecology, 354*(1), 111-118. 10.1016/j.jembe.2007.10.013 Retrieved from <Go to ISI>://000252599600011

Boulon, R., Chiappone, M., Halley, R., Jaap, W., Keller, B., Kruczynski, B., Rogers, C. (2005). *Atlantic Acropora status review document report to National Marine Fisheries Service, Southeast Regional Office*. Available from http://sero.nmfs.noaa.gov/pr/pdf/050303%20status%20review.pdf

Brainard, R.E., C. Birkeland, C.M. Eakin, P. McElhany, M.W. Miller, M. Patterson, and G.A. Piniak. (2011). Status review report of 82 candidate coral species petitioned under the U.S. Endangered Species Act. U.S. Dep. Commer., NOAA Tech. Memo., NOAA-TM-NMFS-PIFSC-27, 530 p. + 1 Appendix.

Brierley, A. S., Fernandes, P. G., Brandon, M. A., Armstrong, F., Millard, N. W., McPhail, S. D. (2003). An investigation of avoidance by Antarctic krill of RRS *James Clark Ross* using the *Autosub*-2 autonomous underwater vehicle. *Fisheries Research, 60*, 569-576.

Brown, E. & Wolf, S. (2009). *Petition to List 83 Coral Species under the Endangered Species Act*. (pp. 191). San Francisco, CA: Center for Biological Diversity.

Brusca, R. C. & Brusca, G. J. (2003). Phylum Cnidaria. In *Invertebrates* (pp. 219-283). Sunderland: Sinauer Associates, Inc.

Bryant, D., Burke, L., McManus, J. & Spalding, M. D. (1998). *Reefs at Risk: A Map Based Indicator of Threats to the Word's Coral Reefs.* (pp. 56). Washington, D.C: World Resources Institute.

Budelmann, B. U. (2010). Cephalopoda, in *The UFAW Handbook on the Care and Management of Laboratory and Other Research Animals, Eighth Edition* (eds R. Hubrecht and J. Kirkwood), Wiley-Blackwell, Oxford, UK.

Butler, J., Neuman, M., Pinkard, D., Kvitek, R. & Cochrane, G. (2006). The use of multibeam sonar mapping techniques to refine population estimates of the endangered white abalone (*Haliotis sorenseni*). *Fishery Bulletin, 104*(4), 521-532.

Bythell, J. C. (1986). A guide to the identification of the living corals (*Scleractinia*) of Southern California. *Occasional Papers of the San Diego Society of Natural History, 16*, 1-40.

Cairns, S. D. (1994). *Scleractinia* of the temperate North Pacific. *Smithsonian Contributions to Zoology, 557*.

Carpenter, K. E., Abrar M., Aeby G., Aronson R. B., Banks S., Bruckner A., Chiriboga A., Cortes J., Delbeek J. C., DeVantier L., Edgar G. J., Edwards A. J., Fenner D., Guzman H. M., Hoeksema B. W., Hodgson G., Johan O., Licuanan W. Y., Livingstone S. R., Lovell E. R., Moore J. A., Obura D. O., Ochavillo D., Polidoro B. A., Precht W. F., Quibilan M. C., Reboton C., Richards Z. T., Rogers A. D., Sanciangco J., Sheppard A., Sheppard C., Smith J., Stuart S., Turak E., Veron J. E. N., Wallace C., Weil E., and Wood E. (2008). One-third of reef-building corals face elevated extinction risk from climate change and local impacts. *Science* 321:560-563.

Castro, P. & Huber, M. E. (2000). Marine animals without a backbone. In *Marine Biology* (3rd ed., pp. 104-138). McGraw-Hill.

Cato, D. H. & M. J. Bell. (1992). Ultrasonic Ambient Noise in Australian Shallow Waters at Frequencies up to 200 kHz. Materials Research Labs Ascot Vale, Australia. Retrieved from: http://handle.dtic.mil/100.2/ADA251679, as accessed on 28 October 2011.

Chan, A., P. Giraldo-Perez, S. Smith & D. Blumstein. (2010). Anthropogenic noise affects risk assessment and attention: the distracted prey hypothesis. *Biology Letters. 23 August, 2010. Retrieved from: http://rsbl.royalsocietypublishing.org/content/6/4/458.full.pdf+html as accessed on 28 October 2011.*

Chave, E.H., and A. Malahoff. (1998). "In deeper waters: Photographic studies of Hawaiian deepsea habitats and life-forms," Honolulu: University of Hawai`i Press.

Chesapeake Biological Laboratory Maryland & Board of Natural Resources. Dept. of Research and Education. (1948). Effects of underwater explosions on oysters, crabs and fish: a preliminary report: Chesapeake Biological Laboratory.

Chess, J. R. & Hobson, E. S. (1997). *Benthic Invertebrates of Four Southern California Marine Habitats Prior to Onset of Ocean Warming in 1976, with Lists of Fish Predators*. (NOAA Technical Memorandum NMFS-SWFSC-243, pp. 110). Tiburon, CA: US Department of Commerce, NOAA, NMFS, Southwest Fisheries Science Center Tiburon Laboratory.

Christian, J. R., A. Mathieu, D. H. Thomson, D. White and R. A. Buchanan. (2003). Effect of Seismic Energy on Snow Crab (*Chionoecetes opilio*). Environmental Research Funds Report No. 144. Calgary. 106 p.

Chuenpagdee, R., Morgan, L. E., Maxwell, S. M., Norse, E. A. & Pauly, D. (2003, December). Shifting gears: assessing collateral impacts of fishing methods in US waters. [Review]. *Frontiers in Ecology and the Environment, 1*(10), 517-524.

Clark, R., Morrison, W., Allen, M. J. & Claflin, L. (2005). Chapter 3: Biogeography of macroinvertebrates. In R. Clark, J. Christensen, C. Caldow, J. Allen, M. Murray and S. MacWilliams (Eds.), *A Biogeographic Assessment of the Channel Islands National Marine Sanctuary: A Review of Boundary Expansion Concepts for NOAA's National Marine Sanctuary Program*. (NOAA Technical Memorandum NOS NCCOS 21, pp. 57-88). Silver Spring, MD: NOAA National Centers for Coastal Ocean Science. Prepared by NCCOS's Biogeography Team in cooperation with the National Marine Sanctuary Program. Available from http://ccma.nos.noaa.gov/ecosystems/sanctuaries/chanisl_nms.html

Cohen, A. L., McCorkle, D. C., de Putron, S., Gaetani, G. A. & Rose, K. A. (2009). Morphological and compositional changes in the skeletons of new coral recruits reared in acidified seawater: Insights into the biomineralization response to ocean acidification. *Geochemistry Geophysics Geosystems, 10*(7), Q07005. doi:10.1029/2009gc002411.

Colin, P. L. & Arneson, A. C. (1995a). Cnidarians: Phylum *Cnidaria*. In *Tropical Pacific Invertebrates: A Field Guide to the Marine Invertebrates Occurring on Tropical Pacific Coral Reefs, Seagrass Beds and Mangroves* (pp. 63-139). Beverly Hills, CA: Coral Reef Press.

Colin, P. L. & Arneson, A. C. (1995b). Echinoderms: Phylum *Echinodermata*. In *Tropical Pacific Invertebrates: A Field Guide to the Marine Invertebrates Occurring on Tropical Pacific Coral Reefs, Seagrass Beds and Mangroves* (pp. 235-266). Beverly Hills, CA: Coral Reef Press.

Colin, P. L. & Arneson, A. C. (1995c). Mollusks: Phylum *Molluska*. In *Tropical Pacific Invertebrates: A Field Guide to the Marine Invertebrates Occurring on Tropical Pacific Coral Reefs, Seagrass Beds and Mangroves* (pp. 157-200). Beverly Hills, CA: Coral Reef Press.

Colin, P. L. & Arneson, A. C. (1995d). Sponges: Phylum *Porifera*. In *Tropical Pacific Invertebrates: A Field Guide to the Marine Invertebrates Occurring on Tropical Pacific Coral Reefs, Seagrass Beds and Mangroves* (pp. 17-62). Beverly Hills, CA: Coral Reef Press.

Collins, A. G. & Waggoner, B. (2006, Last updated 28 January 2000). *Introduction to the Porifera*. [Web page] University of California Museum of Paleontology. Retrieved from http://www.ucmp.berkeley.edu/porifera/porifera.html, 13 September 2010.

Cortes N, J. & Risk, M. J. (1985). A reef under siltation stress: Cahuita, Costa Rica. *Bulletin of Marine Science, 36*(2), 339-356. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-0022177985&partnerID=40&md5=7b3adeceda67f8cafab3bf19af287bae

Cortes, J., Edgar, G., Chiriboga, A., Sheppard, C., Turak, E. & Wood, E. (2008). *Psammocora stellata*. In *IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3*. [Online database]. Retrieved from http://www.iucnredlist.org/apps/redlist/details/132860/0, 29 September 2010.

Davis, G. E., Haaker, P. L. & Richards, D. V. (1996). Status and trends of white abalone at the California Channel Islands. *Transactions of the American Fisheries Society, 125*(1), 42-48.

Davis, G. E., Haaker, P. L. & Richards, D. V. (1998). The perilous condition of white abalone *Haliotis sorenseni*, Bartsch, 1940. *Journal of Shellfish Research, 17*(3), 871-875.

Derraik J.G.B. (2002). The pollution of the marine environment by plastic debris: a review. Marine Pollution Bulletin 44: 842-852.

DeVantier, L., Hodgson, G., Huang, D., Johan, O., Licuanan, A., Obura, D., Turak, E. (2008a). *Cyphastrea agassizi*. In *IUCN 2010. IUCN Red List of Threatened Species. Version 2010.1*. [Online database]. Retrieved from www.iucnredlist.org, 12 May 2010.

DeVantier, L., Hodgson, G., Huang, D., Johan, O., Licuanan, A., Obura, D., Turak, E. (2008b). *Montipora dilatata*. In *IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4*. [Online Database]. Retrieved from http://www.iucnredlist.org/apps/redlist/details/133170/0, 28 October 2010.

DeVantier, L., Hodgson, G., Huang, D., Johan, O., Licuanan, A., Obura, D., Turak, E. (2008c). *Montipora flabellata*. In *IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4*. [Online Database]. Retrieved from http://www.iucnredlist.org/apps/redlist/details/133229/0, 28 October 2010.

DeVantier, L., Hodgson, G., Huang, D., Johan, O., Licuanan, A., Obura, D., Turak, E. (2008d). *Montipora patula*. In *IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4*. [Online Database]. Retrieved from http://www.iucnredlist.org/apps/redlist/details/132942/0, 28 October 2010.

Downs, C. A., Kramarsky-Winter, E., Woodley, C. M., Downs, A., Winters, G., Loya, Y. & Ostrander, G. K. (2009). Cellular pathology and histopathology of hypo-salinity exposure on the coral *Stylophora pistillata*. *Science of the Total Environment, 407*(17), 4838-4851. doi: 10.1016/j.scitotenv.2009.05.015.

Dubinsky, Z. & Berman-Frank, I. (2001). Uncoupling primary production from population growth in photosynthesizing organisms in aquatic ecosystems. *Aquatic Sciences, 63*(1), 4-17. Retrieved from http://www.scopus.com/scopus/inward/record.url?eid=2-s2.0-0035089069&partnerID=40

Dugan, J. E., Hubbard, D. M., Martin, D. L., Engle, J. M., Richards, D. M., Davis, G. E., Ambrose, R. F. (2000). Macrofauna communities of exposed sandy beaches on the southern California mainland and Channel Islands. In D. R. Browne, K. L. Mitchell and H. W. Chaney (Eds.), *Proceedings of the Fifth California Islands Symposium, 29 March - 1 April 1999 (OCS Study MMS 99-0038)* (pp. 339-346). Minerals Management Service.

Durrach, M. R., Chutjian, A. & Plett, G. A. (1998). Trace Explosives Signatures from World War II Unexploded Undersea Ordnance. *Environmental Science and Technology, 32*, 1354-1358.

Emmett, R. L., Hinton, S. A., Stone, S. L. & Monaco, M. E. (1991). *Distribution and Abundance of Fishes and Invertebrates in West Coast Estuaries*. (Vol. II: Species Life History Summaries, ELMR Report Number 8, pp. 329). Rockville, MD: NOAA/NOS Strategic Environmental Assessments Division.

Environmental Sciences Group. (2005). *CFMETR Environmental Assessment Update 2005*. (RMC-CCE-ES-05-21, pp. 652). Kingston, Ontario: Environmental Sciences Group, Royal Military College.

Etnoyer P, Morgan L. (2003). Occurrences of habitat-forming deep sea corals in the northeast Pacific Ocean: A report to NOAA's office of habitat conservation. Redmond, Washington: Marine Conservation Biology Institute.

Etnoyer P, Morgan L.E. (2005). Habitat-forming deep-sea corals in the Northeast Pacific Ocean. In A. Freiwald, and J.M. Roberts, eds. Cold-water corals and ecosystems. Berlin Heidelberg: Springer-Verlag. pp 331-343.

Fenner, D. (2005). *Corals of Hawai'i: A Field Guide to the Hard, Black, and Soft Corals of Hawai'i and the Northwest Hawaiian Islands, including Midway* (pp. 192). Honolulu, HI: Mutual Publishing.

Field, D. B., Baumgartner, T. R., Charles, C. D., Ferreira-Bartrina, V. & Ohman, M. D. (2006). Planktonic Foraminifera of the California Current Reflect 20th-Century Warming. *Science, 311*(5757), 63-66. doi: 10.1126/science.1116220.

Food and Agriculture Organization of the United Nations. (2005). *Fishery Country Profile: United States of America*. [Electronic Data]. Retrieved from ftp://ftp.fao.org/FI/DOCUMENT/fcp/en/FI_CP_US.pdf

Freiwald, A., Fosså, J. H., Grehan, A., Koslow, T. & Roberts, J. M. (2004). *Cold-water coral reefs: Out of sight - no longer out of mind* S. Hain and E. Corcoran (Eds.), (pp. 80). Cambridge, UK: [UNEP-WCMC] United Nations Environment Programme-World Conservation Monitoring Centre. Retrieved from http://www.unep-wcmc.org/resources/publications/UNEP_WCMC_bio_series/22.htm

Friedlander, A., Aeby, G., Brown, E., Clark, A., Coles, S., Dollar, S., Wiltse, W. (2005). The state of coral reef ecosystems of the main Hawaiian islands. In J. Waddell (Ed.), *The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005*. (NOAA Technical Memorandum NOS NCCOS 11, pp. 222-269). Silver Spring, MD: NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team.

Friedman, C. S., Hendrick, R. P. & Moore, J. D. (2003). *Tools for Management of Withering Syndrome in Abalone,* Haliotis spp*: PCR Detection and Feed-based Therapeutic Treatment*. (pp. 23) University of California, San Diego.

Galloway, S. B., Bruckner, A. W. & Woodley, C. M. (Eds.). (2009). *Coral Health and Disease in the Pacific: Vision for Action*. (NOAA Technical Memorandum NOS NCCOS 97 and CRCP 7, pp. 314). Silver Spring, MD: National Oceanic and Atmospheric Administration.

Gaspin, J.B., Peters, G.B., & M.L. Wisely. (1976). Experimental investigations of the effects of underwater explosions on swimbladder fish. II. 1975 Chesapeake Bay tests (Technical Report NSWC/WOL/TR 76-61). Naval Ordnance Lab. White Oak, MD.

Grigg, R. W. (1993). Precious coral fisheries of Hawaii and the U.S. Pacific Islands. *Marine Fisheries Review, 55*(2), 50-60.

Gochfeld, D. J. (2004). Predation-induced morphological and behavioral defenses in a hard coral: implications for foraging behavior of coral-feeding butterflyfishes. *Marine Ecology-Progress Series, 267*, 145-158.

Goodall, C., Chapman, C. & Neil, D. (1990). The acoustic response threshold of Norway lobster Nephrops norvegicus (L.) in a free found field. K. Weise, W. D. Krenz, J. Tautz, H. Reichert and B. Mulloney (Eds.), *Frontiers in Crustacean Neurobiology* (pp. 106 - 113). Basel: Birkhauser.

Guerra A. A.F. Gonzalez, and F, Rocha. (2004). A review of the records of giant squid in the north-eastern Atlantic and severe injuries in *Architeuthis dux* stranded after acoustic explorations. ICES C. M. CC: 29, 1- 17.

Guerra, A. & Gonzales, A. F. (2006). Severe injuries in the giant squid *Architeuthis dux* stranded after seismic explorations, *International Workshop: Impacts of seismic survey activities on whales and other marine biota* (pp. 32-36).

Gulko, D. (1998). The Corallivores: The crown-of-thorns sea star (*Acanthaster planci*). In *Hawaiian Coral Reef Ecology* (pp. 101-102). Honolulu, HI: Mutual Publishing.

Heberholz, J. & Schmitz, B. A. (2001). Signaling via water currents in behavioral interactions of snapping shrimp (*Alpheus heterochaelis*). *Biological Bulletin, 201*, 6-16.

Heithaus, M. R., McLash, J. J., Frid, A., Dill, L. M. & Marshall, G. (2002). Novel insights into green sea turtle behaviour using animal-borne video cameras. *Journal of the Marine Biological Association of the United Kingdom, 82*(6), 1049-1050.

Hobday, A. J. & Tegner, M. (2000). Status Review of white abalone (*Haliotis sorensenit*) throughout its range in California and Mexico National Marine Fisheries Service (Ed.), *NOAA Technical Memorandum*. (pp. 1-90). Available from http://www.nmfs.noaa.gov/pr/pdfs/statusreviews/whiteabalone.pdf

Hobday, A. J., Tegner, M. J. & Haaker, P. L. (2001). Over-exploitation of a broadcast spawning marine invertebrate: Decline of the white abalone. *Reviews in Fish Biology and Fisheries, 10*, 493-514.

Hoover, J. P. (1998a). Bryozoans: Phylum *Byrozoa (or Ectoprocta)*. In *Hawai'i's Sea Creatures: A Guide to Hawai'i's Marine Invertebrates* (pp. 87-91). Honolulu, HI: Mutual Publishing.

Hoover, J. P. (1998b). Echinoderms: Phylum *Echinodermata.* In *Hawai'i's Sea Creatures: A Guide to Hawai'i's Marine Invertebrates* (pp. 290-335). Honolulu, HI: Mutual Publishing.

Hoover, J. P. (1998c). *Hawai'i's Sea Creatures: A Guide to Hawai'i's Marine Invertebrates*. Honolulu, HI: Mutual Publishing.

Hu, Y. H., H. Y. Yan, W. S. Chung, J.C. Shiao, & P. P. Hwang. (2009). Acoustically evoked potentials in two cephalopods inferred using the auditory brainstem response (ABR) approach*. Comparative Biochemistry and Physiology, Part A 153*:278–283.

Hughes, T. P., Baird, A. H., Bellwood, D. R., Card, M., Connolly, S. R., Folke, C., Roughgarden, J. (2003). Climate change, human impacts, and the resilience of coral reefs. *Science, 301*(5635), 929-933.

Hughes, T. P. & Connell, J. H. (1999). Multiple stressors on coral reefs: A long-term perspective. *Limnology and Oceanography, 44*(3 II), 932-940. Retrieved from http://www.scopus.com/scopus/inward/record.url?eid=2-s2.0-0032933347&partnerID=40

International Union for Conservation of Nature and Natural Resources. (2010). IUCN Red List of Threatened Species. Version 2010.4. [Web Page]. Retrieved from www.iucnredlist.org, 12 May 2010.

Jackson, J. B. C. (2008). Ecological extinction and evolution in the brave new ocean. *Proceedings of the National Academy of Sciences of the United States of America, 105*(SUPPL. 1), 11458-11465. Retrieved from http://www.scopus.com/scopus/inward/record.url?eid=2-s2.0-50049124452&partnerID=40&rel=R8.2.0

Jackson, J. B. C., Kirby, M. X., Berger, W. H., Bjorndal, K. A., Botsford, L. W., Bourque, B. J., Warner, R. R. (2001). Historical overfishing and the recent collapse of coastal ecosystems. *Science, 293*(5530), 629-638.

James, M. C. & Herman, T. B. (2001). Feeding of *Dermochelys coriacea* on medusae in the northwest Atlantic. *Chelonian Conservation and Biology, 4*(1), 202-205.

Jeffs, A., N. Tolimieri, & J. C. Montgomery. (2003). Crabs on cue for the coast: the use of underwater sound for orientation by pelagic crab stages. *Marine Freshwater Resources 54*: 841–845.

Jokiel, P. L., Brown E., Rodgers K., and Smith W. (2007). Reef corals and the coral reefs of south Moloka'i. In The coral reef of south Moloka'i, Hawai`i--portrait of a sediment-threatened fringing reef (M. Field, S. Cochran, J. Logan, and C. Storlazzi, eds.), p. 43-50. US Geological Survey, Reston, VA.

Kaifu, K., T. Akamatsu, & S. Segawa. (2008). Underwater sound detection by cephalopod statocyst. *Fisheries Science 74*: 781–786.

Kalvass, P. (2001). The nearshore ecosystem invertebrate resources: Overview. In W. S. Leet, C. M. Dewees, R. Klingbeil and E. J. Larson (Eds.), *California's Living Marine Resources: A Status Report*. (SG01-11, pp. 87-88) California Department of Fish and Game. Available from http://www.dfg.ca.gov/marine/status/nearshore_invert_overview.pdf

Kenyon, J. C., and Brainard R. E. (2006). Second recorded episode of mass coral bleaching in the Northwestern Hawaiian Islands. *Atoll Research Bulletin* 543:505-523.

Kushner, D. J., Shaffer, D. L. J. & Hajduczek, B. (1999). *Kelp Forest Monitoring Annual Report 1999*. (Technical Report CHIS-01-05, pp. 74). Ventura, CA: National Park Service Channel Islands National Park.

Latha, G., S. Senthilvadivu, R. Venkatesan, & V. RajendranLindholm. (2005). Sound of shallow and deep water lobsters: Measurements, analysis, and characterization. *Journal of the Acoustical Society of America: 117,* 2720-2723. Retrieved from http://dx.doi.org/10.1121/1.1893525, as accessed on 28 October 2011.

Lagardère, J.-P. (1982). Effects of noise on growth and reproduction of *Crangon crangon* in rearing tanks. *Marine Biology, 71*, 177-185.

Lagardère, J.-P. & Régnault, M. R. (1980). Influence du niveau sonore de bruit ambient sur la métabolisme de *Crangon crangon* (Decapoda: Natantia) en élevage. *Marine Biology, 57*, 157-164.

Levinton, J. (2009). *Marine Biology: Function, Biodiversity, Ecology* (3rd ed.). New York: Oxford University Press.

Lindholm, J., Gleason, M., Kline, D., Clary, L., Rienecke, S. & Bell, M. (2011). Trawl Impact and Recovery Study: 2009-2010 Summary Report. (pp. 39) California Ocean Protection Council.

Lirman, D. (2000). Fragmentation in the branching coral *Acropora palmata* (Lamarck): growth, survivorship, and reproduction of colonies and fragments. *Journal of Experimental Marine Biology and Ecology, 251*, 41-57.

Lohmann, S., H. Schmitz, H. Lubatschowski, & W. Ertmer. (1995). Photo-acoustic determination of optical parameters of tissue-like media with reference to opto-acoustic diffraction. Lasers in Medical Science 12: 357-363.

Lovell, J.M., M.M. Findlay, R.M. Moate, & H.Y. Yan. (2005). The hearing abilities of the prawn *Palaemon serratus*. Comparative Biochemistry and Physiology, Part A 140 (2005) 89– 100.

Lovell, J.M., M.M. Findlay, J.R. Nedwell, M.A. Pegg. (2006). The hearing abilities of the silver carp (*Hypopthalmichthys molitrix*) and bighead carp (*Aristichthys nobilis*). *Comparative Biochemistry and Physiology - Part A: Molecular & Integrative Physiology 143*: 268-291.

Mackie, G. O. & Singla, C. L. (2003). The Capsular Organ of *Chelyosoma productum* (Ascidiacea: Corellidae): A New Tunicate Hydrodynamic Sense Organ. *Brain, Behavior and Evolution, 61*, 45-58.

Macpherson, E. (2002). Large–scale species–richness gradients in the Atlantic Ocean. *Proceedings of the Royal Society of London. Series B: Biological Sciences, 269*(1501), 1715-1720. doi: 10.1098/rspb.2002.2091.

Mato, Y., Isobe, T., Takada, H., Kanehiro, H., Ohtake, C. & Kaminuma, T. (2001). Plastic resin pellets as a transport medium for toxic chemicals in the marine environment. *Environmental Science and Technology, 35*(2), 318-324. doi: 10.1021/es0010498.

Maragos, J. E., Potts, D. C., Aeby, G., Gulko, D., Kenyon, J., Siciliano, D. & VanRavenswaay, D. (2004). 2000-2002 rapid ecological assessment of corals (*Anthozoa*) on shallow reefs of the northwestern Hawaiian Islands. Part 1: Species and distribution. *Pacific Science, 58*(2), 211-230.

Maragos, J.E. (1998). “Marine ecosystems,” pp. 111-120. In: S.P. Juvik and J.O. Juvik, eds.Atlas of Hawai`i, 3d ed. Honolulu, Hawaii: University of Hawaii Press.

McCauley, R. D., Fewtrell, J., Duncan, A. J., Jenner, C., Jenner, M.-N., Penrose, J. D. (2000a). Marine seismic surveys: analysis and propagation of air-gun signals; and effects of air-gun exposure on humpback whales, sea turtles, fishes and squid. (REPORT R99-15) Centre for Marine Science and Technology, Curtin University.

McCauley, R. D., Fewtrell, J., Duncan, A. J., Jenner, C., Jenner, M. N., Penrose, J. (2000b). Marine seismic surveys - A study of environmental implications. *APPEA Journal*, 692-708.

McLennan, M. W. (1997). A simple model for water impact peak pressure and pulse width: a technical memorandum. Goleta, CA: Greeneridge Sciences Inc.

Miloslavich P, E. Klein, J.M. Díaz, C.E. Hernández, G. Bigatti. (2011). Marine Biodiversity in the Atlantic and Pacific Coasts of South America: Knowledge and Gaps. *PLoS ONE 6*(1).

Mintz, J. D. & Parker, C. L. (2006). *Vessel Traffic and Speed Around the U.S. Coasts and Around Hawaii* [Final report]. (CRM D0013236.A2, pp. 48). Alexandria, VA: CNA Corporation.

Montgomery J.C., Jeffs A., Simpson S.D., Meekan M., & Tindle C. (2006). Sound as an orientation cue for the pelagic larvae of reef fishes and decapod crustaceans. Adv Mar Biol 51: 143–196.

Mooney, T. A., Hanlon, R. T., Christensen-Dalsgaard, J., Madsen, P. T., Ketten, D. & Nachtigall, P. E. (2010). Sound detection by the longfin squid (*Loligo pealeii*) studied with auditory evoked potentials: sensitivity to low-frequency particle motion and not pressure. *J Exp Biol, 213*, 3748-3759.

Morgan, L. E. & Chuenpagdee, R. (2003). Shifting gears: addressing the collateral impacts of fishing methods in US waters *Pew Science Series on Conservation and the Environment*. (pp. 42) Pew Charitable Trusts.

National Marine Fisheries Service. (2001). Endangered and threatened species; Endangered status for white abalone. [Final Rule]. *Federal Register, 66*(103), 29046-29055.

National Marine Fisheries Service. (2007). *Species of Concern: Hawaiian Reef Coral,* Montipora dilatata. (pp. 5) National Oceanic and Atmospheric Administration.

National Marine Fisheries Service. (2008). White Abalone Recovery Plan *(Haliotis sorenseni)*. Long Beach, CA: National Marine Fisheries Service, Southwest Regional Office.

National Marine Fisheries Service. (2009). Endangered and threatened wildlife and plants; endangered status for black abalone. [Final Rule]. *Federal Register, 74*(9), 1937-1946.

National Marine Fisheries Service. (2010). Endangered and threatened wildlife; notice of 90–day finding on a petition to list 83 species of corals as threatened or endangered under the Endangered Species Act (ESA). *Federal Register, 75*(27), 6616-6621.

National Marine Fisheries Service. (2013a). Medicine: NOAA Coral Reefs Conservation Program. http://coralreef.noaa.gov/aboutcorals/values/medicine/. Last accessed 11 June 2013.

National Marine Fisheries Service. (2013b). The U.S. Navy's Training Exercises and Testing Activities in the Hawaii-Southern California Training and Testing Study Area from January 2014 through January 2019.

National Oceanic and Atmospheric Administration. (2007). *Channel Islands National Marine Sanctuary: Final Environmental Impact Statement for the Establishment of Marine Reserves and Marine Conservation Areas*. (pp. 235) U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, National Marine Sanctuary Program.

National Oceanic and Atmospheric Administration. (2010a). Black Abalone *(Haliotis cracherodii)*. [Web Page] NOAA Fisheries Office of Protected Resources. Retrieved from http://www.nmfs.noaa.gov/pr/species/invertebrates/blackabalone.htm, 25 October 2010.

National Oceanic and Atmospheric Administration. (2010b). *NOAA to review status of 82 species of coral*. St. Petersburg, FL.

National Oceanic and Atmospheric Administration. (2010c). White Abalone *(Haliotis sorenseni)*. [Web Page] NOAA Fisheries Office of Protected Resources. Retrieved from http://www.nmfs.noaa.gov/pr/species/invertebrates/whiteabalone.htm, 25 October 2010.

National Oceanic and Atmospheric Administration. (2012). Supplemental Information Report on Status Review Report And Draft Management Report For 82 Coral Candidate Species. U.S. Department of Commerce. November 2012.

National Oceanic and Atmospheric Administration & U.S. Department of Commerce. (2010). *Implementation of the Deep Sea Coral Research and Technology Program 2008 - 2009* [Report to Congress]. (pp. 65). Silver Spring, MD: NOAA Coral Reef Conservation Program, National Marine Fisheries Service. Available from http://www.nmfs.noaa.gov/habitat/2010_deepcoralreport.pdf

Negri, A. P., Smith, L. D., Webster, N. S. & Heyward, A. J. (2002). Understanding ship-grounding impacts on a coral reef: potential effects of anti-foulant paint contamination on coral recruitment. *Marine Pollution Bulletin, 44*(2), 111-117. doi: 10.1016/s0025-326x(01)00128-xO'Keefe 1984.

Neuman, M., B. Tissot, and G. VanBlaricom. (2010). Overall status and threats assessment of black abalone (Haliotis cracherodii Leach, 1814) populations in California. Journal of Shellfish Research 29(3): 577-586.

Normandeau, Exponent, T., T. & Gill, A. (2011). Effects of EMFs from Undersea Power.

Norström, A. V., Nyström, M., Lokrantz, J. & Folke, C. (2009). Alternative states on coral reefs: Beyond coral-macroalgal phase shifts. *Marine ecology progress series, 376*, 293-306. Retrieved from http://www.scopus.com/scopus/inward/record.url?eid=2-s2.0-62149119548&partnerID=40

Ocean Conservancy. (2010). Trash travels: from our hands to the sea, around the globe, and through time C. C. Fox (Ed.), *International Coastal Cleanup report*. (pp. 60) The Ocean conservancy.

O'Keefe, D. J. & Young, G. A. (1984). Handbook on the environmental effects of underwater explosions. (pp. 203). Prepared by Naval Surface Weapons Center.

Packard, A., Karlsen, H. E. & Sand, O. (1990). Low frequency hearing in cephalopods. *Journal of Comparative Physiology A, 166*, 501-505.

Pandolfi, J. M., Bradbury, R. H., Sala, E., Hughes, T. P., Bjorndal, K. A., Cooke, R. G., Jackson, J. B. C. (2003). Global trajectories of the long-term decline of coral reef ecosystems. *Science, 301*(5635), 955-958.

Parry, G. D. & Gason, A. (2006). The effect of seismic surveys on catch rates of rock lobsters in western Victoria, Australia. *Fisheries Research, 79*, 272-284.

Patek, S. N. & Caldwell, R. L. (2006). The stomatopod rumble: Low frequency sound production in *Hemisquilla californiensis*. *Marine and Freshwater Behaviour and Physiology, 39*(2), 99-111.

Patek, S. N., Shipp, L. E. & Staaterman, E. R. (2009, May). The acoustics and acoustic behavior of the California spiny lobster (*Panulirus interruptus*). *Journal of the Acoustical Society of America, 125*(5), 3434-3443.

Pauly, D., Christensen, V., Guenette, S., Pitcher, T. J., Sumaila, U. R., Walters, C. J., Zeller, D. (2002). Towards sustainability in world fisheries. *Nature, 418*(6898), 689-695. doi: 10.1038/nature01017.

Payne, J. F., Andrews, C. A., Fancey, L. L., Cook, A. L. & Christian, J. R. (2007). Pilot Study on the Effects of Seismic Air Gun Noise on Lobster (*Homarus americanus*).

Pawson, David L. (1995). Echinoderms of the tropical island Pacific: status of their sytematics and notes on their ecology and biogeography. In: *Marine and coastal biodiversity in the tropical island Pacific region.* pp.171-192.Payne, J. F., Andrews, C. A., Fancey, L. L., Cook, A. L. & Christian, J. R. (2007). Pilot Study on the Effects of Seismic Air Gun Noise on Lobster (Homarus Americanus).

Pearson, W. H., Skalski, J. R., Sulkin, S. D. & Malme, C. I. (1993). Effects of Seismic Energy Releases on the Survival and Development of Zoeal Larvae of Dungeness Crab (*Cancer magister*). *Marine Environment Research, 38*, 93-113.

Polovina, J. J., Kleiber, P. & Kobayashi, D. R. (1999). Application of TOPEX-POSEIDON satellite altimetry to simulate transport dynamics of larvae of spiny lobster, *Panulirus marginatus*, in the Northwestern Hawaiian Islands, 1993-1996. *Fishery Bulletin, 97*, 132-143.

Popper, A. N., Salmon, M. & Horch, K. W. (2001). Acoustic detection and communication by decapod crustaceans. *Journal of Comparative Physiology A, 187*, 83-89.

Porter, J. W., Dustan, P., Jaap, W. C., Patterson, K. L., Kosmynin, V., Meier, O. W., Parsons, M. (2001). Patterns of spread of coral disease in the Florida Keys. *Hydrobiologia, 460*, 1-24. doi: 10.1023/A:1013177617800.

Precht, W. F., Aronson, R. B. & Swanson, D. W. (2001). Improving scientific decision-making in the restoration of ship-grounding sites on coral reefs. *Bulletin of marine science, 69*, 1001-1012. Retrieved from http://www.ingentaconnect.com/content/umrsmas/bullmar/2001/00000069/00000002/art00058

Proctor, C. M., Garcia, J. C., Galvin, D. V., Joyner, T., Lewis, G. B., Loehr, L. C. & Massa, A. M. (1980). *An Ecological Characterization of the Pacific Northwest Coastal Region*. (Vol. 1. Conceptual Model, FWS/OBS-79/11) U.S. Fish and Wildlife Service, Biological Services Program.

Quanzi, L. & Wang, G. (2009). Diversity of fungal isolates from three Hawaiian marine sponges. *Microbiological Research, 164*(2), 233-241. doi: 10.1016/j.micres.2007.07.002.

Radford, C., Jeffs, A. & Montgomery, J. C. (2007). Directional swimming behavior by five species of crab postlarvae in response to reef sound. *Bulletin of Marine Science, 80*(2), 369-378.

Radford, C., Stanley, J., Tindle, C., Montgomery, J. C. & Jeffs, A. (2010, February). Localised coastal habitats have distinct underwater sound signatures. *Marine Ecology Progress Series, 401*, 21-29.

Reinhall, P. G. & Dahl, P. H. (2011). Underwater Mach Wave Radiation from Impact Pile Driving: Theory and Observation. *Journal of the Acoustical Society of America, 130*(3), 1209-1216.

Richards, Z., Delbeek, J. C., Lovell, E., Bass, D., Aeby, G. & C., R. (2008). *Acropora paniculata*. In *IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4*. [Online Database]. Retrieved from http://www.iucnredlist.org/apps/redlist/details/132972/0, 25 October 2010.

Richmond, R. H. (1997). Reproduction and recruitment in corals: Critical links in the persistence of reefs. In C. Birkeland (Ed.), *Life and Death of Coral Reefs* (pp. 175-197). New York, NY: Chapman and Hall.

Roberts, S., and M. Hirshfield. (2003). "Deep sea corals: Out of sight, but no longer out of mind," Frontiers in Ecology & the Environment, 2(3): 123–130.18 pp.

Rogers-Bennett, L., Haaker, P. L., Huff, T. O. & Dayton, P. K. (2002). Estimating Baseline Abundances of Abalone in California for Restoration. In *California Cooperative Oceanic Fisheries Investigations (CalCOFI) Reports*. (Vol. 43, pp. 97-111).

Rooney, J., Donham E., Montgomery A., Spalding H., Parrish F., Boland R., Fenner D., Gove J., and Vetter O. (2010). Mesophotic coral ecosystems in the Hawaiian Archipelago. *Coral Reefs 29*:361-367.

Rosen, G. & Lotufo, G. R. (2007). Bioaccumulation of explosive compounds in the marine mussel, *Mytilus galloprovincialis*. *Ecotoxicology and Environmental Safety, 68*, 237–245. doi: 10.1016/j.ecoenv.2007.04.009.

Rosen, G. & Lotufo, G. R. (2010). Fate and effects of composition B in multispecies marine exposures. *Environmental Toxicology and Chemistry, 29*(6), 1330-1337. doi: 10.1002/etc.153.

Sanders, H. L. (1968). Marine benthic diversity: A comparative study. *American Naturalist, 102*(925), 243.

Schoeman, D. S., McLachlan, A. & Dugan, J. E. (2000). Lessons from a Disturbance Experiment in the Intertidal Zone of an Exposed Sandy Beach. *Estuarine, Coastal and Shelf Science, 50*(6), 869-884. doi: 10.1006/ecss.2000.0612.

Schuhmacher, H. & Zibrowius, H. (1985). What is hermatypic? *Coral Reefs, 4*(1), 1-9. doi: 10.1007/BF00302198.

Sheppard, A., Fenner, D., Edwards, A., Abrar, M. & Ochavillo, D. (2008). *Porites pukoensis*. In *IUCN 2010. IUCN Red List of Threatened Species. Version 2010.1*. [Online database]. Retrieved from http://www.iucnredlist.org/apps/redlist/details/133574/0, 18 June 2010.

Simpson, S. D., Radford, A. N., Tickle, E. J., Meekan, M. G. & Jeffs, A. (2011). Adaptive Avoidance of Reef Noise. *PLoS ONE, 6*(2).

Singh, B. & Sharma, N. (2008). Mechanistic implications of plastic degradation. *Polymer Degradation and Stability, 93*(3), 561-584. doi: 10.1016/j.polymdegradstab.2007.11.008.

Smith, G., Stamm, C. & Petrovic, F. (2003). *Haliotis cracherodii*. In *IUCN 2010. IUCN Red List of Threatened Species. Version 2010.1*. [Online database]. Retrieved from www.iucnredlist.org, 27 April 2010.

South Atlantic Fishery Management Council. (1998). *Final habitat plan for the South Atlantic region: Essential fish habitat requirements for fishery management plans of the South Atlantic Fishery Management Council*. Charleston, SC: South Atlantic Fishery Management Council.

Spalding, M. D., Ravilious, C. & Green, E. P. (2001). *World Atlas of Coral Reefs* (pp. 424). Berkeley, California: University of California Press.

Spargo, B. J. (1999). *Environmental Effects of RF Chaff: A Select Panel Report to the Undersecretary of Defense for Environmental Security* [Final Report]. (NRL/PU/6110- -99-389, pp. 85). Washington, DC: U.S. Department of the Navy, Naval Research Laboratory.

Stanley, J., Radford, C. & Jeffs, A. (2010, January). Induction of settlement in crab megalopae by ambient underwater reef sound. [Journal Article]. *Behavioral Ecology, 21*(1), 113-120.

Stierhoff, K.L., Neuman, M., & Butler, J.L. (2012). On the road to extinction? Population declines of the endangered white abalone, Haliotis sorenseni. *Biological Conservation*, 152(8).

Swisdak Jr., M. M. & Montaro, P. E. (1992). Airblast and fragmentation hazards produced by underwater explosions. (pp. 35). Silver Springs, Maryland. Prepared by Naval Surface Warfare Center.

Teuten, E. L., Rowland, S. J., Galloway, T. S. & Thompson, R. C. (2007). Potential for plastics to transport hydrophobic contaminants. *Environmental Science and Technology, 41*(22), 7759-7764. doi: 10.1021/es071737s.

Tissot, B. N., Yoklavich, M. M., Love, M. S., York, K. & Amend, M. (2006). Benthic invertebrates that form habitat on deep banks off southern California, with special reference to deep sea coral. *Fishery Bulletin, 104*(2), 167-181.

U.S. Army Corps of Engineers. (2001). Environmental effects of beach nourishment projects. In *The Distribution of Shore Protection Benefits: A Preliminary Examination*. (pp. 67-108). Alexandria, VA: U.S. Army Corps of Engineer Institute for Water Resources.

U.S. Department of the Navy. (2011). San Diego Bay Integrated Natural Resources Management Plan. Navy Regional Southwest, Naval Facilities Engineering Command, and the Unified Port of San Diego. Prepared by Tierra Data, Inc. Escondido, CA.

University of California at Berkeley. (2010a). *Introduction to the Cnidaria: Jellyfish, corals, and other stingers*. Retrieved from http://www.ucmp.berkeley.edu/cnidaria/cnidaria.html

University of California Berkeley. (2010b). *Introduction to the Platyhelminthes: Life in two dimensions*. Retrieved from http://www.ucmp.berkeley.edu/platyhelminthes/platyhelminthes.html, 8 September 2010

VanBlaricom, G., Butler, J., DeVogelaere, A., Gustafson, R., Mobley, C., Neuman, M., & Richards, D. (2009). *Status Review Report for Black Abalone (*Haliotis cracherodii *Leach, 1814)*. (pp. 135). Long Beach, CA: National Marine Fisheries Service.

Vermeij, M. J. A., Marhaver, K. L., Huijbers, C. M., Nagelkerken, I. & Simpson, S. D. (2010). Coral larvae move toward reef sounds. *PLoS ONE, 5*(5), e10660. doi:10.1371/journal.pone.0010660.

Veron, J. E. N. (2000). *Corals of the World*. Australian Institute of Marine Science. Townsville, Australia.

Vilchis, L. I., Tegner, M. J., Moore, J. D., Friedman, C. S., Riser, K. L., Robbins, T. T. & Dayton, P. K. (2005). Ocean warming effects on growth, reproduction, and survivorship of southern California abalone. *Ecological Applications, 15*(2), 469-480.

Waikiki Aquarium. (2009a, Last updated September 2009). *Marine Life Profile: Ghost Crab*. [Fact sheet]. Retrieved from http://www.waquarium.org/marinelifeprofiles_ed.html, 14 June 2010.

Waikiki Aquarium. (2009b, Last updated September 2009). *Marine Life Profile: Hawaiian Slipper Lobsters*. [Fact sheet]. Retrieved from http://www.waquarium.org/marinelifeprofiles_ed.html, 15 June 2010.

Waikiki Aquarium. (2009c, Last updated September 2009). *Marine Life Profile: Hawaiian Spiny Lobster*. [Fact sheet]. Retrieved from http://www.waquarium.org/marinelifeprofiles_ed.html, 15 June 2010.

Wallace, C. C. (1999). *Staghorn Corals of the World: a Revision of the Coral Genus Acropora (Scleractinia; Astrocoeniina; Acroporidae) Worldwide, with Emphasis on Morphology, Phylogeny and Biogeography*. CSIRO Publishing, Collingwood, Australia.

Wang, W.-X. & Rainbow, P. S. (2008). Comparative approaches to understand metal bioaccumulation in aquatic animals. *Comparative Biochemistry and Physiology Part C: Toxicology & Pharmacology, 148*(4), 315-323. doi: 10.1016/j.cbpc.2008.04.003.

Western Pacific Regional Fishery Management Council. (2001). *Final Fishery Management Plan for Coral Reef Ecosystems of the Western Pacific Region*. (Vol. 1, pp. 20). Honolulu, HI.

Western Pacific Regional Fishery Management Council. (2009). *Fishery Ecosystem Plan for the Hawaii Archipelago*. (pp. 266). Honolulu, HI.

Wetmore, K. L. (2006, Last updated 14 August 1995). *Introduction to the Foraminifera*. [Web page] University of California Museum of Paleontology. Retrieved from http://www.ucmp.berkeley.edu/foram/foramintro.html, 13 September 2010.

Wilkinson, C. (2002). Executive Summary. In C. Wilkinson (Ed.), *Status of Coral Reefs of the World: 2002* (pp. 7-31). Global Coral Reef Monitoring Network.

Wilson, M., Hanlon, R. T., Tyack, P. L. & Madsen, P. T. (2007). Intense ultrasonic clicks from echolocating toothed whales do not elicit anti-predator responses or debilitate the squid *Loligo pealeii*. *Biology Letters, 3*, 225-227.

Wood, J. B. & Day, C. L. (2005). *CephBase*. [Online database]. Retrieved from http://www.cephbase.utmb.edu/, 3 June 2005.

Young, G. A. (1991). Concise methods for predicting the effects of underwater explosions on marine life (pp. 1-12). Silver Spring: Naval Surface Warfare Center.

Zabin, C. (2003). *Hawai'i Intertidal Project*. [Web page]. Retrieved from http://intertidalhawaii.org, 14 May 2010.

This Page Intentionally Left Blank

3.9 Fish

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

3.9 FISH

FISH SYNOPSIS

The United States Department of the Navy considered all potential stressors, and the following have been analyzed for fish:

- Acoustic (sonar and other active acoustic sources, and underwater explosives)
- Energy (electromagnetic devices)
- Physical disturbance and strikes (vessels and in-water devices, military expended materials, seafloor devices)
- Entanglement (fiber optic cables and guidance wires, parachutes)
- Ingestion (munitions, military expended materials other than munitions)
- Secondary stressors

Preferred Alternative (Alternative 2)

Acoustics: Pursuant to the Endangered Species Act (ESA), the use of sonar and other active acoustic sources may affect but is not likely to adversely affect ESA-listed steelhead trout. The use of explosives and other impulsive acoustic sources may affect and is likely to adversely affect ESA-listed steelhead trout. Acoustic sources would have no effect on critical habitat.

- Energy: Pursuant to the ESA, the use of electromagnetic devices may affect but is not likely to adversely affect ESA-listed steelhead trout. Electromagnetic devices would have no effect on critical habitat.
- Physical Disturbance and Strikes: Pursuant to the ESA, the use of vessels and in-water devices, military expended materials, and seafloor devices may affect but is not likely to adversely affect ESA-listed steelhead trout. Vessels and in-water devices, military expended materials, and seafloor devices would have no effect on critical habitat.
- Entanglement: Pursuant to the ESA, the use of fiber optic cables, guidance wires, and parachutes may affect but is not likely to adversely affect ESA-listed steelhead trout.
- Ingestions: Pursuant to the ESA, the potential for ingestion of military expended materials may affect but is not likely to adversely affect ESA-listed steelhead trout
- Secondary Stressors: Pursuant to the ESA, secondary stressors may affect, but are not likely to adversely affect, ESA-listed steelhead trout. Secondary stressors would have no effect on critical habitat.
- Pursuant to the Essential Fish Habitat requirements, the use of sonar and other active acoustic sources, explosives, pile driving, and electromagnetic devices may have a minimal and temporary adverse effect on the fishes that occupy water column Essential Fish Habitat.

3.9.1 INTRODUCTION

This section analyzes the potential impacts of the Proposed Action on fishes found in the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area). Section 3.9 provides a synopsis of the United States (U.S.) Department of the Navy's (Navy) determinations of the impacts of the Proposed Action on fish. Section 3.9.1 (Introduction) introduces the species and taxonomic groups that occur in the Study Area. Section 3.9.2 (Affected Environment) discusses the baseline affected environment. The complete analysis of environmental consequences is in Section 3.9.3 (Environmental

Consequences), and the potential impacts of the Proposed Action on fishes are summarized in Section 3.9.4 (Summary of Potential Impacts on Fish).

For this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), marine fishes are evaluated as groups of species characterized by distribution, body type, or behavior relevant to the stressor being evaluated. Activities are evaluated for their potential impact on all fishes in general, by taxonomic groupings, and the one marine fish in the Study Area listed under the Endangered Species Act (ESA).

Fish species listed under the ESA, along with major taxonomic groups in the Study Area, are described in this section. Marine fish species that are regulated under the Magnuson-Stevens Fishery Conservation and Management Act are discussed in Section 3.9.1.3. Additional general information on the biology, life history, distribution, and conservation of marine fishes can be found on the websites of the following agencies and organizations, as well as many others:

- National Marine Fisheries Service (NMFS), Office of Protected Resources (including ESA-listed species distribution maps)
- Regional Fishery Management Councils
- International Union for Conservation of Nature

Fishes are not distributed uniformly throughout the Study Area but are closely associated with a variety of habitats. Some species, such as large sharks, tuna, and billfishes range across thousands of square miles; others, such as gobies and reef fishes have small home ranges and restricted distributions (Helfman et al. 2009a). The movements of some open-ocean species may never overlap with coastal fishes that spend their lives within several hundred feet (a few hundred meters) of the shore. Even within a single fish species, the distribution and specific habitats in which individuals occur may be influenced by its developmental stage, size, sex, reproductive condition, and other factors.

3.9.1.1 Endangered Species Act Species

There is only one marine fish, steelhead trout (*Oncorhynchus mykiss*) in the Study Area that is listed as endangered under the ESA (Table 3.9-1 and Section 3.9.2.3, Steelhead Trout).

One species (scalloped hammerhead shark [*Sphyrna lewini*]) is proposed for listing as threatened or endangered in the future, and there are three species of concern (basking shark [*Cetorhinus maximus*], bocaccio [*Sebastes paucispinis*], and cowcod [*Sebastes levis*]), defined as a species about which NMFS has some concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA. The emphasis on species-specific information in the following profiles will be on the one ESA protected species because any threats or potential impacts on that species are subject to consultation with regulatory agencies. Consideration is also given to the broad taxonomic groups to cover the non-regulated fishes within the marine ecosystem of the Study Area.

Table 3.9-1: Status and Presence of Endangered Species Act-Listed Fish Species, Candidate Species, and Species of Concern Found in the Hawaii-Southern California Training and Testing Study Area

Species Name and Regulatory Status			Presence in Study Area	
Common Name	**Scientific Name**	**Endangered Species Act Listing**	**Open Ocean Area**	**Coastal Waters**
Steelhead trout	*Oncorhynchus mykiss*	Endangered (Southern California distinct population segment[1])	Santa Maria River, California to U.S.-Mexico Border	California Current
Scalloped Hammerhead Shark	*Sphyrna lewini*	Proposed	Southern California and waters off of Hawaii	Southern California and waters off of Hawaii
Basking shark	*Cetorhinus maximus*	Species of Concern (Eastern North Pacific population)	Canada to Southern California	California Current
Bocaccio	*Sebastes paucispinis*	Species of Concern (Southern California distinct population segment[1])	Oregon to Central Baja California	California Current
Cowcod	*Sebastes levis*	Species of Concern (Central Oregon to central Baja California and Guadalupe Island, Mexico evolutionarily significant unit[2])	Central Oregon to Central Baja California	California Current

[1] A species with more than one distinct population segment can have more than one ESA listing status, as individual distinct population segments can be either not listed under the ESA or can be listed as endangered, threatened, or a candidate species.
[2] Evolutionarily significant unit is a population of organisms that is considered distinct for purposes of conservation.

3.9.1.2 Taxonomic Groups

Taxonomic groupings of marine fishes are listed in Table 3.9-2 and are described further in Section 3.9.2 (Affected Environment). In order to capture all marine fishes representative of the Study Area, these taxonomic groups are presented to supplement the approach used for the ESA-protected species in this document.

Table 3.9-2: Major Taxonomic Groups of Marine Fishes within the Hawaii-Southern California Training and Testing Study Area

Major Marine Fish Groups[1]		Vertical Distribution Within Study Area[2]	
Common Name (Taxonomic Group)	**Description**	**Open Ocean**	**Coastal Waters**
Jawless fishes (order Myxiniformes and order Petromyzontiformes)	Primitive fishes with an eel-like body shape that feed on dead fishes or are parasitic on other fishes	Water column, seafloor	Seafloor
Sharks, rays, and chimaeras (class Chondrichthyes)	Cartilaginous (non-bony) fishes, many of which are open ocean predators	Surface, water column, seafloor	Surface, water column, seafloor

[1] Taxonomic groups are based on the following commonly accepted references (Helfman et al. 1997; Moyle and Cech 1996; Nelson 2006).
[2] Presence in the Study Area includes open ocean areas (portions of the North Pacific Subtropical Gyre and North Pacific Transition Zone) and coastal waters of two Large Marine Ecosystems-California Current and Insular Pacific-Hawaiian.

Table 3.9-2: Major Taxonomic Groups of Marine Fishes within the Hawaii-Southern California Training and Testing Study Area (continued)

Major Marine Fish Groups[1]		Vertical Distribution Within Study Area[2]	
Common Name (Taxonomic Group)	Description	Open Ocean	Coastal Waters
Eels and bonefishes (order Anguilliformes, order Elopiformes)	Undergo a unique larval stage with a small head and elongated body; very different from other fishes	Surface, water column, seafloor	Surface, water column, seafloor
Smelt and salmonids (orders Argentiniformes, Osmeriformes, and Salmoniformes)	Most salmon and smelt are migratory between marine and estuarine/freshwater habitats; Argentiniformes occur in deep waters	Seafloor (Argentiniformes only), surface, water column	Surface, water column
Cods (orders Gadiformes and Ophidiiformes)	Important commercial fishery resources (cods), associated with bottom habitats, also includes some deepwater groups	Water column, seafloor	Water column, seafloor
Toadfishes and anglerfishes (orders Batrachoidiformes and Lophiiformes)	Includes the toadfishes and the anglerfishes, a lie-in-wait predator	Seafloor	Seafloor
Mullets, silversides, needlefishes, and killifish (orders Mugiliformes, Atheriniformes, Beloniformes, and Cyprinodontiformes)	Small-sized nearshore/coastal fishes, primarily feed on organic debris; also includes the surface-oriented flyingfishes	Surface	Surface, water column, seafloor
Oarfishes, squirrelfishes, dories (orders Lampridiformes, Beryciformes, Zeiformes)	Primarily open ocean or deepwater fishes, except for squirrelfishes (reef-associated)	Surface, water column, seafloor	Surface, water column, seafloor
Pipefishes and seahorses (order Gasterosteiformes)	Small mouth with tubular snout and armor like scales; gives birth to live young and shows a high level of parental care	None	Surface, water column, seafloor
Scorpionfishes (order Scorpaeniformes)	Bottom dwelling with modified pectoral fins to rest on the bottom	Seafloor	Seafloor
Snappers, drums, and croakers (families Sciaenidae and Lutjanidae)	Important game fishes and common predators of all marine waters; sciaenids produce sounds with their swim bladders	Surface, water column, seafloor	Surface, water column, seafloor
Groupers and seabasses (family Serranidae)	Important game fishes with vulnerable conservation status; some have a hermaphroditic strategy in which females become males as they mature	Water column, seafloor	Surface, water column, seafloor
Wrasses, damselfishes (family Pomacentridae), and parrotfishes (families Labridae and Scaridae)	Primarily reef-associated fishes with a hermaphroditic strategy in which females become males as they mature	Water column, seafloor	Surface, water column, seafloor
Gobies and blennies (families Gobiidae and Blennidae)	Gobies are the largest and most diverse family of marine fishes, mostly found in bottom habitats of coastal areas	Surface, water column, seafloor	Surface, water column, seafloor

[1] Taxonomic groups are based on the following commonly accepted references (Helfman et al. 1997; Moyle and Cech 1996; Nelson 2006).
[2] Presence in the Study Area includes open ocean areas (portions of the North Pacific Subtropical Gyre and North Pacific Transition Zone) and coastal waters of two Large Marine Ecosystems-California Current and Insular Pacific-Hawaiian.

Table 3.9-2: Major Taxonomic Groups of Marine Fishes within the Hawaii-Southern California Training and Testing Study Area (continued)

Major Marine Fish Groups[1]		Vertical Distribution Within Study Area[2]	
Common Name (Taxonomic Group)	**Description**	**Open Ocean**	**Coastal Waters**
Gobies and blennies (families Gobiidae and Blennidae)	Gobies are the largest and most diverse family of marine fishes, mostly found in bottom habitats of coastal areas	Surface, water column, seafloor	Surface, water column, seafloor
Jacks, tunas, mackerels, and billfishes (families Carangidae, Scombridae, Xiphiidae, Istiophoridae)	Highly migratory predators found near the surface; they make up a major component of fisheries	Surface	Surface, water column
Flounders (order Pleuronectiformes)	Flatfishes that occur in bottom habitats throughout the world where they are well camouflaged	Seafloor	Seafloor
Triggerfishes, puffers, and molas (order Tetraodontiformes)	Unique body shapes and characteristics to avoid predators (e.g., spines); includes ocean sunfish, the largest bony fish	Surface, water column, seafloor	Surface, water column, seafloor

[1] Taxonomic groups are based on the following commonly accepted references (Helfman et al. 1997; Moyle and Cech 1996; Nelson 2006).
[2] Presence in the Study Area includes open ocean areas (portions of the North Pacific Subtropical Gyre and North Pacific Transition Zone) and coastal waters of two Large Marine Ecosystems-California Current and Insular Pacific-Hawaiian.

3.9.1.3 Federally Managed Species

The fisheries of the United States are managed within a framework of overlapping international, federal, state, interstate, and tribal authorities. Individual states and territories generally have jurisdiction over fisheries in marine waters within 3 nm of their coast. Federal jurisdiction includes fisheries in marine waters inside the U.S. Exclusive Economic Zone, which encompasses the area from 3 nm to 200 nm offshore of any U.S. coastline (National Oceanic and Atmospheric Administration 1996).

The Magnuson-Stevens Fishery Conservation and Management Act and Sustainable Fisheries Act (see Section 3.0.1.1, Federal Statutes, for details) led to the formation of eight fishery management councils that share authority with the NMFS to manage and conserve the fisheries in federal waters. Essential Fish Habitat is also identified and managed under this act. For analyses of impacts on those habitats included as Essential Fish Habitat within the Study Area, refer to Sections 3.3 (Marine Habitats), 3.7 (Marine Vegetation), and 3.8 (Invertebrates). Together with NMFS, the councils maintain fishery management plans for specific species or species groups to regulate commercial and recreational fishing within their geographic regions. There are two regional fishery management councils including the Western Pacific Regional Fishery Management Council and the Pacific Regional Fishery Management Council within the HSTT Study Area.

Federally managed species of marine fishes are listed in Table 3.9-3 and Table 3.9-4. These species are considered, along with ESA-listed species and other taxonomic groupings, in the analysis of impacts in Section 3.9.3 (Environmental Consequences). The analysis of impacts on commercial and recreational fisheries is provided in Section 3.11 (Socioeconomic Resources).

Table 3.9-3: Federally Managed Fish Species Within the Hawaii-Southern California Training and Testing Study Area, Western Pacific Regional Fishery Management Council

Western Pacific Regional Fishery Management Council		
Common Name	**Local Name**	**Scientific Name**
Hawaii Archipelago Bottomfish Management Unit Species (BMUS)		
Amberjack	kahala	*Seriola dumerili*
Black jack	ulua la‘uli	*Caranx lugubris*
Blue stripe snapper	ta‘ape	*Lutjanus kasmira*
Giant trevally	white papio/ulua au kea	*Caranx ignobilis*
Gray jobfish	uku	*Aprion virescens*
Longtail snapper	onaga or ‘ula‘ula koa‘e	*Etelis coruscans*
Pink snapper	‘opakapaka	*Pristipomoides filamentosus*
Pink snapper	kalekale	*Pristipomoides seiboldii*
Red snapper	ehu	*Etelis carbunculus*
Sea bass	hapu‘upu‘u	*Epinephelus quernus*
Silver jaw jobfish	lehi	*Aphareus rutilans*
Snapper	gindai	*Pristipomoides zonatus*
Thicklip trevally	pig ulua, butaguchi	*Pseudocaranx dentex*
Yellowtail snapper	kalekale	*Pristipomoides auricilla*
Hawaii Archipelago Bottomfish Management Unit Species - Seamount Groundfish		
Alfonsin	n/a	*Beryx splendens*
Armorhead	n/a	*Pseudopentaceros wheeleri*
Raftfish	n/a	*Hyperoglyphe japonica*
Hawaii Archipelago Coral Reef Ecosystem Management Units Species, Currently Harvested Coral Reef Taxa (CHCRT)		
Anchovies	nehu	Engraulidae
Anemones	n/a	Actinaria
Angelfishes	n/a	Pomacanthidae
Banded goatfish	kumu or moano	*Parupeneus* spp.
Bandtail goatfish	weke pueo	*Upeneus arge*
Barracudas	kaku	Sphyraenidae
Bigeye	‘aweoweo	*Priacanthus hamrur*
Bigeye scad	akule or hahalu	*Selar crumenophthalmus*
Bigscale soldierfish	menpachi or ‘u‘u	*Myripristis berndti*
Black tongue unicornfish	kala holo	*Naso hexacanthus*
Black triggerfish	humuhumu ‘ele‘ele	*Melichthys niger*
Blacktip reef shark	manō	*Carcharhinus melanopterus*
Blennies	pa o‘o	Blenniidae
Blue-lined squirrelfish	‘ala‘ihi	*Sargocentron tiere*
Blue-lined surgeon	maiko	*Acanthurus nigroris*
Bluespine unicornfish	kala	*Naso unicornus*
Brick soldierfish	menpachi or ‘u‘u	*Myripristis amaena*

Table 3.9-3: Federally Managed Fish Species Within the Hawaii-Southern California Training and Testing Study Area, Western Pacific Regional Fishery Management Council (continued)

Western Pacific Regional Fishery Management Council		
Common Name	**Local Name**	**Scientific Name**
Bridled triggerfish	n/a	*Sufflamen fraenatum*
Brown surgeonfish	maiʻiʻi	*Acanthurus nigrofuscus*
Butterflyfish	kikakapu	*Chaetodon auriga*
Butterflyfishes	kikakapu	Chaetodontidae
Cardinalfishes	ʻupapalu	Apogonidae
Cigar wrasse	kupoupou	*Cheilio inermis*
Convict tang	manini	*Acanthurus triostegus*
Coral crouchers	n/a	Caracanthidae
Cornetfish	nunu peke	Fistularia commersoni
Crown squirrelfish	ʻalaʻihi	*Sargocentron diadema*
Damselfishes	mamo	Pomacentridae
Doublebar goatfish	munu	*Parupeneus bifasciatus*
Dragon eel	puhi	*Enchelycore pardalis*
Eels (Those species not listed as CHCRT)	puhi	Muraenidae
		Congridae
		Ophichthidae
Eller's barracuda	kaweleʻa or kaku	*Sphyraena helleri*
Eye-striped surgeonfish	palani	*Acanthurus dussumieri*
False mullet	uouoa	*Neomyxus leuciscus*
File-lined squirrelfish	ʻalaʻihi	*Sargocentron microstoma*
Flounders and soles	pakiʻi	Bothidae
Flounders and soles	pakiʻi	Soleidae
Flounders and soles	pakiʻi	Pleuronectidae
Frogfishes	n/a	Antennariidae
Galapagos shark	manō	*Carcharhinus galapagensis*
Giant moray eel	puhi	*Gymnothorax javanicus*
Glasseye	ʻaweoweo	*Heteropriacanthus cruentatus*
Goatfishes	weke, moano, kumu	Mullidae
Gobies	ʻoʻopu	Gobiidae
Gray unicornfish	n/a	*Naso caesius*
Great barracuda	kaku	*Sphyraena barracuda*
Grey reef shark	manō	*Carcharhinus amblyrhynchos*
Groupers, seabass (Those species not listed as CHCRT or in BMUS)	roi, hapuʻupuʻu	Serrandiae
Hawaiian flag-tail	ʻaholehole	*Kuhlia sandvicensis*
Hawaiian squirrelfish	ʻalaʻihi	*Sargocentron xantherythrum*
Hawkfishes (Those species not listed as CHCRT)	poʻopaʻa	Cirrhitidae
Herrings	n/a	Clupeidae

Table 3.9-3: Federally Managed Fish Species Within the Hawaii-Southern California Training and Testing Study Area, Western Pacific Regional Fishery Management Council (continued)

Western Pacific Regional Fishery Management Council		
Common Name	**Local Name**	**Scientific Name**
Jacks and scads (Those species not listed as CHCRT or in BMUS)	dobe, kagami, paʻopaʻo, papa, omaka, ulua	Carangidae
Labridae wrasses (Those species not listed as CHCRT)	hinalea	Labridae wrasses
Mackerel scad	ʻopelu or ʻopelu mama	*Decapterus macarellus*
Moorish idol	kihikihi	*Zanclus cornutus*
Moorish Idols	kihikihi	Zanclidae
Multi-barred goatfish	moano	*Parupeneus multifaciatus*
Orange goatfish	weke nono	*Mulloidichthys pfleugeri*
Orangespine unicornfish	kalalei or umaumalei	*Naso lituratus*
Orange-spot surgeonfish	naʻenaʻe	*Acanthurus olivaceus*
Parrotfish	uhu or palukaluka	*Scarus* spp.
Pearly soldierfish	menpachi or ʻuʻu	*Myripristis kuntee*
Peppered squirrelfish	ʻalaʻihi	*Sargocentron punctatissimum*
Picassofish	humuhumu nukunuku apuaʻa	*Rhinecanthus aculeatus*
Pinktail triggerfish	humuhumu hiʻukole	*Melichthys vidua*
Pipefishes and seahorses	n/a	Syngnathidae
Puffer fishes and porcupine fishes	ʻoʻopu hue or fugu	Tetraodontidae
Raccoon butterflyfish	kikakapu	*Chaetodon lunula*
Razor wrasse	laenihi or nabeta	*Xyrichtys pavo*
Rays and skates	hihimanu	Dasyatididae
		Myliobatidae
Red ribbon wrasse	n/a	*Thalassoma quinquevittatum*
Remoras	n/a	Echeneidae
Ringtail surgeonfish	Pualu	*Acanthurus blochii*
Ring-tailed wrasse	poʻou	*Oxycheilinus unifasciatus*
Rockmover wrasse	n/a	*Novaculichthys taeniourus*
Rudderfish	nenue	*Kyphosus biggibus*
Rudderfish	nenue	*Kyphosus cinerascens*
Rudderfish	nenue	*Kyphosus vaigiensis*
Rudderfishes (Those species not listed as CHCRT)	nenue	Kyphosidae
Saber or long jaw squirrelfish	ʻalaʻihi	*Sargocentron spiniferum*
Saddleback butterflyfish	kikakapu	*Chaetodon ephippium*
Saddleback hogfish	ʻaʻawa	*Bodianus bilunulatus*
Sandperches	n/a	Pinguipedidae
Scorpionfishes, lionfishes	nohu, okoze	Scorpaenidae
Sharks	manō	Carcharhinidae
		Sphyrnidae
Side-spot goatfish	malu	*Parupeneus pleurostigma*

Table 3.9-3: Federally Managed Fish Species Within the Hawaii-Southern California Training and Testing Study Area, Western Pacific Regional Fishery Management Council (continued)

Western Pacific Regional Fishery Management Council		
Common Name	**Local Name**	**Scientific Name**
Snappers (Those species not listed as CHCRT or in BMUS)	to‘au	Lutjanidae
Trumpetfish	nunu	Aulostomus chinensis
Solderfishes and squirrelfishes	‘u‘u	Holocentridae
Sponges	n/a	Porifera
Spotfin squirrelfish	‘ala‘ihi	*Neoniphon* spp.
Spotted unicornfish	kala lolo	*Naso brevirostris*
Stareye parrotfish	panuhunuhu	*Calotomus carolinus*
Surgeonfishes	na‘ena‘e, maikoiko	Acanthuridae
Striped bristletooth	n/a	*Ctenochaetus striatus*
Stripped mullet	‘ama‘ama	*Mugil cephalus*
Sunset wrasse	n/a	*Thalassoma lutescens*
Surge wrasse	ho‘u	*Thalassoma purpureum*
Threadfin	moi	*Polydactylus sexfilis*
Tilefishes	n/a	Malacanthidae
	humu humu	Balistidae
Trunkfishes	makukana	Ostraciidae
Undulated moray eel	puhi laumilo	*Gymnothorax undulatus*
Whitebar surgeonfish	maiko or maikoiko	*Acanthurus leucopareius*
Whitecheek surgeonfish	n/a	*Acanthurus nigricans*
Whitemargin unicornfish	kala	*Naso annulatus*
White-spotted surgeonfish	‘api	*Acanthurus guttatus*
Whitetip reef shark	manō lalakea	*Triaenodon obesus*
Yellow goatfish	weke	*Mulloidichthys spp.*
Yellow tang	lau‘ipala	*Zebrasoma flavescens*
Yellow-eyed surgeonfish	kole	*Ctenochaetus strigosus*
Yellowfin goatfish	weke‘ula	*Mulloidichthys vanicolensis*
Yellowfin soldierfish	menpachi or ‘u‘u	*Myripristis chryseres*
Yellowfin surgeonfish	pualu	*Acanthurus xanthopterus*
Yellowmargin moray eel	puhi paka	*Gymnothorax flavimarginatus*
Yellowsaddle goatfish	moano kea or moano kale	*Parupeneus cyclostomas*
Yellowstripe goatfish	weke‘a or weke a‘a	*Mulloidichthys flavolineatus*

Notes: (1) All other coral reef ecosystem management unit species that are marine plants, invertebrates, and fishes that are not listed in the preceding tables or are not bottomfish management unit species, crustacean management unit species, Pacific pelagic management unit species, precious coral or seamount groundfish. (2) n/a = Not Applicable.
Source: Western Pacific Regional Fishery Management Council (2009)

Table 3.9-4: Federally Managed Fish Species within the Hawaii-Southern California Training and Testing Study Area, Pacific Regional Fishery Management Council

Pacific Regional Fishery Management Council	
Common Name	**Scientific Name**
Groundfish Management Unit Species	
Sharks and Skates	
Big skate	*Raja binoculata*
California skate	*Raja inornata*
Leopard shark	*Triakis semifasciata*
Longnose skate	*Raja rhina*
Soupfin shark	*Galeorhinus zyopterus*
Spiny dogfish	*Squalus acanthias*
Ratfish	
Ratfish	*Hydrolagus colliei*
Morids	
Finescale codling	*Antimora microlepis*
Grenadiers	
Pacific rattail	*Coryphaenoides acrolepis*
Roundfish	
Cabezon	*Scorpaenichthys marmoratus*
Kelp greenling	*Hexagrammos decagrammus*
Lingcod	*Ophiodon elongatus*
Pacific cod	*Gadus macrocephalus*
Pacific Regional Fishery Management Council	
Roundfish	
Pacific whiting (hake)	*Merluccius productus*
Sablefish	*Anoplopoma fimbria*
Rockfish[1]	
Aurora rockfish	*Sebastes aurora*
Bank rockfish	*Sebastes rufus*
Black rockfish	*Sebastes melanops*
Black and yellow rockfish	*Sebastes chrysomelas*
Blackgill rockfish	*Sebastes melanostomus*
Blue rockfish	*Sebastes mystinus*
Bocaccio	*Sebastes paucispinis*
Bronzespotted rockfish	*Sebastes gilli*
Brown rockfish	*Sebastes auriculatus*
Calico rockfish	*Sebastes dallii*
California scorpionfish	*Scorpaena gutatta*
Canary rockfish	*Sebastes pinniger*
Chameleon rockfish	*Sebastes phillipsi*
China rockfish	*Sebastes nebulosus*
Chilipepper	*Sebastes goodei*

Table 3.9-4: Federally Managed Fish Species within the Hawaii-Southern California Training and Testing Study Area, Pacific Regional Fishery Management Council (continued)

Pacific Regional Fishery Management Council	
Common Name	**Scientific Name**
Copper rockfish	*Sebastes caurinus*
Cowcod	*Sebastes levis*
Darkblotched rockfish	*Sebastes crameri*
Dusky rockfish	*Sebastes ciliatus*
Dwarf-red rockfish	*Sebastes rufinanus*
Flag rockfish	*Sebastes rubrivinctus*
Freckled rockfish	*Sebastes lentiginosus*
Gopher rockfish	*Sebastes carnatus*
Grass rockfish	*Sebastes rastrelliger*
Greenblotched rockfish	*Sebastes rosenblatti*
Greenspotted rockfish	*Sebastes chlorostictus*
Greenstriped rockfish	*Sebastes elongatus*
Halfbanded rockfish	*Sebastes semicinctus*
Harlequin rockfish	*Sebastes variegatus*
Honeycomb rockfish	*Sebastes umbrosus*
Kelp rockfish	*Sebastes atrovirens*
Longspine thornyhead	*Sebastolobus altivelis*
Mexican rockfish	*Sebastes macdonaldi*
Olive rockfish	*Sebastes serranoides*
Pink rockfish	*Sebastes eos*
Pinkrose rockfish	*Sebastes simulator*
Pygmy rockfish	*Sebastes wilsoni*
Pacific ocean perch	*Sebastes alutus*
Quillback rockfish	*Sebastes maliger*
Redbanded rockfish	*Sebastes babcocki*
Redstripe rockfish	*Sebastes proriger*
Rosethorn rockfish	*Sebastes helvomaculatus*
Rosy rockfish	*Sebastes rosaceus*
Rougheye rockfish	*Sebastes aleutianus*
Sharpchin rockfish	*Sebastes zacentrus*
Shortbelly rockfish	*Sebastes jordani*
Shortraker rockfish	*Sebastes borealis*
Shortspine thornyhead	*Sebastolobus alascanus*
Silvergray rockfish	*Sebastes brevispinis*
Speckled rockfish	*Sebastes ovalis*
Splitnose rockfish	*Sebastes diploproa*
Squarespot rockfish	*Sebastes hopkinsi*
Starry rockfish	*Sebastes constellatus*
Stripetail rockfish	*Sebastes saxicola*

Table 3.9-4: Federally Managed Fish Species within the Hawaii-Southern California Training and Testing Study Area, Pacific Regional Fishery Management Council (continued)

Pacific Regional Fishery Management Council	
Common Name	**Scientific Name**
Swordspine rockfish	*Sebastes ensifer*
Tiger rockfish	*Sebastes nigrocinctus*
Treefish	*Sebastes serriceps*
Vermilion rockfish	*Sebastes miniatus*
Widow rockfish	*Sebastes entomelas*
Yelloweye rockfish	*Sebastes ruberimus*
Yellowmouth rockfish	*Sebastes reedi*
Yellowtail rockfish	*Sebastes flavidus*
Flatfish	
Arrowtooth flounder (turbot)	*Atheresthes stomias*
Butter sole	*Isopsetta isolepis*
Curlfin sole	*Pleuronichthys decurrens*
Dover sole	*Microstomus pacificus*
English sole	*Parophrys vetulus*
Flathead sole	*Hippoglossoides elassodon*
Pacific sanddab	*Citharichthys sordidus*
Petrale sole	*Eopsetta jordani*
Rex sole	*Glyptocephalus zachirus*
Rock sole	*Lepidopsetta bilineata*
Sand sole	*Psettichthys melanostictus*
Starry flounder	*Platichthys stellatus*
Coastal Pelagic Management Unit Species	
Pacific sardine	*Sardinops sagax*
Pacific (chub) mackerel	*Scomber japonicus*
Northern anchovy, central and northern subpopulations	*Engraulis mordax*
Market squid	*Doryteuthis opalescens*
Jack mackerel	*Trachurus symmetricus*
Highly Migratory Species Management Unit Species	
North Pacific albacore	*Thunnus alalunga*
Yellowfin tuna	*Thunnus albacares*
Bigeye tuna	*Thunnus obesus*
Skipjack tuna	*Katsuwonus pelamis*
Pacific bluefin tuna	*Thunnus orientalis*
Sharks	
Common thresher shark	*Alopias vulpinus*
Pelagic thresher shark	*Alopias pelagicus*
Bigeye thresher shark	*Alopias superciliosus*
Shortfin mako or bonito shark	*Isurus oxyrinchus*

Table 3.9-4: Federally Managed Fish Species within the Hawaii-Southern California Training and Testing Study Area, Pacific Regional Fishery Management Council (continued)

Pacific Regional Fishery Management Council	
Common Name	**Scientific Name**
Highly Migratory Species Management Unit Species	
Sharks (continued)	
Blue shark	*Prionace glauca*
Billfish and Swordfish	
Striped marlin	*Tetrapturus audax*
Swordfish	*Xiphias gladius*
Other	
Dorado or dolphinfish	*Coryphaena hippurus*

[1] The category "rockfish" includes all genera and species of the family Scopaenidae, even if not listed, that occur in the Washington, Oregon, and California area. The Scopaenidae genera are *Sebastes*, *Scorpaena*, *Sebastolobus*, and *Scorpaenodes*.
Source: Pacific Fishery Management Council (2008)

3.9.2 Affected Environment

The distribution and abundance of fishes depends greatly on the physical and biological factors of the marine ecosystem, such as salinity, temperature, dissolved oxygen, population dynamics, predator and prey interaction oscillations, seasonal movements, reproduction and life cycles, and recruitment success (Helfman et al. 1997). A single factor is rarely responsible for the distribution of fish species; more often, a combination of factors is accountable. For example, open ocean species optimize their growth, reproduction, and survival by tracking gradients of temperature, oxygen, or salinity (Helfman et al. 1997). Another major component in understanding species distribution is the location of highly productive regions, such as frontal zones. These areas concentrate various prey species and their predators, such as tuna, and provide visual cues for the location of target species for commercial fisheries (National Marine Fisheries Service 2001). These types of open ocean predatory fishes occupy the transit lane portion of the Study Area, located mostly within the North Pacific Subtropical Gyre.

Environmental variations, such as the Pacific decadal oscillation events (e.g., El Niño or La Niña), change the normal water temperatures in an area which affects the distribution, habitat range, and movement of open ocean species (Adams et al. 2002; Bakun et al. 2010; Sabarros et al. 2009) within the transit lane and the Study Area. Pacific decadal oscillation events have caused the distribution of fisheries, such as that of the skipjack tuna (*Katsuwonus pelamis*), to shift by more than 620 miles (mi.) (997.8 kilometers [km]) (National Marine Fisheries Service 2001; Stenseth et al. 2002).

Currently 566 species of reef and shore fishes are known to occur around the Insular Pacific-Hawaiian Large Marine Ecosystem within the Study Area. The high number of species that are found only in Hawaii can be explained by its geographical and hydrographical isolation; 24 percent of fishes that occur in Hawaii are found only in the Hawaiian Islands (Randall 1998). Migratory open ocean fishes, such as the larger tunas, the billfishes, and some sharks, are able to move across the great distance that separates the Hawaiian Islands from other islands or continents in the Pacific. Coral reef fish communities in the Hawaiian Islands (excluding Nihoa) show a consistent pattern of species throughout the year. Exceptions include the seasonal distributions of migratory, open ocean species. Several of the reef fish species (bigeye scad [*Selar crumenophthalmus*], mackerel scad [*Decapterus macarellus*], goatfishes [Mullidae], and squirrelfishes [Holocentridae]) in the Study Area also show seasonal fluctuations which are usually related to movements of juveniles into new areas or spawning activity (U.S. Navy Office of Naval Research 2001).

The Southern California portion of the Study Area is in a region of highly productive fisheries (Leet et al. 2001) within the California Current Large Marine Ecosystem. The portion of the California Bight in the Study Area is a transitional zone between cold and warm water masses, geographically separated by Point Conception. The California Bight refers to the coastal area between Point Conception to just past San Diego, including much of the Southern California portion of the Study Area. The cold-water California Current Large Marine Ecosystem is rich in microscopic plankton (diatoms, krill, and other organisms), which form the base of the food chain in the Southern California portion of the Study Area. Small coastal pelagic fishes depend on this plankton and in turn are fed on by larger species (such as highly migratory species). Approximately 480 species of marine fish inhabit the southern California Bight, and numerous fish species utilize spawning, nursery, feeding, and seasonal grounds in nearshore, inshore (including bays and estuaries), and offshore waters of southern California (Cross and Allen 1993). The high fish diversity found in the Study Area occurs for several reasons: (1) the ranges of many temperate and tropical species extend into Southern California; (2) the area has complex bottom features and physical oceanographic features that include several water masses and a changeable marine climate (Allen et al. 2006; Horn and Allen 1978); and (3) the islands and coastal areas provide a diversity of habitats that include soft bottom, rocky reefs, kelp beds, and estuaries, bays, and lagoons.

3.9.2.1 Hearing and Vocalization

Many researchers have investigated hearing and vocalizations in fish species (e.g., Astrup 1999; Astrup and Mohl 1993; Casper et al. 2003a; Casper and Mann 2006a; Coombs and Popper 1979a; Dunning et al. 1992; Egner and Mann 2005a; Gregory and Clabburn 2003; Hawkins and Johnstone 1978a; Higgs et al. 2004; Iversen 1967, 1969; Jorgensen et al. 2005; Kenyon 1996a; Mann et al. 2001a; Mann et al. 2005a; Mann and Lobel 1997; Meyer et al. 2010; Myrberg 2001; Nestler et al. 2002; Popper 2008; Popper and Carlson 1998; Popper and Tavolga 1981; Ramcharitar et al. 2006a; Ramcharitar et al. 2001; Ramcharitar and Popper 2004a; Ramcharitar and Popper 2004b; Remage-Healey et al. 2006b; Ross 1996; Sisneros and Bass 2003b; Song et al. 2006; Wright, Soto, et al. 2007; Wright et al. 2005a).

All fish have two sensory systems to detect sound in the water: the inner ear, which functions very much like the inner ear in other vertebrates, and the lateral line, which consists of a series of receptors along the fish's body (Popper 2008). The inner ear generally detects relatively higher-frequency sounds, while the lateral line detects water motion at low frequencies (below a few hundred Hertz [Hz]) (Hastings and Popper 2005a).

Although hearing capability data only exist for fewer than 100 of the 32,000 fish species, current data suggest that most species of fish detect sounds from 50 to 1,000 Hz, with few fish hearing sounds above 4 kilohertz (kHz) (Popper 2008). It is believed that most fish have their best hearing sensitivity from 100 to 400 Hz (Popper 2003b). Additionally, some clupeids (shad in the subfamily Alosinae) possess ultrasonic hearing (i.e., able to detect sounds above 100,000 Hz) (Astrup 1999).

The inner ears of fish are directly sensitive to acoustic particle motion rather than acoustic pressure (for a more detailed discussion of particle motion versus pressure, see Section 3.0.4, Acoustic and Explosives Primer). Although a propagating sound wave contains both pressure and particle motion components, particle motion is most significant at low frequencies (less than a few hundred Hz) and closer to the sound source. However, a fish's gas-filled swim bladder can enhance sound detection by converting acoustic pressure into localized particle motion, which may then be detected by the inner ear. Fish with swim bladders generally have better sensitivity and better high-frequency hearing than fish without swim bladders (Popper and Fay 2010). Some fish also have specialized structures such as small gas bubbles or gas-filled projections that terminate near the inner ear. These fish have been called "hearing specialists," while fish that do not possess specialized structures have been referred to as "generalists" (Popper et al. 2003). In reality many fish species possess a continuum of anatomical specializations that may enhance their sensitivity to pressure (versus particle motion), and thus higher frequencies and lower intensities (Popper and Fay 2010).

Past studies indicated that hearing specializations in marine fish were quite rare (Amoser and Ladich 2005; Popper 2003b). However, more recent studies have shown that there are more fish species than originally investigated by researchers, such as deep sea fish, that may have evolved structural adaptations to enhance hearing capabilities (Buran et al. 2005; Deng et al. 2011). Marine fish families Holocentridae (squirrelfish and soldierfish), Pomacentridae (damselfish), Gadidae (cod, hakes, and grenadiers), and Sciaenidae (drums, weakfish, and croakers) have some members that can potentially hear sound up to a few kHz. There is also evidence, based on the structure of the ear and the relationship between the ear and the swim bladder, that at least some deep-sea species, including myctophids, may have hearing specializations and thus be able to hear higher frequencies (Deng et al. 2011; Popper 1977; Popper 1980), although it has not been possible to do actual measures of hearing on these fish from great depths.

Several species of reef fish tested have shown sensitivity to higher frequencies (i.e., over 1000 Hz). The hearing of the shoulderbar soldierfish (*Myripristis kuntee*) has a high-frequency auditory range extending toward 3 kHz (Coombs and Popper 1979b), while other species tested in this family have been demonstrated to lack this high frequency hearing ability (e.g., Hawaiian squirrelfish [*Adioryx xantherythrus*] and saber squirrelfish [*Sargocentron spiniferum*]). Some damselfish can hear frequencies of up to 2 kHz, but with best sensitivity well below 1 kHz (Egner and Mann 2005b; Kenyon 1996b; Wright et al. 2005b; Wright, Higgs, et al. 2007).

Sciaenid research by Ramcharitar et al. (2006b) investigated the hearing sensitivity of weakfish (*Cynoscion regalis*). Weakfish were found to detect frequencies up to 2 kHz. The sciaenid with the greatest hearing sensitivity discovered thus far is the silver perch (*Bairdiella chrysoura*), which has responded to sounds up to 4 kHz (Ramcharitar et al. 2004). Other species tested in the family Sciaenidae have been demonstrated to lack this higher frequency sensitivity.

It is possible that the Atlantic cod (*Gadus morhua,* Family: Gadidae) is also able to detect high-frequency sounds (Astrup and Mohl 1993). However, in Astrup and Mohl's (1993) study it is feasible that the cod was detecting the stimulus using touch receptors that were over driven by very intense fish-finding sonar emissions (Astrup 1999)Ladich, 2004. Nevertheless, Astrup and Mohl (1993) indicated that cod have high frequency thresholds of up to 38 kHz at 185 to 200 decibels (dB) relative to (re) 1 micropascal (μPa), which likely only allows for detection of odontocete's clicks at distances no greater than 33 to 98 feet (ft.) (10.1 to 29.9 meters [m]) (Astrup 1999).Experiments on several species of the Clupeidae (i.e., herrings, shads, and menhadens) have obtained responses to frequencies between 40 and 180 kHz (Astrup 1999); however, not all clupeid species tested have demonstrated this very high-frequency hearing. Mann et al. (1998) reported that the American shad can detect sounds from 0.1 to 180 kHz with two regions of best sensitivity: one from 0.2 to 0.8 kHz, and the other from 25 kHz to 150 kHz. This shad species has relatively high thresholds (about 145 dB re 1μPa), which should enable the fish to detect odontocete clicks at distances up to about 656 ft. (200 m) (Mann et al. 1997). Likewise, other members of the subfamily Alosinae, including Alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), and Gulf menhaden (*Brevoortia patronus*), have upper hearing thresholds exceeding 100 to 120 kHz. In contrast, the Clupeidae bay anchovy (*Anchoa mitchilli*), scaled sardine (*Harengula jaguana*), and Spanish sardine (*Sardinella aurita*) did not respond to frequencies over 4 kHz (Gregory and Clabburn 2003; Mann et al. 2001b). Mann et al. (2005b) found hearing thresholds of 0.1 kHz to 5 kHz for Pacific herring (*Clupyea pallasii*).

Two other groups to consider are the jawless fish (Superclass: Agnatha – lamprey) and the cartilaginous fish (Class: Chondrichthyes – the sharks, rays, and chimeras). While there are some lampreys in the marine environment, virtually nothing is known about their hearing capability. They do have ears, but these are relatively primitive compared to the ears of other vertebrates, and it is unknown whether they can detect sound (Popper and Hoxter 1987). While there have been some studies on the hearing of cartilaginous fish, these have not been extensive. However, available data suggest detection of sounds from 20 to 1000 Hz, with best sensitivity at lower ranges (Casper et al. 2003b; Casper and Mann 2006b; Casper and Mann 2009; Myrberg 2001). It is likely that elasmobranchs only detect low-frequency sounds because they lack a swim bladder or other pressure detector.

Most other marine species investigated to date lack higher-frequency hearing (i.e., greater than 1000 Hz). This notably includes sturgeon species tested to date that could detect sound up to 400 or 500 Hz (Lovell et al. 2005; Meyer et al. 2010)and Atlantic salmon that could detect sound up to about 500 Hz (Hawkins and Johnstone 1978b; Kane et al. 2010). Both of these groups of fish have members within the Study Area listed or proposed for listing under the ESA.

Bony fish can produce sounds in a number of ways and use them for a number of behavioral functions (Ladich 2008). Over 30 families of fish are known to use vocalizations in aggressive interactions, whereas over 20 families known to use vocalizations in mating (Ladich 2008). Sound generated by fish as a means of communication is generally below 500 Hz (Slabbekoorn et al. 2010a). The air in the swim bladder is vibrated by the sound producing structures (often muscles that are integral to the swim bladder wall) and radiates sound into the water (Zelick et al. 1999). Sprague and Luczkovich (2004) calculated that silver perch can produce drumming sounds ranging from 128 to 135 dB re 1 µPa. Female midshipman fish apparently use the auditory sense to detect and locate vocalizing males during the breeding season (Sisneros and Bass 2003a). Sciaenids produce a variety of sounds, including calls produced by males on breeding grounds (Ramcharitar et al. 2001), and a “drumming” call produced during chorusing by reef fish (McCauley and Cato 2000). Other sounds produced by chorusing reef fish include “popping,” “banging,” and “trumpet” sounds; all together, these choruses produce sound levels 35 dB above background levels, at peak frequencies between 250 and 1200 Hz, and source levels between 144 and 157 dB re 1µPa (McCauley and Cato 2000).

3.9.2.2 General Threats

This section covers the existing condition of marine fishes as a resource and presents some of the major threats within the Study Area. Species-specific threats are addressed for each of the ESA-listed species. Human-made impacts are widespread throughout the world’s oceans, such that very few habitats remain unaffected by human influence (Halpern et al. 2008). These stressors have shaped the condition of marine fish populations, particularly those species with large body sizes and late maturity ages, making these species especially vulnerable to habitat losses and fishing pressure (Reynolds et al. 2005). This trend is evidenced by the world’s shark species, which make up 60 percent of the marine fishes of conservation concern (International Union for Conservation of Nature and Natural Resources 2009). Furthermore, the conservation status of only 3 percent of the world’s marine fish species has been evaluated, so the threats to the remaining species are largely unknown at this point (Reynolds et al. 2005).

Overfishing is the most serious threat that has led to the listing of ESA-protected marine species (Crain et al. 2009; Kappel 2005), with habitat loss also contributing to extinction risk (Cheung et al. 2007; Dulvy et al. 2003; Jonsson et al. 1999; Limburg and Waldman 2009; Musick et al. 2000). Approximately 30 percent of the United States-managed fishery stocks are overfished (National Marine Fisheries Service 2009). Overfishing occurs when fishes are harvested in quantities above a sustainable level. Overfishing impacts targeted species, and non-targeted species (or "bycatch" species) that often are prey for other fishes and marine organisms. Bycatch may also include seabirds, turtles, and marine mammals. Additionally, in recent decades the marine fishes being targeted have changed such that when higher-level predators become scarce, different organisms on the food chain are subsequently targeted; this has negative implications for entire marine food webs (Crain et al. 2009; Pauly and Palomares 2005). Other factors, such as fisheries-induced evolution and intrinsic vulnerability to overfishing, have been shown to reduce the abundance of some populations (Kauparinen and Merila 2007). Fisheries-induced evolution describes a change in genetic composition of the population that results from intense fishing pressure, such as a reduction in the overall size and growth rates of fish in a population. Intrinsic vulnerability describes certain life history traits (e.g., large body size, late maturity age, low growth rate) that result in a species being more susceptible to overfishing than others (Cheung et al. 2007).

Pollution primarily impacts coastal fishes that occur near the sources of pollution. However, global oceanic circulation patterns result in a considerable amount of marine pollutants and debris scattered throughout the open ocean (Crain et al. 2009). Pollutants in the marine environment that may impact marine fishes include organic pollutants (e.g., pesticides, herbicides, polycyclic aromatic hydrocarbons, flame retardants, and oil), inorganic pollutants (e.g., heavy metals), and debris (e.g., plastics and wastes from dumping at sea) (Pews Oceans Commission 2003). High chemical pollutant levels in marine fishes may cause behavioral changes, physiological changes, or genetic damage in some species (Goncalves et al. 2008; Moore 2008; Pews Oceans Commission 2003; van der Oost et al. 2003). Bioaccumulation of pollutants (e.g., metals and organic pollutants) is also a concern, particularly in terms of human health, because people consume top predators with high pollutant loads. Bioaccumulation is the net buildup of substances (e.g., chemicals or metals) in an organism directly from contaminated water or sediment through the gills or skin, from ingesting food containing the substance (Newman 1998), or from ingestion of the substance itself (Moore 2008). Entanglement in abandoned commercial and recreational fishing gear has also caused pollution-related declines for some marine fishes; some species are more susceptible to entanglement by marine debris than others (Musick et al. 2000).

Other human-caused stressors on marine fishes are the introduction of non-native species, climate change, aquaculture, energy production, vessel movement, and underwater noise:

- Non-native fishes pose threats to native fishes when they are introduced into an environment lacking natural predators and then compete with, and prey upon, native marine fishes for resources (Crain et al. 2009).
- Global climate change is contributing to a shift in fish distribution from lower to higher latitudes (Brander 2010; Brander 2007; Dufour et al. 2010; Glover and Smith 2003; Limburg and Waldman 2009; Wilson et al. 2010).
- The threats of aquaculture operations on wild fish populations are reduced water quality, competition for food, predation by escaped or released farmed fishes, spread of disease, and

reduced genetic diversity (Kappel 2005). These threats become apparent when escapees enter the natural ecosystem (Hansen and Windsor 2006; Ormerod 2003). The National Oceanic and Atmospheric Administration is developing an aquaculture policy aimed at promoting sustainable marine aquaculture (National Oceanic and Atmospheric Administration 2011).

- Energy production and offshore activities associated with power-generating facilities results in direct and indirect fish injury or mortality from two primary sources; including cooling water withdrawal that results in entrainment mortality of eggs and larvae and impingement mortality of juveniles and adults (U.S. Environmental Protection Agency 2004), and offshore wind energy development that results in acoustic impacts (Madsen et al. 2006).
- Vessel strikes pose threats to some large, slow-moving fishes at the surface. Whale sharks, basking sharks, ocean sunfish, and manta rays are also vulnerable to ship strikes, and numerous collisions have been recorded (National Marine Fisheries Service 2010; Rowat et al. 2007b; Stevens 2007; The Hawaii Association for Marine Education and Research Inc. 2005).
- Underwater noise is a threat to marine fishes. However, the physiological and behavioral responses of marine fishes to underwater noise (Codarin et al. 2009; Popper 2003a)(Slabbekoorn et al. 2010b; Wright et al. 2010) have been investigated for only a limited number of species (Popper and Hastings 2009a, b). In addition to vessels, other sources of underwater noise include active sonar, pile-driving activity (California Department of Transportation 2001; Carlson and Hastings 2007; Feist et al. 1992; Mueller-Blenkle et al. 2010a; Nedwell et al. 2003a; Popper et al. 2006) and seismic activity (Popper and Hastings 2009a). Information on fish hearing is provided in Section 3.9.2.1 (Hearing and Vocalization), with further discussion in Section 3.9.3.1 (Acoustic Stressors).

3.9.2.3 Steelhead Trout (*Oncorhynchus mykiss*)

3.9.2.3.1 Life History

Steelhead are born in freshwater streams, where they spend their first 1-3 years. They later move into the ocean, where most of their growth occurs. After spending between 1 and 4 years in the ocean, steelhead return to their home freshwater stream to spawn. Unlike other species of Pacific salmon, steelhead do not necessarily die after spawning and are able to spawn more than once. Steelhead may exhibit either an anadromous lifestyle or they may spend their entire life in freshwater (McEwan and Jackson 1996). The name steelhead trout is used primarily for the anadromous form of this species.

There is considerable variation in this life history pattern within the population, partly due to Southern California's variable seasonal and annual climatic conditions. Some winters produce heavy rainfall and flooding, which allow juvenile steelhead easier access to the ocean, while dry seasons may close the mouths of coastal streams, limiting juvenile steelheads' access to marine waters (National Marine Fisheries Service 1997).

3.9.2.3.2 Status and Management

Steelhead trout are an anadromous form of rainbow trout and are federally protected by the designation of distinct population segments, which is defined as a population or group of populations that is discrete or separate from other populations of the same species and are equivalent to evolutionarily significant units. Distinct population segments are also the smallest division of a taxonomic species permitted to be protected under the ESA (West Coast Salmon Biological Review Team et al. 2003). NMFS has jurisdiction over the marine life form, while the U.S. Fish and Wildlife Service and respective state resource agencies have jurisdiction over the freshwater resident life forms.

Of the 15 steelhead trout distinct population segments, 2 are listed as endangered, 9 are listed as threatened, and 1 is an ESA species of concern (National Marine Fisheries Service 2010). NMFS listed the Southern California distinct population segment of steelhead as endangered in 1997 (National Marine Fisheries Service 1997). Critical habitat for 10 west coast steelhead distinct population segments has been designated and the Southern California critical habitat, relative to the Study Area is shown in Figure 3.9-1 and includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (e.g., spawning sites, rearing sites, and migration corridors), and are outside the Study Area.

3.9.2.3.3 Habitat and Geographic Range

The present distribution of steelhead extends from the Kamchatka Peninsula in Asia, east to Alaska and south to Southern California, although the species' historical range extended at least to Mexico (Good et al. 2005). Steelhead trout are found along the entire Pacific Coast of the United States. Worldwide, steelhead are also naturally found in the western Pacific as far as the Kamchatka Peninsula (Russia). This species has also been introduced (by stocking) in other locations throughout the world, including freshwater streams in Hawaii (Kokee State Park on the island of Kauai) (National Marine Fisheries Service 2010), although this particular population does not migrate into the ocean.

Since spawning occurs exclusively in freshwater systems outside of the Study Area, spawning habitats are not described here. However, information on freshwater habitats and spawning areas can be found in Pacific Fishery Management Council (2000), Beauchamp et al. (1983) and Emmett et al. (1991).

Of the six species of Pacific salmon that have evolutionarily significant units or distinct population segments along the West Coast, only the steelhead occurs within the Southern California portion of the Study Area (National Marine Fisheries Service 2005). The Southern California distinct population segment range for steelhead extends from Santa Maria River south to San Mateo Creek (National Marine Fisheries Service 2002), within the California Current Large Marine Ecosystem. It was expanded in 2002 to include streams south of Malibu Creek, specifically Topanga and San Mateo Creeks (National Marine Fisheries Service 2002). The lower portion of San Mateo Creek flows through Marine Corps Base Camp Pendleton and into the Southern California portion of the Study Area. Except for this possible small population in San Mateo Creek, the species is considered completely extinct from the Santa Monica Mountains in California to the U.S.-Mexico border.

Steelhead tend to move immediately offshore on entering the marine environment although, in general, steelhead tend to remain closer to shore than other Pacific salmon species (Beamish et al. 2005). They generally remain within the coastal waters of the California Current (Beamish et al. 2005; Quinn and Myers 2004).

3.9.2.3.4 Population and Abundance

Most of the distinct population segments have a low abundance relative to historical levels, and there is widespread occurrence of hatchery fish in naturally spawning populations (Good et al. 2005; National Marine Fisheries Service 2010). NMFS has reported population sizes from individual distinct population segments, but because all of these units occur together while at sea, it is difficult to estimate the marine population numbers. Specific population numbers, based on freshwater returns, within each of the distinct population segments is found in Good et al. (2005).

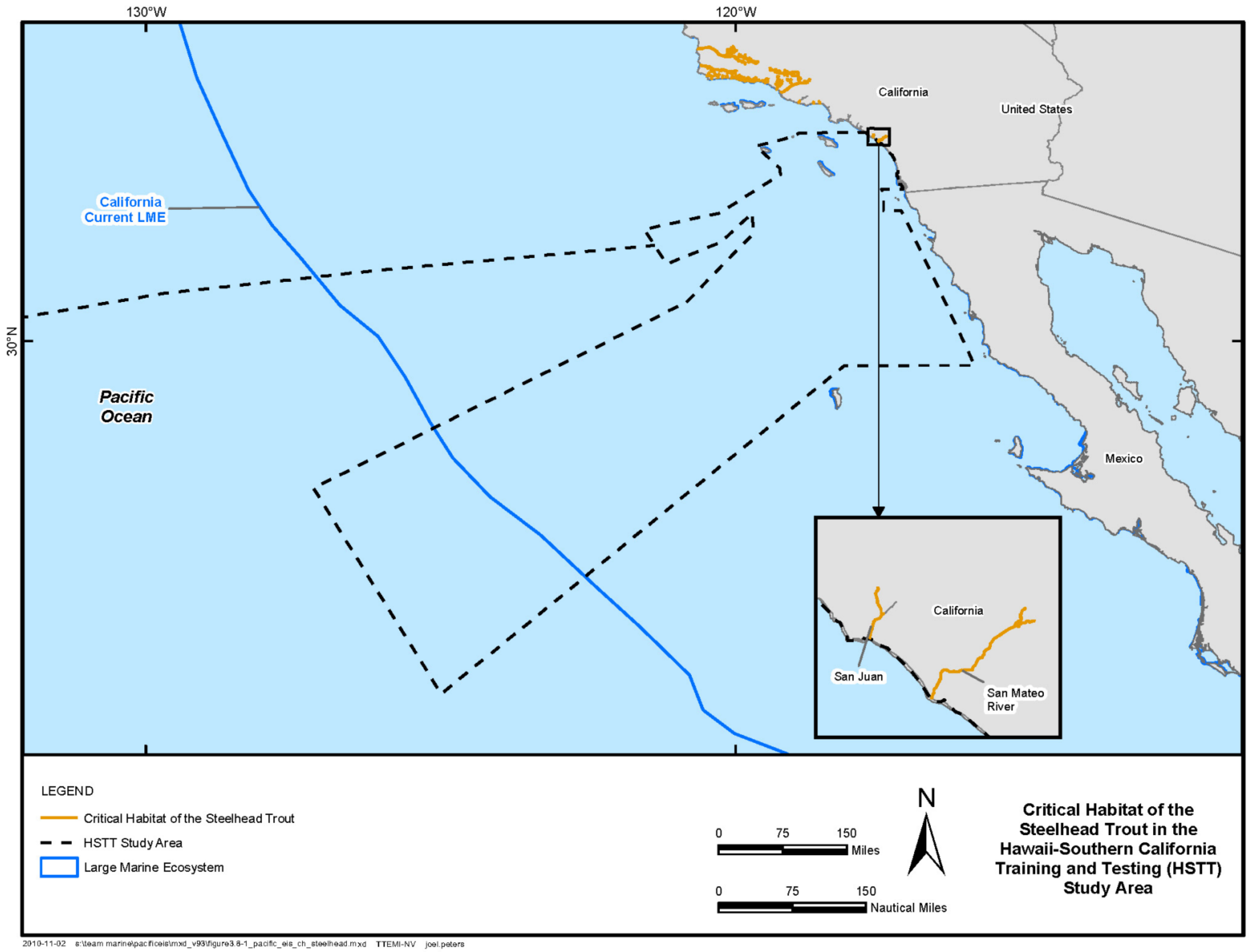


Figure 3.9-1: Critical Habitat of the Steelhead Trout Within and Adjacent to the Southern California Study Area

3.9.2.3.5 Predator/Prey Interactions

Predators of steelhead include fish-eating birds, such as terns and cormorants, and pinnipeds, such as sea lions and harbor seals, especially within coastal areas (National Marine Fisheries Service 2010). Juveniles in freshwater feed mostly on zooplankton (small animals that drift in the water), while adults feed on aquatic and terrestrial insects, mollusks, crustaceans, fish eggs, minnows, and other small fishes, including other trout and salmon depending on whether they are inhabiting streams or the ocean (National Marine Fisheries Service 2010).

3.9.2.3.6 Migration

Adult steelhead can migrate up to 930 mi. (1,496.7 km) from their ocean habitats to reach their freshwater spawning grounds in high elevation tributaries. In the Southern California portion of the Study Area, the primary rivers that steelhead migrate into are the Santa Maria, Santa Ynez, Ventura, and Santa Clara Rivers (Good et al. 2005), although some of these rivers contain considerable migration barriers such as dams.

3.9.2.3.7 Species-Specific Threats

There are many threats to the survival of the Southern California steelhead distinct population segment. Principle threats include, but are not limited to, alteration of stream flow patterns and habitat degradation, barriers to fish passages, channel alterations, water quality problems, non-native exotic fish and plants and climate change. These threats pose a serious challenge to the persistence of Southern California steelhead, and most threats are increasing in magnitude as human population grows in Southern California.

3.9.2.4 Scalloped Hammerhead Shark (*Sphyrna lewini*)

3.9.2.4.1 Status and Management

In August 2011, NMFS received a petition to list the scalloped hammerhead shark as threatened or endangered under the ESA and to designate critical habitat concurrently with the listing (National Marine Fisheries Service 2011). In 2013, based on the best scientific and commercial information available, including the status review report (Miller et al. 2013), and other information available since completion of the status review report, NMFS determined that the species is comprised of six distinct population segments (DPSs) that qualify as species under the ESA: Northwest Atlantic and Gulf of Mexico (NW Atlantic & GOM DPS); Central and Southwest Atlantic (Central & SW Atlantic DPS); Eastern Atlantic DPS; Indo-West Pacific DPS; Central Pacific DPS; and Eastern Pacific DPS. After reviewing the best available scientific and commercial information on the DPSs, we have determined that two DPSs warrant listing as endangered, the Eastern Atlantic and Eastern Pacific DPSs; two DPSs warrant listing as threatened, the Central & SW Atlantic and Indo-West Pacific DPSs; and two DPSs do not warrant listing at this time, the NW Atlantic & GOM DPS and the Central Pacific DPS.

3.9.2.4.2 Habitat and Geographic Range

The scalloped hammerhead shark is circumglobal, occurring in all temperate to tropical waters (Duncan and Holland 2006) from the surface to depths of 275 m (902 ft.). It typically inhabits nearshore waters of bays and estuaries where water temperatures are at least 22 degrees (°) Celsius (C) (72° Fahrenheit [F]) (Castro 1983; Compagno 1984). The scalloped hammerhead shark remains close to shore during the day and moves to deeper waters at night to feed (Bester 1999). A genetic marker study suggests that females typically remain close to coastal habitats, while males are more likely to disperse across larger open ocean areas (Daly-Engel et al. 2012). In the eastern Pacific, the scalloped hammerhead ranges from southern California (including the Gulf of California) to Panama, Ecuador, and northern Peru, and includes waters

3.9.2.4.3 Population and Abundance

National Marine Fisheries Service data and information provided in the listing petition suggest that the scalloped hammerhead shark has undergone substantial declines throughout its range (National Marine Fisheries Service 2011). Specific information for scalloped hammerhead in Eastern Central and Southeast Pacific region is unavailable, but informal observations and overall shark estimates are available. Reports from divers and tourists in the Galapagos Islands indicate a severe decrease in the number of sharks observed, as well as a decrease in the sightings of hammerhead schools. Reports from Costa Rica's exclusive economic zone for catch rates of pelagic sharks, including scalloped hammerhead, from 1991 to 2000 show a decrease of 60 percent. In Ecuador, concern has grown over illegal fishing around the Galapagos. Because the fins of the scalloped hammerhead are highly valuable in worldwide markets, experts expect that a large portion of this illegal fishing targets scalloped hammerheads

3.9.2.4.4 Predator and Prey Interactions

Scalloped hammerhead sharks follow daily vertical movement patterns within their home range (Holland et al. 1993; Klimley and Nelson 1984), and feed primarily at night (Compagno 1984). They are a high trophic level predator, and feed opportunistically on all types of teleost fish, cephalopods, crustaceans, and rays (Bethea et al. 2011; Compagno 1984; Torres-Rojas et al. 2010; Vaske et al. 2009).

3.9.2.4.5 Species-Specific Threats

The primary threat to the scalloped hammerhead shark is direct take, especially by the foreign commercial shark fin market (National Marine Fisheries Service 2011). Scalloped hammerheads are a principal component of the total shark bycatch in the swordfish and tuna longline fishery, and are particularly susceptible to overfishing and bycatch in gillnet fisheries because of schooling habits (Food and Agriculture Organization of the United Nations 2012). Longline mortality for this species is estimated between 91 and 94 percent (National Marine Fisheries Service 2011).

3.9.2.5 Jawless Fishes (Orders Myxiniformes and Petromyzontiformes)

Hagfishes (Myxiniformes) occur exclusively in marine habitats and are represented by 70 species worldwide within temperate marine locations. This group feeds on dead or dying fishes and has very limited external features often associated with fishes, such as fins and scales (Helfman et al. 1997). The members of this group are important scavengers that recycle nutrients back through the ecosystem. Lampreys (Petromyzontiformes) are represented by approximately 11 marine or saltwater/freshwater species distributed primarily throughout the temperate regions of the Northern Hemisphere. Lampreys typically are parasitic, feeding on other live fishes. The most striking feature of the lampreys is the oral disc mouth, which they use to attach to other fishes and feed on their blood (Moyle and Cech 1996; Nelson 2006).

Hagfishes and lampreys occur in the seafloor habitats of open ocean waters in the transit lane and California Current Large Marine Ecosystem portions of the Study Area, but not in the Hawaii portion of the Study Area (Paxton and Eshmeyer 1994). Hagfishes are typically found at depths greater than 80 ft. (24.4 m) and temperatures below 55°F (13°C).

3.9.2.6 Sharks, Rays, and Chimaeras (Class Chondrichthyes)

The cartilaginous (non-bony) marine fishes of the class Chondrichthyes are distributed throughout the world's oceans, occupying all areas of the water column. This group is mainly predatory and contains many of the apex predators found in the ocean (e.g., great white shark, mako shark, and tiger shark) (Helfman et al. 1997). The whale shark and basking shark are notable exceptions as filter-feeders. Sharks and rays have some unique features among marine fishes; no swim bladder; protective toothlike scales; unique sensory systems (electroreception, mechanoreception); and some species bear live young in a variety of life history strategies (Moyle and Cech 1996). The subclass Elasmobranchii contains more than 850 marine species, including sharks, rays and skates, spread across nine orders (Nelson 2006). Very little is known about the subclass Holocephali, which contains 58 marine species of chimaeras (Nelson 2006).

Sharks and rays occupy relatively shallow temperate and tropical waters throughout the world. More than half of these species occur in less than 655 ft. (199.6 m) of water, and nearly all are found at depths less than 6,560 ft. (1,999.4 m) (Nelson 2006). Sharks and rays are found in all open ocean areas and coastal waters of the Study Area (Paxton and Eshmeyer 1994) and throughout the North Pacific Subtropical Gyre, the Insular Pacific-Hawaiian Large Marine Ecosystem, and the California Current Large Marine Ecosystem that encompass the Study Area. While most sharks occur in the water column, many rays occur on or near the seafloor. Chimaeras are cool-water marine fishes that are found at depths between 260 and 8,500 ft. (79.2 and 2,590.8 m) (Nelson 2006). They occur in the open ocean of the transit lane and Hawaii portions of the Study Area, up to the lower continental shelf (Paxton and Eshmeyer 1994).

3.9.2.7 Eels and Bonefishes (Orders Anguilliformes and Elopiformes)

These fishes have a unique larval stage, called leptocephalus, in which leptocephali grow to much larger sizes during an extended larval period as compared to most other fishes. The eels (Anguilliformes) have an elongated snakelike body; most of the 780 eel species do not inhabit the deep ocean. Eels generally feed on other fishes or small bottom-dwelling invertebrates, but they also feed on larger organisms (Helfman et al. 1997). Moray eels, snake eels, and conger eels are well represented by many species that occur in the Study Area (Paxton and Eshmeyer 1994). The fishes in the order Elopiformes include two distinct groups that exhibit very different forms: the bonefishes, predators of shallow tropical waters; and the little-known spiny eels, elongated seafloor feeders of decaying organic matter in deep ocean areas (Paxton and Eshmeyer 1994).

Eels are found in all marine habitat types, although most inhabit shallow subtropical or tropical marine habitats (Paxton and Eshmeyer 1994) within the Insular Pacific-Hawaiian and California Current Large Marine Ecosystems in the water column and seafloor. The bonefishes and spiny eels occur in deep ocean waters, ranging from 400 to 16,000 ft. (121.9 to 4,876.8 m) within the open ocean area of the Study Area and throughout the North Pacific Subtropical Gyre on the seafloor and water column (Paxton and Eshmeyer 1994).

3.9.2.8 Smelt and Salmonids (Orders Argentiniformes, Osmeriformes, and Salmoniformes)

A distinguishing feature of this group of fishes is an adipose fin composed of fatty tissue on their backs. The deepwater smelts of the order Argentiniformes differ from the true smelts of the order Osmeriformes, mostly by their preferred habitat (deepwater versus coastal). The true smelts are found in large abundances within coastal areas throughout the Northern Hemisphere, while the deepwater smelts are limited mainly to deepwater regions of the world's oceans. Smelts are an important forage fish for other marine organisms, including other fishes, birds, and marine mammals.

The native distribution of Salmoniformes is restricted to the cold waters of the Northern Hemisphere. Most species of salmon spawn in freshwater and live in the sea; they are among the most thoroughly studied fish groups in the world.

3.9.2.9 Dragonfishes and Lanternfishes (Orders Stomiiformes and Myctophiformes)

The orders Stomiiformes and Myctophiformes comprise one of the largest groups of the world's deepwater fishes—more than 500 total species, many of which are not very well described in the scientific literature (Nelson 2006). The ecological role of many of these species is also not well understood (Helfman et al. 1997). These fishes are known for their unique body forms (e.g., slender bodies, or disc-like bodies, often possessing light-producing capabilities) and adaptations that likely present some advantages within the deepwater habitats in which they occur (e.g., large mouths, sharp teeth, and sensitive lateral line (sensory) systems) (Haedrich 1996; Koslow 1996; Marshall 1996; Rex and Etter 1998; Warrant and Locket 2004).

Overall the dragonfishes and lanternfishes occur in deep ocean waters, ranging from 3,280 to 16,000 ft. (999.7 to 4,876.8 m), making diurnal migrations within the open ocean area of the Study Area and throughout the North Pacific Subtropical Gyre (Froese and Pauly 2010; Paxton and Eshmeyer 1994).

3.9.2.10 Greeneyes, Lizardfishes, Lancetfishes, and Telescopefishes (Order Aulopiformes)

Fishes of the order Aulopiformes are a diverse group that possess both primitive (adipose [fatty] fin, rounded scales) and advanced (unique swim bladder and jawbone) features of marine fishes (Paxton and Eshmeyer 1994). They are common in estuarine and coastal waters as well as deep ocean waters. The lizardfishes (Synodontidae), Bombay ducks (Harpadontidae), and greeneyes (Chlorophthalmidae) primarily occur in coastal waters to the outer shelf, where they rest on the bottom and are well camouflaged with the substrate (Paxton and Eshmeyer 1994). Lancetfishes (Alepisauridae) are primarily mid-water column fishes, but can be found ranging from the surface to deep-waters. Telescopefishes are primarily found in deep waters 1,640 to 3,280 ft. (499.9 to 999.7 m), but can also be found at shallower depths and may approach the surface at night (Paxton and Eshmeyer 1994).

In general greeneyes, lizardfishes, and lancetfishes occur in the coastal waters of the Study Area, including all of the Insular Pacific-Hawaiian and California Current Large Marine Ecosystems. Telescopefishes occur primarily in the deeper waters associated with the open ocean areas of the Study Area (Paxton and Eshmeyer 1994).

3.9.2.11 Cods and Cusk-eels (Orders Gadiformes and Ophidiiformes)

The cods and cusk-eels include over 900 species, some of which are target species of commercial fisheries. The cods, or groundfish, account for approximately half of the world's commercial fishery landings (Food and Agriculture Organization of the United Nations 2005). Gadiforms, such as cods, are almost exclusively marine fishes, and occupy seafloor habitats in temperate, arctic, and Antarctic regions.

The order Ophidiiformes includes cusk-eels and brotulas, which have long eel-like tapering bodies and are distributed in deepwater areas throughout tropical and temperate oceans. The characteristics of ophidiiforms are similar to those of the other deepwater groups. Other fishes of this order are also found in shallow waters on coral reefs. In addition, there are several cusk-eel species which are pelagic or found on the continental shelves and slopes.

Cods are generally found near the seafloor and feed on bottom-dwelling organisms. They do not occur in the Study Area (Paxton and Eshmeyer 1994). Cusk-eels occur near the seafloor of the coastal waters and in the open ocean areas of the HSTT Study Area (Paxton and Eshmeyer 1994).

3.9.2.12 Toadfishes and Anglerfishes (Orders Batrachoidiformes and Lophiiformes)

The toadfishes and anglerfishes include nearly 400 species. The order Batrachoidiformes includes only the toadfish family. Some species of toadfishes produce and detect sounds by vibrating the swimbladder. They spawn in and around bottom structures and invest a substantial amount of parental care by defending their nests, Moyle and Cech 1996; Paxton and Eshmeyer 1994). The order Lophiiformes includes all of the world's anglerfishes, goosefishes, frogfishes, batfishes, and deepwater anglerfishes—most of which occur in seafloor habitats of all oceans. Some deepwater anglerfish use highly modified "lures" to attract prey (Helfman et al. 1997; Koslow 1996). These fishes are also an important predator among the deepwater, seafloor habitats of the Study Area (Nelson 2006). The anglerfishes can be broken into two groups: (1) those that dwell in the deep water (10 families); and (2) those that live on the bottom or attached to drifting seaweed in shallow water (5 families).

The primary distribution of the toadfishes in the Study Area is limited to seafloor habitats of the California Current Large Marine Ecosystem. Anglerfishes are also found in seafloor habitats, but with a wider distribution covering all waters of the Study Area (Froese and Pauly 2010; Moyle and Cech 1996; Paxton and Eshmeyer 1994).

3.9.2.13 Mullets, Silversides, Needlefish, and Killifish (Orders Mugiliformes, Atheriniformes, Beloniformes, and Cyprinodontiformes)

Mugiliformes (mullets) contain 71 marine species that occupy coastal marine and estuarine waters of all tropical and temperate oceans. There has been disagreement in the taxonomic classification of this group; some have included this group within the superorder Athinerimorpha (Nelson 2006), while others have placed it as a suborder within the Perciformes (Moyle and Cech 1996). Mullets feed on decaying organic matter in estuaries and possess a filter feeding mechanism with a gizzard like digestive tract. They feed on the bottom by scooping up food that is retained by their very small gill rakers (Moyle and Cech 1996). Most species within these groups are important prey for predators in all estuarine habitats within the Study Area.

Most of these fishes are found in tropical or temperate marine waters and occupy shallow habitats near the water surface. An exception to this nearshore distribution includes the flyingfishes and halfbeaks, which occur within oceanic or shallow seacoast regions where light penetrates, in tropical to warm-temperate regions. The silversides are a small inshore species often found in intertidal habitats. The Cyprinodontiformes include the killifishes that are often associated with intertidal coastal zones and salt marsh habitats and are highly tolerant of pollution. These fishes are found in all coastal waters and open ocean areas of the Study Area (Froese and Pauly 2010; Paxton and Eshmeyer 1994).

3.9.2.14 Oarfishes, Squirrelfishes, and Dories (Orders Lampridiformes, Beryciformes, and Zeiformes)

There are only 19 species in the order Lampridiformes—the oarfishes. They exhibit diverse body shapes, and some have a protruding mouth, which allows for a suction feeding technique while feeding on plankton. Other species, including the crestfish, posses grasping teeth used to catch prey. They occur only in the mid-water column of the open ocean, but are rarely observed (Nelson 2006). Fishes in the order Beryciformes are primarily deepwater or nocturnal species, many of which are poorly described. There are a few shallow water exceptions, including squirrelfishes, which are distributed throughout reef systems in tropical and subtropical marine regions (Nelson 2006). Squirrelfishes are an important food source relied upon by some communities who catch their own food (Froese and Pauly 2010). They possess specialized eyes and large mouths and primarily feed on bottom-dwelling crustaceans (Goatley and Bellwood 2009). Very little is known about the order Zeiformes, or dories, which include some very rare families, many containing only a single species (Paxton and Eshmeyer 1994). Even general information on their biology, ecology, and behavior is limited.

Squirrelfishes are common in coral reef systems in the Study Area within the Insular Pacific-Hawaiian Large Marine Ecosystem. Most of the Lampridiformes and Zeiformes are confined to seafloor regions in all coastal waters of the Study Area, as well as the open ocean areas at depths of 130 to 330 ft. (39.6 to 100.6 m) (Moyle and Cech 1996; Paxton and Eshmeyer 1994).

3.9.2.15 Pipefishes and Seahorses (Order Gasterosteiformes)

Gasterosteiformes include sticklebacks, pipefishes, and seahorses, many of which are common within the Study Area. Most of these species are found in brackish water (a mixture of seawater and freshwater) throughout the world (Nelson 2006) and occur in surface, water column, and seafloor habitats. Small mouths on a long snout and armorlike scales are characteristic of this group. Most of these species exhibit a high level of parental care, either through nest building (sticklebacks) or brooding pouches (male seahorses have a pouch where eggs develop), which results in relatively few young being produced (Helfman et al. 1997). This group also includes the trumpetfishes and cornetfishes, ambush predators, with a large mouth used to capture smaller lifestages of fishes.

This group is associated with tropical and temperate reef systems. They are found in the coastal waters of the Study Area within the Insular Pacific-Hawaiian and California Current Large Marine Ecosystems, but not in the open ocean (Froese and Pauly 2010; Moyle and Cech 1996; Paxton and Eshmeyer 1994).

3.9.2.16 Scorpionfishes (Order Scorpaeniformes)

The order Scorpaeniformes is a diverse group of more than 1,400 marine species, all with bony plates or spines near the head. This group contains the scorpionfishes, waspfishes, rockfishes, velvetfishes, pigfishes, sea robins, gurnards, sculpins, snailfishes, and lumpfishes (Froese and Pauly 2010; Moyle and Cech 1996; Paxton and Eshmeyer 1994). Many of these fishes are adapted for inhabiting the seafloor of the marine environment (e.g., modified pectoral fins or suction discs), where they feed on smaller crustaceans and fishes. Sea robins are capable of generating sounds with their swimbladders (Moyle and Cech 1996).

Scorpionfishes are widely distributed in open ocean and coastal habitats, at all depths, throughout the world. They occur in all waters of the Study Area. Most occur in depths less than 330 ft. (100.6 m), but others are found in deepwater habitat, down to 7,000 ft. (2,133.6 m) (Paxton and Eshmeyer 1994).

3.9.2.17 Croakers, Drums, and Snappers (Families Sciaenidae and Lutjanidae)

The families Sciaenidae and Lutjanidae include mainly predatory coastal marine fishes, including the recreationally important snappers, drums, and croakers. These fishes are sometimes distributed in schools as juveniles, and then become more solitary as they grow larger. They feed on fishes and crustaceans. Drums and croakers (Sciaenidae) produce sounds via their swimbladders, which generate a drumming sound. The snappers (Lutjanidae) are generally associated with seafloor habitats and tend to congregate near structured habitats, including natural/artificial reefs and oil platforms (Moyle and Cech 1996). Other representative groups include the brightly colored and diverse forms of reef-associated cardinalfishes, butterflyfishes, angelfishes, dottybacks, and goatfishes (Paxton and Eshmeyer 1994).

Like the scorpionfishes, this group is widely distributed in open ocean and coastal habitats throughout the world. They occur in all waters of the Study Area, but are particularly concentrated, and exhibit the most varieties, in depths less than 330 ft. (100 m), often associated with reef systems within the Insular Pacific-Hawaiian and California Current Large Marine Ecosystems portion of the Study Area (Froese and Pauly 2010; Paxton and Eshmeyer 1994).

3.9.2.18 Groupers and Seabasses (Family Serranidae)

The Serranidae are primarily nearshore marine fishes that support recreational and commercial fisheries. Most seabasses and groupers are nocturnal predators found primarily within reef systems. They generally possess large mouths and feed mostly on bottom-dwelling fishes and crustaceans (Goatley and Bellwood 2009). Some groupers and seabasses take advantage of feeding opportunities in the low-light conditions of twilight when countershaded fishes become conspicuous and easier for these predators to locate (Rickel and Genin 2005). Other groupers are active during the daytime and exhibit a variety of opportunistic predatory strategies, such as ambush (Wainwright and Richard 1995) to benefit from mistakes made by prey species. Many of the serranids begin life as females and then become male as they grow larger (Moyle and Cech 1996). Their slow maturation has resulted in many of the grouper species within the Study Area to be designated with vulnerable to critically endangered conservation status (International Union for Conservation of Nature and Natural Resources 2010). This group occurs in all coastal waters of the Study Area, but are mostly concentrated, in depths less than 100 ft. (30.5 m), within the Insular Pacific-Hawaiian and California Current Large Marine Ecosystems portion of the Study Area (Froese and Pauly 2010, Moyle and Cech 1996, Paxton and Eshmeyer 1994).

3.9.2.19 Wrasses, Parrotfish, and Damselfishes (Families Labridae, Scaridae, and Pomacentridae)

The suborder Labroidei contains many nearshore marine reef or structure-associated fishes, including the diverse wrasses (Labridae), parrotfishes (Scaridae), and damselfishes (Pomacentridae). Most of the wrasses are conspicuous, brightly colored, coral reef fishes, but others are found in temperate waters. Most are active during the daytime and exhibit a variety of opportunistic predatory strategies, such as ambush (Wainwright and Richard 1995) to capitalize on mistakes made by prey species. Parrotfishes provide important ecological functions to the reef system by grazing on coral and processing sediments (Goatley and Bellwood 2009). Similar to the Serranidae, many wrasses and parrotfishes begin life as females but change into males as they grow larger and exhibit with a variety of reproductive strategies found among the species and between populations (Moyle and Cech 1996). Damselfishes are noted for their territoriality and are brightly colored. This group occurs in all coastal waters of the Study Area, but are mostly concentrated in depths less than 100 ft. (30.5 m) within the Insular Pacific-Hawaiian and California Current Large Marine Ecosystems portion of the Study Area (Froese and Pauly 2010, Moyle and Cech 1996, Paxton and Eshmeyer 1994).

3.9.2.20 Gobies, Blennies, and Surgeonfishes (Suborders Gobioidei, Blennioidei, and Acanthuroidei)

The seafloor-dwelling gobies (Gobioidei) include Gobiidae, the largest family of marine fishes (Nelson 2006); they exhibit modified pelvic fins that allow them to adhere to varying bottom surfaces (Helfman et al. 1997). Fishes of the suborder Blennioidei primarily occupy the intertidal zones throughout the world, including the clinid blennies and the combtooth blennies of the family Blenniidae (Mahon et al. 1998, Moyle and Cech 1996, Nelson 2006). The blennies and gobies primarily feed on detritus on the seafloor. The suborder Acanthuroidei contains the surgeonfishes, moorish idols, and rabbitfishes of tropical reef systems. They have elongated small mouths used to scrape algae from coral. These grazers provide an important function to the reef system by controlling the growth of algae on the reef (Goatley and Bellwood 2009). Some of these species are adapted to target particular prey species; for example, the elongated snouts of butterflyfishes allow for biting off exposed parts of invertebrates (Leysen et al. 2010).

These fishes occur in all coastal waters of the Study Area, but are mostly concentrated, and exhibit the most varieties, in depths less than 100 ft. (30.5 m), within the Insular Pacific-Hawaiian and California Current Large Marine Ecosystems portion of the Study Area (Froese and Pauly 2010, Moyle and Cech 1996, Paxton and Eshmeyer 1994).

3.9.2.21 Jacks, Tunas, Mackerels, and Billfishes (Families Carangidae, Scombridae, Xiphiidae, and Istiophoridae)

The suborder Scombroidei contain some of the most voracious open ocean predators: the jacks, mackerels, barracudas, billfishes, and tunas (Estrada et al. 2003, Sibert et al. 2006). Many jacks are known to feed nocturnally (Goatley and Bellwood 2009) and in the low-light conditions of twilight (Rickel and Genin 2005), by ambushing their prey (Sancho 2000). The open ocean, highly migratory tunas, mackerels, and billfishes are extremely important to fisheries; they together account for approximately one-third of total annual worldwide catch, by weight, with tunas, and swordfish as the most important species (Food and Agriculture Organization of the United Nations 2005, 2009). There are two Hawaii-based longline fisheries that target bigeye tuna and swordfish, with fishing grounds occurring in the Study Area. One unique adaptation found in these fishes is ram ventilation (Wegner et al. 2006). Ram ventilation uses the motion of the fish through the water to increase respiratory efficiency in large, fast-swimming open ocean fishes (Wegner et al. 2006). Many fishes in this group have large-scale migrations that allow for feeding in highly productive areas, which vary by season (Pitcher 1995).

These fishes occupy the open ocean areas that comprise the largest area of ocean but make up only about 5 percent of the total marine fishes (Froese and Pauly 2010, Helfman et al. 1997). They are mostly found near the surface, or the upper portion of the water column, located within all coastal waters and open ocean areas of the Study Area, including all of the Insular Pacific-Hawaiian and California Current Large Marine Ecosystems (Froese and Pauly 2010, Paxton and Eshmeyer 1994).

3.9.2.22 Flounders (Order Pleuronectiformes)

The order Pleuronectiformes includes flatfishes (flounders, dabs, soles, and tonguefishes) that are found in all marine seafloor habitats throughout the world (Nelson 2006). Fishes in this group have eyes on either the left side or the right side of the head as larvae mature and are not symmetrical like other fishes (Saele et al. 2004). All flounder species are ambush predators, feeding mostly on other fishes and bottom-dwelling invertebrates (Drazen and Seibel 2007, Froese and Pauly 2010).

This group is widely distributed on the seafloor of open ocean and coastal habitats throughout the world. They occur in all waters of the Study Area, but are particularly concentrated, and exhibit the most varieties, in depths less than 330 ft. (100.6 m), often associated with sand bottoms within the Insular Pacific-Hawaiian and California Current Large Marine Ecosystems and open ocean portions of the Study Area (Froese and Pauly 2010, Paxton and Eshmeyer 1994).

3.9.2.23 Triggerfish, Puffers, and Molas (Order Tetraodontiformes)

The fishes in the order Tetraodontiformes are the most advanced group of modern bony fishes. This order includes the triggerfishes, filefishes, puffers, and ocean sunfishes. Like the flounders, this group exhibits body shapes unique among marine fishes, including modified spines or other structures advantageous in predator avoidance. The unique body shapes also require the use of a tail swimming style because some species lack the muscle structure and body shape of other fishes. Most of these fishes are active during the daytime and exhibit a variety of strategies for catching prey, such as ambushing their prey (Wainwright and Richard 1995). The ocean sunfishes (*Mola* species) are the largest bony fish and the most prolific vertebrate species, with females producing more than 300 million eggs in a breeding season (Moyle and Cech 1996). The ocean sunfishes occur very close to the surface. They are slow swimming and feed on a variety of plankton, like jellyfish, crustaceans, and fishes (Froese and Pauly 2010). Their only natural predators are sharks, orcas, and sea lions (Helfman et al. 1997).

Most species within this group are associated with reef systems. This group is widely distributed in tropical and temperate bottom or mid-water column habitats (open ocean and coastal) throughout the world. They occur in all waters of the Study Area, but are particularly concentrated, and exhibit the most varieties, in depths less than 330 ft. (100.6 m), often associated with reefs or structured seafloor habitats within the Insular Pacific-Hawaiian and California Current Large Marine Ecosystems and open ocean portions of the Study Area (Froese and Pauly 2010, Paxton and Eshmeyer 1994). One major exception is for the molas (ocean sunfishes), which occur at the surface in all open ocean areas (Helfman et al. 1997).

3.9.3 Environmental Consequences

This section evaluates how and to what degree the activities described in Chapter 2 (Description of Proposed Action and Alternatives) potentially impact marine fishes known to occur within the Study Area. Tables 2.8-1 through 2.8-5 present the baseline and proposed training and testing activity locations for each alternative (including number of activities and ordnance expended). The stressors vary in intensity, frequency, duration, and location within the Study Area. The stressors applicable to marine fish in the Study Area and analyzed below include the following:

- Acoustic (sonar, other non-impulsive acoustic sources, underwater explosives)
- Energy (electromagnetic devices)
- Physical disturbance and strike (vessels and in-water devices, military expended materials, seafloor devices)
- Entanglement (fiber optic cables and guidance wires, parachutes)
- Ingestion (munitions, fragments from munitions, military expended materials other than munitions)
- Secondary

Each of these components was carefully analyzed for potential impacts on fishes within the stressor categories contained in this section. The specific analysis of the training and testing activities considers these components within the context of geographic location and overlap of marine fish resources. In addition to the analysis here, the details of all training and testing activities, stressors, components that cause the stressor, and geographic overlap within the Study Area are included in Chapter 2.

3.9.3.1 Acoustic Stressors

The following sections analyze potential impacts on fish from proposed activities that involve acoustic stressors (non-impulsive and impulsive).

3.9.3.1.1 Analysis Background and Framework

This section is largely based on a technical report prepared for the Navy: *Effects of Mid- and High-Frequency Sonars on Fish* (Popper 2008). Additionally, Popper and Hastings (2009) provide a critical overview of some of the most recent research regarding potential effects of anthropogenic sound on fish.

Studies of the effects of human-generated sound on fish have been reviewed in numerous places (e.g., National Research Council 1994, 2003; Popper 2003; Popper et al. 2004; Hastings and Popper 2005a; Popper 2008; Popper and Hastings 2009). Most investigations, however, have been in the gray literature (non-peer-reviewed reports—see Hastings and Popper 2005a, Popper 2008, and Popper and Hastings 2009 for extensive critical reviews of this material).

Fish have been exposed to short-duration, high-intensity signals such as might be found near high-intensity sonar, pile driving, or a seismic air gun survey. The investigators in such studies examined short-term effects that could result in death to the exposed fish, as well as hearing loss and long-term consequences. Recent experimental studies have provided additional insight into the issues (e.g., Doksæter et al. 2009; Govoni et al. 2003; McCauley et al. 2003; Popper et al. 2005, 2007).

3.9.3.1.1.1 Direct Injury

Non-Impulsive Acoustic Sources

Potential direct injuries from non-impulsive sound sources, such as sonar, are unlikely because of to the relatively lower peak pressures and slower rise times than potentially injurious sources such as explosives. Non-impulsive sources also lack the strong shock wave such as that associated with an explosion. Therefore, direct injury is not likely to occur from exposure to non-impulsive sources such as sonar, vessel noise, or subsonic aircraft noise. The theories of sonar induced acoustic resonance, bubble formation, neurotrauma, and lateral line system injury are discussed below, although these phenomena are difficult to recreate under real-world conditions and are therefore unlikely to occur.

Two unpublished reports examined the effects of mid-frequency sonar-like signals (1.5 to 6.5 kHz) on larval and juvenile fish of several species (Jørgensen et al. 2005; Kvadsheim and Sevaldsen 2005). In the first study, Jørgensen et al. (2005) exposed larval and juvenile fish to various sounds in order to investigate potential effects on survival, development, and behavior. The study used herring (*Clupea harengus*) (standard lengths 2 to 5 centimeters [cm]), Atlantic cod (*Gadus morhua*) (standard length 2 and 6 cm), saithe (*Pollachius virens*) (4 cm), and spotted wolffish (*Anarhichas minor*) (4 cm) at different developmental stages. The researchers placed the fish in plastic bags 10 ft. (3 m) from the sound source and exposed them to between four and 100 pulses of one-second duration of pure tones at 1.5, 4, and 6.5 kHz. The fish in only two groups out of the 82 tested exhibited any adverse effects. These two groups were both composed of herring, a hearing specialist, and were tested with sound pressure levels of 189 dB re 1 µPa, which resulted in a post-exposure mortality of 20 to 30 percent. In the remaining 80 tests, there were no observed effects on behavior, growth (length and weight), or the survival of fish that were kept as long as 34 days post exposure. While statistically significant losses were documented in the two groups impacted, the researchers only tested that particular sound level once, so it is not known if this increased mortality was due to the level of the test signal or to other unknown factors.

High sound pressure levels may cause bubbles to form from micronuclei in the blood stream or other tissues of animals, possibly causing embolism damage (Ketten 1998). Fish have small capillaries where these bubbles could be caught and lead to the rupturing of the capillaries and internal bleeding. It has also been speculated that this phenomena could also take place in the eyes of fish due to potentially high gas saturation within the fish's eye tissues (Popper and Hastings 2009).

As reviewed in Popper and Hastings (2009), Hastings (1990, 1995) found 'acoustic stunning' (loss of consciousness) in blue gouramis (*Trichogaster trichopterus*) following an 8-minute exposure to a 150 Hz pure tone with a peak sound pressure level (SPL) of 198 dB re 1 µPa. This species of fish has an air bubble in the mouth cavity directly adjacent to the animal's braincase that may have caused this injury. Hastings (1990, 1995) also found that goldfish exposed to two hours of continuous wave sound at 250 Hz with peak pressures of 204 dB re 1 µPa, and fathead minnows exposed to 0.5 hours of 150 Hz continuous wave sound at a peak level of 198 dB re 1 µPa did not survive.

The only study on the effect of exposure of the lateral line system to continuous wave sound (conducted on one freshwater species) suggests no effect on these sensory cells by intense pure tone signals (Hastings et al. 1996).

Explosives and Other Acoustic Sources

The greatest potential for direct, non-auditory tissue effects is primary blast injury and barotrauma following exposure to explosions. Primary blast injury refers to those injuries that result from the initial compression of a body exposed to a blast wave. Primary blast injury is usually limited to gas-containing structures (e.g., swim bladder) and the auditory system. Barotrauma refers to injuries caused when the swim bladder or other gas-filled structures vibrate in response to the signal, particularly if there is a relatively sharp rise-time and the walls of the structure strike near-by tissues and damage them.

An underwater explosion generates a shock wave that produces a sudden, intense change in local pressure as it passes through the water (U.S. Department of the Navy 1998, 2001). Pressure waves extend to a greater distance than other forms of energy produced by the explosion (i.e., heat and light) and are therefore the most likely source of negative effects to marine life from underwater explosions (Craig 2001, Scripps Institution of Oceanography 2005, U.S. Department of the Navy 2006).

The shock wave from an underwater explosion is lethal to fish at close range (see Section 3.0.5.3.1.2, Explosions, for a discussion of ranges for mortality dependent on charge size), causing massive organ and tissue damage and internal bleeding (Keevin and Hempen 1997). At greater distance from the detonation point, the extent of mortality or injury depends on a number of factors including fish size, body shape, orientation, and species (Keevin and Hempen 1997, Wright 1982). At the same distance from the source, larger fish are generally less susceptible to death or injury, elongated forms that are round in cross-section are less at risk than deep-bodied forms, and fish oriented sideways to the blast suffer the greatest impact (Edds-Walton and Finneran 2006, O'Keeffe 1984, O'Keeffe and Young 1984, Wiley et al. 1981, Yelverton et al. 1975). Species with gas-filled organs have higher mortality than those without them (Continental Shelf Associates Inc. 2004, Goertner et al. 1994).

Two aspects of the shock wave appear most responsible for injury and death to fish: the received peak pressure and the time required for the pressure to rise and decay (Dzwilewski and Fenton 2002). Higher peak pressure and abrupt rise and decay times are more likely to cause acute pathological effects (Wright and Hopky 1998). Rapidly oscillating pressure waves might rupture the kidney, liver, spleen, and sinus and cause venous hemorrhaging (Keevin and Hempen 1997). They can also generate bubbles in blood and other tissues, possibly causing embolism damage (Ketten 1998). Oscillating pressure waves might also burst gas-containing organs. The swim bladder, the gas-filled organ used by most fish to control buoyancy, is the primary site of damage from explosives (Wright 1982, Yelverton et al. 1975). Gas-filled swim bladders resonate at different frequencies than surrounding tissue and can be torn by rapid oscillation between high- and low-pressure waves. Swim bladders are a characteristic of many bony fish but are not present in sharks and rays.

Studies that have documented fish killed during planned underwater explosions indicate that most fish that die do so within one to four hours, and almost all die within a day (Hubbs and Rechnizer 1952, Yelverton et al. 1975). Fitch and Young (1948) found that the type of fish killed changed when blasting was repeated at the same marine location within 24 hours of previous blasting. They observed that most fish killed on the second day were scavengers, presumably attracted by the victims of the previous day's blasts. However, fishes collected during these types of studies have mostly been recovered floating on the water's surface. Gitschlag et al. (2001) collected both floating fish and those that were sinking or lying on the bottom after explosive removal of nine oil platforms in the northern Gulf of Mexico. They found that 3 to 87 percent (46 percent average) of the specimens killed during a blast might float to the surface. Other impediments to accurately characterizing the magnitude of fish mortality included currents and winds that transported floating fishes out of the sampling area and predation by seabirds or other fishes.

There have been few studies of the impact of underwater explosions on early life stages of fishes (eggs, larvae, juveniles). Fitch and Young (1948) reported the demise of larval anchovies exposed to underwater blasts off California, and Nix and Chapman (1985) found that anchovy and smelt larvae died following the detonation of buried charges. It has been suggested that impulsive sounds, such as that produced by seismic airguns, may cause damage to the cells of the lateral line in fish larvae and fry when in close proximity (15 ft. [5 m]) to the sound source (Booman et al. 1996).Similar to adult fishes, the presence of a swim bladder contributes to shock wave-induced internal damage in larval and juvenile fishes (Settle et al. 2002). Shock wave trauma to internal organs of larval pinfish and spot from shock waves was documented by Govoni et al. (2003). These were laboratory studies, however, and have not been verified in the field.

It has been suggested that impulsive sounds, such as those produced by seismic airguns, may cause damage to the cells of the lateral line in fish larvae and juveniles when in proximity (16 ft. [4.9 m]) to the sound source (Booman et al. 1996).

There have been a number of studies that suggest that the sounds from impact pile driving, and particularly from driving of larger piles, kill fish that are very close to the source. The source levels in such cases often reach peak sound pressure level of 193 - 212 dB re 1 µPa and there is some evidence of tissue damage accompanying exposure (e.g., Abbott and Reyff 2004, Caltrans 2001) reviewed in (Hastings and Popper 2005b). However, there is reason for concern in analysis of such data since, in many cases the only dead fish that were observed were those that came to the surface. It is not clear whether fish that did not come to the surface survived the exposure to the sounds, or died and were carried away by currents.

There are also a number of studies that placed fish in cages at different distances from the pile driving operations and attempted to measure mortality and tissue damage as a result of sound exposure. However, in most cases the studies' (e.g., Abbott et al. 2002, Abbott and Reyff 2004, Abbott et al. 2005, Caltrans 2001, Nedwell et al. 2003b) work was done with few or no controls, and the behavioral and histopathological observations done very crudely (the exception being Abbott et al. 2005). As a consequence of these limited and unpublished data, it is not possible to know the real effects of pile driving on fish.

Interim criteria for injury of fish were discussed in Stadler and Woodbury (2009). The onset of physical injury would be expected if either the peak sound pressure level exceeds 206 dB re 1 µPa, or the cumulative sound exposure level, accumulated over all pile strikes generally occurring within a single day, exceeds 187 dB re 1 μPa^2-s for fish 2 grams or larger, or 183 dB re 1 μPa^2-s for smaller fish (Stadler and Woodbury 2009). A more recent study by Halvorsen et al., (2011) used carefully controlled laboratory conditions to determine the level of pile driving sound that may cause a direct injury to the fish tissues (barotrauma). The investigators found that juvenile Chinook salmon (*Oncorhynchus tshawytscha*) which received less than a single strike sound exposure level of 179 to 181 dB re 1μPa^2-s and cumulative sound exposure level of less than 211 dB re 1μPa^2-s over the duration of the pile driving activity would sustain no more than mild, non-life-threatening injuries.

3.9.3.1.1.2 Hearing Loss

Exposure to high intensity sound can cause hearing loss, also known as a noise-induced threshold shift, or simply a threshold shift (Miller 1974). A temporary threshold shift (TTS) is a temporary, recoverable loss of hearing sensitivity. A TTS may last several minutes to several weeks and the duration may be related to the intensity of the sound source and the duration of the sound (including multiple exposures). A permanent threshold shift is non-recoverable, results from the destruction of tissues within the auditory system, and can occur over a small range of frequencies related to the sound exposure. As with temporary threshold shift, the animal does not become deaf but requires a louder sound stimulus (relative to the amount of PTS) to detect a sound within the affected frequencies; however, in this case, the effect is permanent.

Permanent hearing loss, or permanent threshold shift, has not been documented in fish. The sensory hair cells of the inner ear in fish can regenerate after they are damaged, unlike in mammals where sensory hair cells loss is permanent (Lombarte et al. 1993; Smith et al. 2006). As a consequence, any hearing loss in fish may be as temporary as the timeframe required to repair or replace the sensory cells that were damaged or destroyed (e.g., Smith et al. 2006).

Non-Impulsive Acoustic Sources

Studies of the effects of long-duration sounds with sound pressure levels below 170–180 dB re 1 µPa indicate that there is little to no effect of long-term exposure on species that lack notable anatomical hearing specialization (Amoser and Ladich 2003; Scholik and Yan 2001; Smith et al. 2004a, b; Wysocki et al. 2007). The longest of these studies exposed young rainbow trout (*Onorhynchus mykiss*), to a level of noise equivalent to one that fish would experience in an aquaculture facility (e.g., on the order of 150 dB re 1 µPa) for about nine months. The investigators found no effect on hearing (i.e., TTS) as compared to fish raised at 110 dB re 1 µPa.

In contrast, studies on fish with hearing specializations (i.e., greater sensitivity to lower sound pressures and higher frequencies) have shown that there is some hearing loss after several days or weeks of exposure to increased background sounds, although the hearing loss seems to recover (e.g., Scholik and Yan 2002, Smith et al. 2006, Smith et al. 2004a). Smith et al. (2006; 2004b) exposed goldfish to noise at 170 dB re 1 µPa and found a clear relationship between the amount of hearing loss (TTS) and the duration of exposure until maximum hearing loss occurred after 24 hours of exposure. A 10-minute exposure resulted in a 5 dB TTS, whereas a 3-week exposure resulted in a 28 dB TTS that took over 2 weeks to return to pre-exposure baseline levels (Smith et al. 2004a) (Note: recovery time not measured by investigators for shorter exposure durations).

Similarly, Wysocki and Ladich (2005) investigated the influence of noise exposure on the auditory sensitivity of two freshwater fish with notable hearing specializations, the goldfish and the lined Raphael catfish (*Platydoras costatus*), and on a freshwater fish without notable specializations, the pumpkinseed sunfish (*Lepomis gibbosus*). Baseline thresholds showed greatest hearing sensitivity around 0.5 kHz in the goldfish and catfish and at 0.1 kHz in the sunfish. For the goldfish and catfish, continuous white noise of approximately 130 dB re 1 µPa at 1 m resulted in a significant TTS of 23 to 44 dB. In contrast, the auditory thresholds in the sunfish declined by 7 to 11 dB. The duration of exposure and time to recovery was not addressed in this study. Scholik and Yan (2001) demonstrated TTS in fathead minnows (*Pimephales promelas*) after a 24-hour exposure to white noise (0.3–2.0 kHz) at 142 dB re 1 µPa, that did not recover as long as 14 days post-exposure.

Studies have also examined the effects of the sound exposures from Surveillance Towed Array Sensor System Low-Frequency Active sonar on fish hearing (Kane et al. 2010; Popper et al. 2007). Hearing was measured both immediately post exposure and for several days thereafter. Maximum received sound pressure levels were 193 dB re 1 µPa for 324 or 628 seconds. Catfish and some specimens of rainbow trout showed 10-20 dB of hearing loss immediately after exposure to the low-frequency active sonar when compared to baseline and control animals; however, another group of rainbow trout showed no hearing loss. Recovery in trout took at least 48 hours, but studies were not completed. The different results between rainbow trout groups is difficult to understand, but may be due to developmental or genetic differences in the various groups of fish. Catfish hearing returned to, or close to, normal within about 24 hours after exposure to low-frequency active sonar. Furthermore, examination of the inner ears of the fish during necropsy (note: maximum time fish were held post exposure before sacrifice was 96 hours) revealed no differences from the control groups in cilliary bundles or other features indicative of hearing loss (Kane et al. 2010).

The study of mid-frequency active sonar by the same investigators also examined potential effects on fish hearing and the inner ear (Halvorsen et al. 2012; Kane et al. 2010). Out of the four species tested (rainbow trout, channel catfish, largemouth bass, and yellow perch) only one group of channel catfish, tested in December, showed any hearing loss after exposure to mid-frequency active sonar. The signal consisted of a 2 second (s) long, 2.8–3.8 kHz frequency sweep followed by a 3.3 kHz tone of 1 s duration. The stimulus was repeated five times with a 25 second interval. The maximum received sound pressure level was 210 dB re 1 µPa. These animals, which have the widest hearing range of any of the species tested, experienced approximately 10 dB of threshold shift that recovered within 24 hours. Channel catfish tested in October did not show any hearing loss. The investigators speculated that the difference in hearing loss between catfish groups might have been due to the difference in water temperature of the lake where all of the testing took place (Seneca Lake, New York) between October and December. Alternatively, the observed hearing loss differences between the two catfish groups might have been due to differences between the two stocks of fish (Halvorsen et al. 2012). Any effects on hearing in channel catfish due to sound exposure appear to be transient (Halvorsen et al. 2012; Kane et al. 2010). Investigators observed no damage to cilliary bundles or other features indicative of hearing loss in any of the other fish tested including the catfish tested in October (Kane et al. 2010).

Some studies have suggested that there may be some loss of sensory hair cells due to high intensity sources; however, none of these studies concurrently investigated effects on hearing. Enger (1981) found loss of cilliary bundles of the sensory cells in the inner ears of Atlantic cod (*Gadus morhua*) following 1-5 hours of exposure to pure tone sounds between 50 and 400 Hz with a sound pressure level of 180 dB re 1 µPa. Hastings (1995) found auditory hair-cell damage in a species with notable anatomical hearing specializations, the goldfish (*Carassius auratus*) exposed to 250 Hz and 500 Hz continuous tones with maximum peak levels of 204 dB re 1 µPa and 197 dB re 1 µPa, respectively, for about 2 hours. Similarly, Hastings et al. (1996) demonstrated damage to some sensory hair cells in oscars (*Astronotus ocellatus*) following a one hour exposure to a pure tone at 300 Hz with a peak pressure level of 180 dB re 1 µPa. In none of the studies was the hair cell loss more than a relatively small percent (less than a maximum of 15 percent) of the total sensory hair cells in the hearing organs.

Explosives and Other Impulsive Acoustic Sources

Popper et al. (2005) examined the effects of a seismic airgun array on a fish with hearing specializations, the lake chub (*Couesius plumbeus*), and two species that lack notable specializations, the northern pike (*Esox lucius*) and the broad whitefish (*Coregonus nasus*) (a salmonid). In this study the average received exposure levels were a mean peak pressure level of 207 dB re 1 µPa; sound pressure level of 197 dB re 1 µPa; and single-shot sound exposure level of 177 dB re 1 μPa^2-s. The results showed temporary hearing loss for both lake chub and northern pike to both 5 and 20 airgun shots, but not for the broad whitefish. Hearing loss was approximately 20 to 25 dB at some frequencies for both the northern pike and lake chub, and full recovery of hearing took place within 18 hours after sound exposure. Examination of the sensory surfaces of the ears by an expert on fish inner ear structure showed no damage to sensory hair cells in any of the fish from these exposures (Song et al. 2008).

McCauley et al. (2003) showed loss of a small percent of sensory hair cells in the inner ear of the pink snapper (*Pagrus auratus*) exposed to a moving airgun array for 1.5 hours. Maximum received levels exceeded 180 dB re 1 μPa^2s for a few shots. The loss of sensory hair cells continued to increase for up to at least 58 days post exposure to 2.7 percent of the total cells, with disproportionate damage (approximately 15 percent of hair cells) in the caudal portion of the ear. It is not known if this hair cell loss would result in hearing loss since fish have tens or even hundreds of thousands of sensory hair cells in the inner ear Popper and Hoxter 1984; Lombarte and Popper 1994) and only a small portion were affected by the sound. The question remains as to why McCauley et al. (2003) found damage to sensory hair cells while Popper et al. (2005) did not. There are many differences between the studies, including species, precise sound source, and spectrum of the sound that it is hard to speculate.

Hastings et al. (2008) exposed the pinecone soldierfish (*Myripristis murdjan*), a fish with anatomical specializations to enhance their hearing; and three species without notable specializations: the blue green damselfish (*Chromis viridis*), the saber squirrelfish (*Sargocentron spiniferum*), and the bluestripe seaperch (*Lutjanus kasmira*) to an airgun array. Fish in cages in 16 ft. (4.9 m) of water were exposed to multiple airgun shots with a cumulative sound exposure level of 190 dB re 1 μPa^2s. The authors found no hearing loss in any fish following exposures.

As with other impulsive sound sources, it is assumed that sound from pile driving may cause hearing loss in fish located near the site (Popper and Hastings 2009c), however research definitively demonstrating this is lacking.

3.9.3.1.1.3 Auditory Masking

Auditory masking refers to the presence of a noise that interferes with a fish's ability to hear biologically relevant sounds. Fish use sounds to detect predators and prey, and for schooling, mating, and navigating, among other uses (Myrberg 1980; Popper et al. 2003). Masking of sounds associated with these behaviors could have impacts to fish by reducing their ability to perform these biological functions.

Any noise (i.e., unwanted or irrelevant sound, often of an anthropogenic nature) detectable by a fish can prevent the fish from hearing biologically important sounds including those produced by prey or predators (Myrberg 1980; Popper et al. 2003). Auditory masking may take place whenever the noise level heard by a fish exceeds ambient noise levels, the animal's hearing threshold, and the level of a biologically relevant sound. Masking is found among all vertebrate groups, and the auditory system in all vertebrates, including fish, is capable of limiting the effects of masking noise, especially when the frequency range of the noise and biologically relevant signal differ (Fay 1988; Fay and Megela-Simmons 1999).

The frequency of the sound is an important consideration for fish because many marine fish are limited to detection of the particle motion component of low frequency sounds at relatively high sound intensities (Amoser and Ladich 2005). The frequency of the acoustic stimuli must first be compared to the animal’s known or suspected hearing sensitivity to establish if the animal can potentially detect the sound.

One of the problems with existing fish auditory masking data is that the bulk of the studies have been done with goldfish, a freshwater fish with well-developed anatomical specializations that enhance hearing abilities. The data on other species are much less extensive. As a result, less is known about masking in marine species, many of which lack the notable anatomical hearing specializations. However, Wysocki and Ladich (2005) suggest that ambient sound regimes may limit acoustic communication and orientation, especially in animals with notable hearing specializations.

Tavolga (1974a, b) studied the effects of noise on pure-tone detection in two species without notable anatomical hearing specializations, the pin fish (*Lagodon rhomboids*) and the African mouth-Breeder (*Tilapia macrocephala*), and found that the masking effect was generally a linear function of masking level, independent of frequency. In addition, Buerkle (1968, 1969) studied five frequency bandwidths for Atlantic cod in the 20 to 340 Hz region and showed masking across all hearing ranges. Chapman and Hawkins (1973b) found that ambient noise at higher sea states in the ocean has masking effects in cod, *Gadus morhua* (L.), haddock, *Melanogrammus aeglefinus* (L.), and pollock, *Pollochinus pollachinus* (L.), and similar results were suggested for several sciaenid species by Ramcharitar and Popper (2004c). Thus, based on limited data, it appears that for fish, as for mammals, masking may be most problematic in the frequency region near the signal.

There have been a few field studies that may suggest masking could have an impact on wild fish. Gannon et al. (2005) showed that bottlenose dolphins (*Tursiops truncatus*) move toward acoustic playbacks of the vocalization of Gulf toadfish (*Opsanus beta*). Bottlenose dolphins employ a variety of vocalizations during social communication including low-frequency pops. Toadfish may be able to best detect the low-frequency pops since their hearing is best below 1 kHz, and there is some indication that toadfish have reduced levels of calling when bottlenose dolphins approach (Remage-Healey et al. 2006a). Silver perch have also been shown to decrease calls when exposed to playbacks of dolphin whistles mixed with other biological sounds (Luczkovich et al. 2000). Results of the Luczkovich et al. (2000) study, however, must be viewed with caution because it is not clear what sound may have elicited the silver perch response (Ramcharitar et al. 2006b). Astrup (1999) and Mann et al. (1998) hypothesized that high frequency detecting species (e.g., clupeids) may have developed sensitivity to high frequency sounds to avoid predation by odontocetes. Therefore, the presence of masking noise may hinder a fish's ability to detect predators and therefore increase predation.

Of considerable concern is that human-generated sounds could mask the ability of fish to use communication sounds, especially when the fish are communicating over some distance. In effect, the masking sound may limit the distance over which fish can communicate, thereby having an impact on important components of their behavior. For example, the sciaenids, which are primarily inshore species, are one of the most active sound producers among fish, and the sounds produced by males are used to "call" females to breeding sights (Ramcharitar et al. 2001) reviewed in (2006b). If the females are not able to hear the reproductive sounds of the males, there could be a significant impact on the reproductive success of a population of sciaenids. Since most sound production in fish used for communication is generally below 500 Hz (Slabbekoorn et al. 2010a), sources with significant low-frequency acoustic energy could affect communication in fish.

Also potentially vulnerable to masking is navigation by larval fish, although the data to support such an idea are still exceedingly limited. There is indication that larvae of some reef fish (species not identified in study) may have the potential to navigate to juvenile and adult habitat by listening for sounds emitted from a reef (either due to animal sounds or non-biological sources such as surf action) (e.g., Higgs 2005). In a study of an Australian reef system, the sound signature emitted from fish choruses was between 0.8 and 1.6 kHz (Cato 1978) and could be detected by hydrophones 3 to 4 nm (5.6 to 7.4 km) from the reef (McCauley and Cato 2000). This bandwidth is within the detectable bandwidth of adults and larvae of the few species of reef fish, such as the dameslefish, *Pomacentrus partitus,* and bicolor damselfish, *Eupomacentrus partitus,* that have been studied (Kenyon 1996b; Myrberg 1980). At the same time, it has not been demonstrated conclusively that sound, or sound alone, is an attractant of larval fish to a reef, and the number of species tested has been very limited. Moreover, there is also evidence that larval fish may be using other kinds of sensory cues, such as chemical signals, instead of, or alongside of, sound (Atema et al. 2002).

3.9.3.1.1.4 Physiological Stress and Behavioral Reactions

As with masking, a fish must first be able to detect a sound above its hearing threshold for that particular frequency and the ambient noise before a behavioral reaction or physiological stress can occur. There are little data available on the behavioral reactions of fish, and almost no research conducted on any long-term behavioral effects or the potential cumulative effects from repeated exposures to loud sounds (Popper and Hastings 2009c).

Stress refers to biochemical and physiological responses to increases in background sound. The initial response to an acute stimulus is a rapid release of stress hormones into the circulatory system, which may cause other responses such as elevated heart rate and blood chemistry changes. Although an increase in background sound has been shown to cause stress in humans, only a limited number of studies have measured biochemical responses by fish to acoustic stress (Remage-Healey et al. 2006a, Smith et al. 2004b, Wysocki et al. 2007, Wysocki et al. 2006) and the results have varied. There is evidence that a sudden increase in sound pressure level or an increase in background noise levels can increase stress levels in fish (Popper and Hastings 2009). Exposure to acoustic energy has been shown to cause a change in hormone levels (physiological stress) and altered behavior in some species such as the goldfish (*Carassius auratus*) (Pickering 1981; Smith et al. 2004a, b), but not all species tested to date, such as the rainbow trout (*Oncorhynchus mykiss*) (Wysocki et al. 2007).

Behavioral effects to fish could include disruption or alteration of natural activities such as swimming, schooling, feeding, breeding, and migrating. Sudden changes in sound level can cause fish to dive, rise, or change swimming direction. There is a lack of studies that have investigated the behavioral reactions of unrestrained fish to anthropogenic sound. Studies of caged fish have identified three basic behavioral reactions to sound: startle, alarm, and avoidance (McCauley et al. 2000; Pearson et al. 1992; Scripps Institution of Oceanography and Foundation. 2008). Changes in sound intensity may be more important to a fish's behavior than the maximum sound level. Sounds that fluctuate in level tend to elicit stronger responses from fish than even stronger sounds with a continuous level (Schwartz 1985).

Non-Impulsive Acoustic Sources

Remage-Healey et al. (2006a) found elevated cortisol levels, a stress hormone, in Gulf toadfish (*Opsanus beta*) exposed to low frequency bottlenose dolphin sounds. Additionally, the toadfish' call rates dropped by about 50 percent, presumably because the calls of the toadfish, a primary prey for bottlenose dolphins, give away the fish's location to the dolphin. The researchers observed none of these effects in toadfish exposed to an ambient control sound (i.e., low-frequency snapping shrimp 'pops').

Smith et al. (2004b) found no increase in corticosteroid, a stress hormone, in goldfish (*Carassius auratus*) exposed to a continuous, band-limited noise (0.1 to 10 kHz) with a sound pressure level of 170 dB re 1 µPa for 1 month. Wysocki et al. (2007) exposed rainbow trout (*Onorhynchus mykiss*) to continuous band-limited noise with a sound pressure level of about 150 dB re 1 µPa for 9 months with no observed stress effects. Growth rates and effects on the trout's immune system were not significantly different from control animals held at sound pressure level of 110 dB re 1 µPa.

Gearin et al. (2000) studied responses of adult sockeye salmon (*Oncorhynchus nerka*) and sturgeon (*Acipenser* sp.) to pinger sounds produced by acoustic devices designed to deter marine mammals from gillnet fisheries. The pingers produced sounds with broadband energy with peaks at 2 kHz or 20 kHz. They found that fish did not exhibit any reaction or behavior change to the pingers, which demonstrated that the alarm was either inaudible to the salmon and sturgeon, or that neither species was disturbed by the mid-frequency sound (Gearin et al. 2000). Based on hearing threshold data, it is highly likely that the salmonids did not hear the sounds.

Culik et al. (2001) did a very limited number of experiments to determine the catch rate of herring (*Clupea harengus*) in the presence of pingers producing sounds that overlapped with the frequency range of hearing for herring (base frequency of 2.7 kHz with harmonics to 19 kHz). They found no change in catch rates in gill nets with or without the higher frequency (greater than 20 kHz) sounds present, although there was an increase in the catch rate with the signals from 2.7 kHz to 19 kHz (a different source than the higher frequency source). The results could mean that the fish did not "pay attention" to the higher frequency sound or that they did not hear it, but that lower frequency sounds may be attractive to fish. At the same time, it should be noted that there were no behavioral observations on the fish, and so how the fish actually responded when they detected the sound is not known.

Doksæter et al (2009) studied the reactions of wild, overwintering herring to Royal Netherlands Navy experimental mid-frequency active sonar and killer whale feeding sounds. The behavior of the fish was monitored using upward looking echosounders. The received levels from the 1 to 2 kHz and 6 to 7 kHz sonar signals ranged from 127 to 197 dB re 1 µPa and 139 to 209 dB re 1 µPa, respectively. Escape reactions were not observed upon the presentation of the mid-frequency active sonar signals; however, the playback of the killer whale sounds elicited an avoidance reaction. The authors concluded that these mid-frequency sonars could be used in areas of overwintering herring without substantially affecting the fish.

There is evidence that elasmobranchs respond to human-generated sounds. Myrberg and colleagues did experiments in which they played back sounds and attracted a number of different shark species to the sound source (e.g., Myrberg et al. 1969; Myrberg et al. 1976; Myrberg et al. 1972; Nelson and Johnson 1972). The results of these studies showed that sharks were attracted to low-frequency sounds (below several hundred Hz), in the same frequency range of sounds that might be produced by struggling prey. However, sharks are not known to be attracted by continuous signals or higher frequencies (which they presumably cannot hear since their best hearing sensitivity is around 20 Hz, and drops off above 1000 Hz [Casper and Mann 2006; Casper and Mann 2009]).

Studies documenting behavioral responses of fish to vessels show that Barents Sea capelin (*Mallotus villosus*) may exhibit avoidance responses to engine noise, sonar, depth finders, and fish finders (Jørgensen et al. 2004). Avoidance reactions are quite variable depending on the type of fish, its life history stage, behavior, time of day, and the sound propagation characteristics of the water (Schwartz 1985). Misund (1997a) found that fish ahead of a ship, that showed avoidance reactions, did so at ranges of 160 to 490 ft. (48.8–149.4 m). When the vessel passed over them, some species of fish responded with sudden escape responses that included lateral avoidance or downward compression of the school.

In a study by Chapman and Hawkins (1973b) the low-frequency sounds of large vessels or accelerating small vessels caused avoidance responses by herring. Avoidance ended within 10 seconds after the vessel departed. Twenty-five percent of the fish groups habituated to the sound of the large vessel and 75 percent of the responsive fish groups habituated to the sound of small boats.

Explosives and Other Impulsive Acoustic Sources

Pearson et al. (1992) exposed several species of rockfish (*Sebastes spp.*) to a seismic airgun. The investigators placed the rockfish in field enclosures and observed the fish's behavior while firing the airgun at various distances for 10 minute trials. Dependent upon the species, rockfish exhibited startle or alarm reactions between peak-to-peak sound pressure levels of 180 dB re 1 µPa and 205 dB re 1 µPa. The authors reported the general sound level where behavioral alterations became evident was at about 161 dB re 1 µPa for all species. During all of the observations, the initial behavioral responses only lasted for a few minutes, ceasing before the end of the 10-minute trial.

Similarly, Skalski et al. (1992) showed a 52 percent decrease in rockfish (*Sebastes* sp.) caught with hook-and-line (as part of the study–fisheries independent) when the area of catch was exposed to a single airgun emission at 186-191 dB re 1 µPa (mean peak level) (See also Pearson et al. 1987, 1992). They also demonstrated that fish would show a startle response to sounds as low as 160 dB re 1 µPa, but this level of sound did not appear to elicit decline in catch. Wright (1982) also observed changes in fish behavior as a result of the sound produced by an explosion, with effects intensified in areas of hard substrate.

Wardle et al. (2001) used a video system to examine the behaviors of fish and invertebrates on reefs in response to emissions from seismic airguns. The researchers carefully calibrated the airguns to have a peak level of 210 dB re 1 µPa at 16 m and 195 dB re 1 µPa at 109 m from the source. There was no indication of any observed damage to the marine organisms. They found no substantial or permanent changes in the behavior of the fish or invertebrates on the reef throughout the course of the study, and no marine organisms appeared to leave the reef.

Engås et al. (1996) and Engås and Løkkeborg (2002) examined movement of fish during and after a seismic airgun study by measuring catch rates of haddock (*Melanogrammus aeglefinus*) and Atlantic cod (*Gadus morhua*) as an indicator of fish behavior using both trawls and long-lines as part of the experiment. These investigators found a significant decline in catch of both species that lasted for several days after termination of airgun use. Catch rate subsequently returned to normal. The conclusion reached by the investigators was that the decline in catch rate resulted from the fish moving away from the airgun sounds at the fishing site. However, the investigators did not actually observe behavior, and it is possible that the fish just changed depth.

The same research group showed, more recently, parallel results for several additional pelagic species including blue whiting and Norwegian spring spawning herring (Slotte et al. 2004). However, unlike earlier studies from this group, the researchers used fishing sonar to observe behavior of the local fish schools. They reported that fish in the area of the airguns appeared to go to greater depths after the airgun exposure compared to their vertical position prior to the airgun usage. Moreover, the abundance of animals 18 to 31 mi. (30 to 50 km) away from the ensonification increased, suggesting that migrating fish would not enter the zone of seismic activity.

Alteration in natural behavior patterns due to exposure to pile driving noise has not been well studied. However, one study (Mueller-Blenkle et al. 2010b) demonstrated behavioral reactions of cod (*Gadus morhua*) and Dover sole (*Solea solea*) to pile driving sounds using acoustic telemetry to track animals confined in large net pens. Sole showed a significant increase in swimming speed. Cod reacted, but not significantly, and both species showed directed movement away from the sources with signs of habituation after multiple exposures. For sole, reactions were seen with peak sound pressure levels of 144–156 dB re 1µPa; and cod showed altered behavior at peak sound pressure levels of 140–161 dB re 1 µPa. For both species, this corresponds to a peak particle motion between 6.51×10^{-3} and 8.62×10^{-4} m/s^2.

3.9.3.1.2 Impacts from Sonar and Other Active Sources

Non-impulsive sources from the Proposed Action include sonar and other active acoustic sources, vessel noise, and subsonic aircraft noise. Potential acoustic effects to fish from non-impulsive sources may be considered in four categories, as detailed in Section 3.9.3.1.1 (Analysis Background and Framework): (1) direct injury; (2) hearing loss; (3) auditory masking; and (4) physiological stress and behavioral reactions.

As discussed in Section 3.9.3.1.1.1 (Direct Injury), direct injury to fish as a result of exposure to non-impulsive sounds is highly unlikely to occur. Therefore, direct injury as a result of exposure to non-impulsive sound sources is not discussed further in this analysis.

Research discussed in Section 3.9.3.1.1.2 (Hearing Loss), indicates that exposure of fish to transient, non-impulsive sources is unlikely to result in any hearing loss. Most sonar sources are outside of the hearing and sensitivity range of most marine fish, and noise sources such as vessel movement and aircraft overflight lack the duration and intensity to cause hearing loss. Furthermore, permanent threshold shift has not been demonstrated in fish as they have been shown to regenerate lost sensory hair cells. Therefore, hearing loss as a result of exposure to non-impulsive sound sources is not discussed further in this analysis.

3.9.3.1.2.1 No Action Alternative – Training Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-1, and Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources), training activities under the No Action

Alternative include activities that produce in-water noise from the use of sonar and other active acoustic sources, and could occur throughout the Study Area. Sonar and other active acoustic sources proposed for use are transient in most locations as active sonar activities pass through the Study Area. A few activities involving sonar and other active acoustic sources occur in inshore water (within bays and estuaries), specifically at pierside locations. Sonar maintenance activities that would occur at pierside locations occur infrequently and typically emit only a few pings per activity.

Only a few species of shad within the Clupeidae family (herrings) are known to be able to detect high-frequency sonar and other active acoustic sources (greater than 10,000 Hz). Other marine fish would not detect these sounds and would therefore experience no stress, behavioral disturbance, or auditory masking. Shad species, especially in nearshore and inland areas where mine warfare activities take place that often employ high-frequency sonar systems, could have behavioral reactions and experience auditory masking during these activities. However, mine warfare activities are typically limited in duration and geographic extent. Furthermore, sound from high-frequency systems may only be detectable above ambient noise regimes in these coastal habitats from within a few kilometers. Behavioral reactions and auditory masking if they occurred for some shad species are expected to be transient. Long-term consequences for the population would not be expected.

Most marine fish species are not expected to be able to detect sounds in the mid-frequency range of the operational sonars. The fish species that are known to detect mid-frequencies (some sciaenids [drum], most clupeids [herring], and potentially deep-water fish such as myctophids [lanternfish]) do not have their best sensitivities in the range of the operational sonars. Thus, these fish may only detect the most powerful systems, such as hull mounted sonar within a few kilometers; and most other, less powerful mid-frequency sonar systems, for a kilometer or less. Due to the limited time of exposure from the moving sound sources, most mid-frequency active sonar used in the Study Area would not have the potential to substantially mask key environmental sounds or produce sustained physiological stress or behavioral reactions. Furthermore, although some species may be able to produce sound at higher frequencies (greater than 1 kHz), vocal marine fish, such as sciaenids, largely communicate below the range of mid-frequency levels used by most sonars. Other marine species cannot detect mid-frequency sonar (1,000 – 10,000 Hz) and therefore impacts are not expected for these fish. However, any such impacts would be temporary and infrequent as a vessel operating mid-frequency sonar transits an area. As such, sonar use is unlikely to impact fish species. Long-term consequences for fish populations due to exposure to mid-frequency sonar and other active acoustic sources are not expected.

A large number of marine fish species may be able to detect low-frequency sonars and other active acoustic sources. However, low-frequency active usage is rare and most low-frequency active operations are conducted in deeper waters, usually beyond the continental shelf break. The majority of fish species, including those that are the most highly vocal, exist on the continental shelf and within nearshore, estuarine areas. Fish within a few tens of kilometers around a low-frequency active sonar could experience brief periods of masking, physiological stress, and behavioral disturbance while the system is used, with effects most pronounced closer to the source. However, overall effects would be localized and infrequent. Based on the low level and short duration of potential exposure to low-frequency sonar and other active acoustic sources, long-term consequences for fish populations are not expected.

Vessel Noise

As discussed in Section 3.0.5.3.1.6 (Vessel Noise), training activities under the No Action Alternative include vessel movement. Navy vessel traffic could occur anywhere within the Study Area; however, it would be concentrated near ports or naval installations and training ranges (e.g., San Diego, Silver

Strand Training Complex (SSTC), San Clemente Island, Pearl Harbor). Activities involving vessel movements occur intermittently and are variable in duration, ranging from a few hours up to 2 weeks. Additionally, a variety of smaller craft would be operated within the Study Area. Small craft types, sizes and speeds vary. These activities would be spread across the coastal and open ocean areas designated within the Study Area. Vessel movements involve transit to and from ports to various locations within the Study Area, and many ongoing and proposed training and testing activities within the Study Area involve maneuvers by various types of surface ships, boats, and submarines (collectively referred to as vessels).

A detailed description of vessel noise associated with the Proposed Action is provided in Section 3.0.5.3.1.6 (Vessel Noise). Vessel noise has the potential to expose fish to sound and general disturbance, which could result in short-term behavioral or physiological responses (e.g., avoidance, stress, increased heart rate). Training and testing activities involving vessel movements occur intermittently and range in duration from a few hours up to a few weeks. These activities are widely dispersed throughout the Study Area. While vessel movements have the potential to expose fish occupying the water column to sound and general disturbance, potentially resulting in short-term behavioral or physiological responses, such responses would not be expected to compromise the general health or condition of individual fish. In addition, most activities involving vessel movements are infrequent and widely dispersed throughout the Study Area. The exception is for pierside activities; although these areas are located inshore, these are industrialized areas that are already exposed to high levels of anthropogenic noise due to numerous waterfront users (e.g., industrial and marinas). Therefore, impacts from vessel noise would be temporary and localized. Long-term consequences for the population are not expected.

Aircraft Noise

As described in Section 3.0.5.3.1.7 (Aircraft Overflight Noise), training activities under the No Action Alternative include fixed and rotary wing aircraft overflights. Certain portions of the Study Area, such as areas near Navy airfields, installations, and ranges are used more heavily by Navy aircraft than other portions. These activities would be spread across the coastal and open ocean areas designated within the Study Area. A detailed description of aircraft noise as a stressor is provided in Section 3.0.5.3.1.7 (Aircraft Overflight Noise). Aircraft produce extensive airborne noise from either turbofan or turbojet engines. A severe but infrequent type of aircraft noise is the sonic boom, produced when the aircraft exceeds the speed of sound. Rotary wing aircraft (helicopters) produce low-frequency sound and vibration (Pepper et al. 2003).

Fish may be exposed to aircraft-generated noise wherever aircraft overflights occur; however, sound is primarily transferred into the water from air in a narrow cone under the aircraft. Most of these sounds would occur near airbases and fixed ranges within each range complex. Some species of fish could respond to noise associated with low-altitude aircraft overflights or to the surface disturbance created by downdrafts from helicopters. Aircraft overflights have the potential to affect surface waters and, therefore, to expose fish occupying those upper portions of the water column to sound and general disturbance potentially resulting in short-term behavioral or physiological responses. If fish were to respond to aircraft overflights, only short-term behavioral or physiological reactions (e.g., swimming away and increased heart rate) would be expected. Therefore, long-term consequences for individuals would be unlikely and long-term consequences for the populations are not expected.

3.9.3.1.2.2 Summary of Impacts from Non-impulsive Acoustic Sources

The majority of fish species exposed to non-impulsive sources would likely have no reaction or mild behavioral reactions. Overall, long-term consequences for individual fish are unlikely in most cases because acoustic exposures are intermittent and unlikely to repeat over short periods. Since long-term consequences for most individuals are unlikely, long-term consequences for populations are not expected.

Steelhead trout, as summarized in Section 3.9.2.3, are anadromous and spend a portion of their lives in both the marine environment as well as in the riverine and estuarine systems from the Kamchatka Peninsula in Asia, east to Alaska, and south to Southern California. Steelhead trout have the potential to be exposed to non-impulsive sound associated with training activities under the No Action Alternative in the coastal areas of the Southern California (SOCAL) Range Complex and SSTC.

It is believed that steelhead trout, which are anatomically similar to Atlantic salmon, are unable to detect the sound produced by mid- or high-frequency sonar and other active acoustic sources (Section 3.9.2.1, Hearing and Vocalization). Therefore acoustic impacts from these sources are not expected. Effects to designated steelhead trout critical habitat would not occur as activities do not overlap.

Low-frequency active sonar and other active acoustic sources are not typically operated in coastal or nearshore waters. If low frequency sources are used in coastal waters, then adult steelhead trout could be exposed to sound within their hearing range within these areas. If this did occur, steelhead trout could experience behavioral reactions, physiological stress, and auditory masking, although these impacts would be expected to be short-term and infrequent based on the low probability of co-occurrence between the activity and species. Long-term consequences for the populations would not be expected. Effects to designated steelhead trout critical habitat would not occur as activities do not overlap.

The primary exposure to vessel and aircraft noise would occur around the Navy ranges, ports, and air bases. Vessel and aircraft overflight noise have the potential to expose steelhead trout to sound and general disturbance, potentially resulting in short-term behavioral responses. However, as discussed above, any short-term behavioral reactions, physiological stress, or auditory masking are unlikely to lead to long-term consequences for individuals. Therefore, long-term consequences for populations are not expected.

Pursuant to the ESA, the use of non-impulsive sound sources for training activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of non-impulsive sound sources under the No Action Alternative during training activities would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.1.2.3 No Action Alternative – Testing Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Tables 2.8-2 to 2.8-5 and in Section 3.0.5.3.1 (Acoustic Stressors), testing activities under the No Action Alternative include activities that use sonar and other active acoustic sources that produce underwater sound, and could occur throughout the Study Area. Proposed testing activities under the No Action Alternative that involve sonar and other active acoustic sources differ in number and location from training activities under the

No Action Alternative, however the types and severity of impacts would not be discernable from those described in Section 3.9.3.1.2.1 (No Action Alternative – Training Activities).

As discussed in Section 3.0.5.3.1.6 (Vessel Noise), testing activities under the No Action Alternative include vessel movement in many events. Navy vessel traffic could occur anywhere within the Study Area; however, it would be concentrated near ports or naval installations and training ranges (e.g., San Diego, Silver Strand Training Complex [SSTC], San Clemente Island, Pearl Harbor). Activities involving vessel movements occur intermittently and are variable in duration, ranging from a few hours up to 2 weeks. Additionally, a variety of smaller craft would be operated within the Study Area. Small craft types, sizes, and speeds vary. During testing, speeds generally range from 10 to 14 knots; however, vessels can and will, on occasion, operate within the entire spectrum of their specific operational capabilities. In all cases, the vessels would be operated in a safe manner consistent with the local conditions. These events would occur throughout the entire Study Area. Proposed testing activities under the No Action Alternative that involve vessel movement differ in number and location from training activities under the No Action Alternative, however the types and severity of impacts would not be discernable from those described in Section 3.9.3.1.2.1 (No Action Alternative – Training Activities).

As discussed in Section 3.0.5.3.1.7 (Aircraft Overflight Noise), testing activities under the No Action Alternative include fixed and rotary wing aircraft overflights. Certain portions of the Study Area, such as areas near Navy airfields, installations, and ranges are used more heavily by Navy aircraft than other portions. These events would occur throughout the entire Study Area. Proposed testing activities under the No Action Alternative that involve aircraft overflights differ in number and location from training activities under the No Action Alternative, however, the types and severity of impacts would not be discernable from those described in Section 3.9.3.1.2.1 (No Action Alternative – Training Activities).

Impacts to fish due to non-impulsive sound are expected to be limited to short-term, minor behavioral reactions. Long-term consequences for populations would not be expected. Predicted effects to ESA-listed steelhead trout and any designated critical habitat would not be discernable from those described in Section 3.9.3.1.2.1 (No Action Alternative – Training Activities). Effects to designated steelhead trout critical habitat would not occur as activities do not overlap.

Pursuant to the ESA, the use of non-impulsive sound sources for testing activities as described in the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of non-impulsive sound sources under the No Action Alternative during testing activities would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.1.2.4 Alternative 1 Training Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-1 and Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources), the number of annual training activities that produce in-water noise from the use of sonar and other active acoustic sources under Alternative 1 would increase, however the locations, types, and severity of impacts would not be discernable from those described in Section 3.9.3.1.2.1 (No Action Alternative – Training Activities).

As discussed in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-1, and Section 3.0.5.3.1.6 (Vessel Noise), training activities, under Alternative 1 include an increase in the numbers of activities that involve vessels compared to the No Action Alternative; however, the locations and predicted impacts would not differ. Proposed training activities under Alternative 1 that involve vessel movement differ in number from training activities proposed under the No Action Alternative, however, the locations, types, and severity of impacts would not be discernable from those described in Section 3.9.3.1.2.1 (No Action Alternative – Training Activities).

As discussed in Chapter 2 (Description of Proposed Action And Alternatives), Table 2.8-1, and Section 3.0.5.3.1.7 (Aircraft Overflight Noise), training activities under Alternative 1 include an increase in the number of activities that involve aircraft as compared to the No Action Alternative, however, the training locations, types of aircraft, and types of activities would not differ. The number of individual predicted impacts associated with Alternative 1 aircraft overflight noise may increase, however, the locations, types, and severity of impacts would not be discernable from those described in Section 3.9.3.1.2.1 (No Action Alternative – Training Activities).

Despite the increase in activity, the potential impacts of training activities involving sonar and other active acoustic sources under Alternative 1 on fish species would be similar to those described above for training activities under the No Action Alternative, and are expected to be limited to short-term, minor behavioral reactions. Impacts to fish populations would not occur as a result of non-impulsive sounds associated with training activities under Alternative 1. Predicted effects to ESA-listed steelhead trout and designated critical habitat would not be discernable from those described in Section 3.9.3.1.2.1 (No Action Alternative – Training Activities). Effects to designated steelhead trout critical habitat would not occur as activities do not overlap.

Pursuant to the ESA, the use of non-impulsive acoustic sources for training activities under Alternative 1 may affect, but is not likely to adversely affect ESA-listed steelhead trout.

The use of non-impulsive acoustic sources under Alternative 1 during training activities would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.1.2.5 Alternative 1 - Testing Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Tables 2.8-2 to 2.8-5, and Section 3.0.5.3.1 (Acoustic Stressors), the number of annual testing activities that produce in-water sound from the use of sonar and other active acoustic sources analyzed under Alternative 1 would increase over what was analyzed for the No Action Alternative. These activities would happen in the same general locations under Alternative 1 as described under the No Action Alternative in Section 3.9.3.1.2.1 (No Action Alternative – Testing Activities).

Despite the increase in activity, the potential impacts of testing activities involving sonar and other active acoustic sources under Alternative 1 on fish species would be similar to those described above for training activities under the No Action Alternative, and are expected to be limited to short-term, minor behavioral reactions. Impacts to fish populations would not occur as a result of non-impulsive acoustic sources associated with testing activities under Alternative 1. Predicted effects to ESA-listed steelhead trout and designated critical habitat would not be discernable from those described in Section 3.9.3.1.2.1 (No Action Alternative – Training Activities).

Pursuant to the ESA, the use of non-impulsive acoustic sources for testing activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of non-impulsive acoustic sources under Alternative 1 during testing activities would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.1.2.6 Alternative 2 – Training Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-1 and Section 3.0.5.3.1.1 (Sonar and Other Active Acoustic Sources), the number of annual training activities that produce in-water noise from the use of sonar and other active acoustic sources under Alternative 2 would increase, however the locations, types, and severity of impacts would not be discernable from those described in Section 3.9.3.1.2.1 (No Action Alternative – Training Activities).

As discussed in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-1, and Section 3.0.5.3.1.6 (Vessel Noise), training activities, under Alternative 2 include an increase in the numbers of activities that involve vessels compared to the No Action Alternative; however, the locations and predicted impacts would not differ. Proposed training activities under Alternative 2 that involve vessel movement differ in number from training activities proposed under the No Action Alternative, however, the locations, types, and severity of impacts would not be discernable from those described in Section 3.9.3.1.2.1 (No Action Alternative – Training Activities).

As discussed in Chapter 2 (Description of Proposed Action And Alternatives), Table 2.8-1, and Section 3.0.5.3.1.7 (Aircraft Overflight Noise), training activities under Alternative 2 include an increase in the number of activities that involve aircraft as compared to the No Action Alternative, however, the training locations, types of aircraft, and types of activities would not differ. The number of individual predicted impacts associated with Alternative 2 aircraft overflight noise may increase, however, the locations, types, and severity of impacts would not be discernable from those described in Section 3.9.3.1.2.1 (No Action Alternative – Training Activities).

Despite the increase in activity, the potential impacts of training activities involving sonar and other active acoustic sources under Alternative 2 on fish species would be similar to those described above for training activities under the No Action Alternative, and are expected to be limited to short-term, minor behavioral reactions. Impacts to fish populations would not occur as a result of non-impulsive acoustic sources associated with training activities under Alternative 2. Predicted effects to ESA-listed steelhead trout and designated critical habitat would not be discernable from those described in Section 3.9.3.1.2.1 (No Action Alternative – Training Activities). Effects to designated steelhead trout critical habitat would not occur as activities do not overlap.

Pursuant to the ESA, the use of non-impulsive acoustic sources for training activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of non-impulsive acoustic sources under Alternative 2 *during training activities would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.*

3.9.3.1.2.7 Alternative 2 - Testing Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Tables 2.8-2 to 2.8-5, and Section 3.0.5.3.1 (Acoustic Stressors), the number of annual testing activities that produce in-water sound from the use of sonar and other active acoustic sources analyzed under Alternative 2 would increase over what was analyzed for the No Action Alternative. These activities would occur in the same general locations under Alternative 2 as described under the No Action Alternative in Section 3.9.3.1.2.1 (No Action Alternative – Training Activities).

Despite the increase in activity, the potential impacts of testing activities involving sonar and other active acoustic sources under Alternative 2 on fish species would be similar to those described above for training activities under the No Action Alternative, and are expected to be limited to short-term, minor behavioral reactions. Impacts to fish populations would not occur as a result of non-impulsive sounds associated with testing activities under Alternative 2. Predicted effects to ESA-listed steelhead trout and designated critical habitat would not be discernable from those described in Section 3.9.3.1.2.1 (No Action Alternative – Training Activities). Effects to designated steelhead trout critical habitat would not occur as activities do not overlap.

Pursuant to the ESA, the use of non-impulsive acoustic sources for testing activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of non-impulsive acoustic sources under Alternative 2 during testing activities would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.1.3 Impacts from Explosives and Other Impulsive Acoustic Sources

Explosions and other impulsive sound sources include explosions from underwater detonations and explosive ordnance, swimmer defense airguns, pile driving, and noise from weapons firing, launch, and impact with the water's surface. Potential acoustic effects to fish from impulsive sources may be considered in four categories, as detailed in Section 3.9.3.1 (Acoustic Stressors): (1) direct injury, (2) hearing loss, (3) auditory masking, and (4) physiological stress and behavioral reactions.

3.9.3.1.3.1 No Action Alternative – Training Activities

Training activities do not include the use of swimmer defense airguns.

Explosives

As described in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-1, and Section 3.0.5.3.1.2 (Explosives), training activities under the No Action Alternative would use underwater detonations and explosive ordnance. Training activities involving explosives could be conducted throughout the Study Area, although activities do not normally occur within 3 nm of shore except at designated underwater detonation areas (e.g., Puuloa Underwater Range, Barbers Point Underwater Range, NISMF, Lima Landing, Ewa Training Minefield, Pyramid cove, NW Harbor, Imperial Beach, SSTC).

Concern about potential fish mortality associated with the use of at-sea explosives led military researchers to develop mathematical and computer models that predict safe ranges for fish and other animals from explosions of various sizes (e.g., Yelverton et al. 1975, Goertner 1982, Goertner et al. 1994). Young (1991) provides equations that allow estimation of the potential effect of underwater explosions on fish possessing swim bladders using a damage prediction method developed by Goertner (1982). Young's parameters include the size of the fish and its location relative to the explosive source, but are independent of environmental conditions (e.g., depth of fish and explosive shot frequency). An example of such model predictions is shown in Table 3.9-5, which lists estimated explosive-effects ranges using Young's (1991) method for fish possessing swim bladders exposed to explosions that would typically occur during training exercises. The 10 percent mortality range is the distance beyond which 90 percent of the fish present would be expected to survive. It is difficult to predict the range of more subtle effects causing injury but not mortality (CSA 2004).

Fish not killed or driven from a location by an explosion might change their behavior, feeding pattern, or distribution. Changes in behavior of fish have been observed as a result of sound produced by explosives, with effect intensified in areas of hard substrate (Wright 1982). Stunning from pressure waves could also temporarily immobilize fish, making them more susceptible to predation.

Table 3.9-5: Estimated Explosive Effects Ranges for Fish with Swim Bladders

Training Operation and Type of Ordnance	Net Explosive Weight (lb.)	Depth of Explosion (ft.)	10% Mortality Range (ft.)		
			1-oz. Fish	1-lb. Fish	30-lb. Fish
Mine Neutralization					
MK 103 Charge	0.002	10	40	28	18
AMNS Charge	3.24	20	366	255	164
20 lb NEW UNDET Charge	20	30	666	464	299
Missile Exercise					
Hellfire	8	3.3	317	221	142
Maverick	100	3.3	643	449	288
Firing Exercise at Sea					
HE Naval Gun Shell, 5-inch	8	1	244	170	109
Bombing Exercise					
MK 20	109.7	3.3	660	460	296
MK 82	192.2	3.3	772	539	346
MK 83	415.8	3.3	959	668	430
MK 84	945	3.3	1,206	841	541

Notes: AMNS = airborne mine neutralization system, HE = high-explosive, NEW = Net Explosive Weight, lb. = pound, ft. = foot/feet, oz. = ounce, UNDET = underwater detonation

The number of fish killed by an underwater explosion would depend on the population density in the vicinity of the blast, as well as factors discussed above such as net explosive weight, depth of the explosion, and fish size. For example, if an explosion occurred in the middle of a dense school of menhaden, herring, or other schooling fish, a large number of fish could be killed. Furthermore, the probability of this occurring is low based on the patchy distribution of dense schooling fish.

Sounds from explosions could cause hearing loss in nearby fish (dependent upon charge size). Permanent hearing loss has not been demonstrated in fish, as lost sensory hair cells can be replaced unlike in mammals. Fish that experience hearing loss could miss opportunities to detect predators or prey, or reduce interspecific communication. If an individual fish were repeatedly exposed to sounds from underwater explosions that caused alterations in natural behavioral patterns or physiological stress, these impacts could lead to long-term consequences for the individual such as reduced survival, growth, or reproductive capacity. However, the time scale of individual explosions is very limited, and training exercises involving explosions are dispersed in space and time. Consequently, repeated exposure of individual fish to sounds from underwater explosions is not likely and most acoustic effects are expected to be short-term and localized. Long-term consequences for populations would not be expected.

Weapons Firing, Launch, and Impact Noise

As described in Chapter 2 (Description of Proposed Action and Alternatives), and Table 2.8-1, training activities under the No Action Alternative include activities that produce in water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface. Activities are spread throughout the Study Area, and could take place within coastal or open ocean areas. Most activities involving large caliber naval gunfire or the launching of targets, missiles, bombs, or other ordnance are conducted greater than 12 nm from shore.

A detailed description of weapons firing, launch, and impact noise is provided in Section 3.0.5.3.1.5 (Weapons Firing, Launch, and Impact Noise). Noise under the muzzle blast of a 5-inch gun and directly under the flight path of the shell (assuming the shell is a few meters above the water's surface) would produce a peak sound pressure level of approximately 200 dB re 1 µPa near the surface of the water (1–2 m depth). Sound due to missile and target launches is typically at a maximum during initiation of the booster rocket and rapidly fades as the missile or target travels downrange. Many missiles and targets are launched from aircraft, which would produce minimal noise in the water due to the altitude of the aircraft at launch. Mines, non-explosive bombs, and intact missiles and targets could impact the water with great force and produce a large impulse and loud noise of up to approximately 270 dB re 1 µPa at 1 m, but with very short pulse durations, depending on the size, weight, and speed of the object at impact (McLennan 1997). This corresponds to sound exposure levels of around 200 dB re 1 μPa^2-s at 1 m. These sounds from weapons firing launch, and impact noise would be transient and of short duration, lasting no more than a few seconds at any given location.

Fish that are exposed to noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface may exhibit brief behavioral reactions, however due to the short term, transient nature of weapons firing, launch, and non-explosive impact noise, animals are unlikely to be exposed multiple times within a short period. Behavioral reactions would likely be short term (minutes) and substantive costs or long-term consequences for individuals or populations would not be expected.

Pile Driving

Pile driving would occur during the construction and removal phases of the elevated causeway training activities at the SSTC. The training involves the use of an impact hammer to drive the piles into the sediment and a vibratory hammer to later remove the piles. The pile driving locations are adjacent to Navy pier side locations in industrialized waterways that carry a high volume of vessel traffic in addition to Navy vessels using the pier. These coastal areas tend to have high ambient noise levels due to natural and anthropogenic sources present.

The results to date show only the most limited mortality, and then only when fish are very close to an intense sound source. Although there is evidence that fish within a few meters of a pile driving operation would potentially be killed, very limited data suggest that fish further from the source are not killed, and may not be harmed. As a consequence of these limited and unpublished data, it is not possible to know the quantitative effects of pile driving on fish.

Elevated causeway system pile installation and removal within the project area would result in temporary increased underwater noise levels. Underwater sound levels likely to result from unattenuated impact pile driving would be 190 dB re 1 µPa (root mean square), 210 dB re 1 µPa (peak), and 177 dB re 1 μPa^2-sec (sound exposure level) at 10 meters. Underwater sound levels likely to result from vibratory pile driving would be 170 dB re 1 µPa (root mean square) at 10 meters. Since many fish use their swim bladders for buoyancy, they are susceptible to rapid expansion/decompression due to peak pressure waves from underwater noises (Hastings and Popper 2005a). At a sufficient level this exposure can be fatal. Recently, underwater noise effects criteria for fish were revised and accepted for in-water projects following a multi-agency agreement that included concurrence from National Marine Fisheries Service and the U.S. Fish and Wildlife Service (Fisheries Hydroacoustic Working Group 2008). The underwater noise thresholds for fish for behavioral disturbance and the onset of injury are presented in Table 3.9-6. The Navy evaluated the distance at which pile driving noise would meet or exceed these thresholds, resulting in zones within the water column where behavioral or injurious effects could occur. However, due to the absence of any data from which the density of fish species could be determined, the Navy was unable to calculate the number or percent of the fish population that may be exposed to these effects within each zone. As a result, the remaining analysis presents the distance(s) from the pile at which these criteria or effects would be experience by fish and a qualitative assessment of the impacts that these sounds would have on the behavior and physiology of these animals.

Table 3.9-6: Range of Effects for Fish from Pile Driving

Criteria/ Predicted Effect	Size of Fish	Criteria	Distance of Effect for Impact Hammer (meters)	Distance of Effect for Vibratory Pile Driving (meters)
Onset of Injury	All Fish	206 dB re 1 µPa (peak)	18	n/a
	Fish two grams or greater	187 dB re 1 µPa (rms) (SEL)	2	n/a
	Fish less than two grams	183 dB re 1 µPa (rms) (SEL)	4	n/a
Behavioral impacts[1]	All Fish	150 dB re 1 µPa (rms)	4642	215

[1]Behaviorial criteria was not set forth by the Fisheries Hydroacoustic Working Group, so as a conservative measure, National Oceanic and Atmospheric Administration Fisheries and U.S. Fish and Wildlife Service generally use 150 dB root mean square as the threshold for behavioral effects to ESA-listed fish species (salmon and bull trout) for most biological opinions evaluating pile driving, however there are currently no research or data to support this threshold.
Notes: SEL=sound exposure level, rms=root mean square, n/a = not applicable, dB re 1 µPa = decibel level referenced to one micro Pascal at one meter
Source: Fisheries Hydroacoustic Working Group (2008)

For impact pile driving, the underwater noise threshold criteria for fish injury from a single pile strike occurs at a peak sound pressure level of 206 dB re 1 µPa. This sound level may be exceeded during impact pile driving within a circle centered at the location of the driven pile, out to a distance of approximately 60 ft. (18.3 m).

Alternatively, fish can also be impacted by the cumulative effects of underwater noise from impact pile driving, and the extent of effects is evaluated by calculating the accumulated sound exposure level, based on the number of strikes per day. An impact hammer could be used for up to 200 to 300 impact strikes per pile, with a speed of 30 to 50 strikes per minute. It is expected that any pile driven using an impact hammer would probably require more than one strike. The results of the cumulative noise analysis for this proposed action indicate that the 187 dB and 183 dB accumulated sound exposure level threshold could be exceeded within a circle centered at the location of the driven pile out to a distance of approximately 6.6 ft. (2.01 m), and 13.2 ft. (4.02 m), respectively. The accumulated sound exposure level distance is shorter than the distance to the peak pressure of 206 dB re 1 µ Pa; therefore the fish are likely to be injured from peak pressure before accumulating enough exposure to cause injury. During impact pile driving, the associated underwater noise levels would result in behavioral responses, including avoidance of the pile driving location, and would have the potential to cause injury.

A vibratory hammer would be used to remove all piles during elevated causeway system training. When using the vibratory driver method, the distances at which the underwater noise thresholds occur (150 dB root mean square) would be reduced to 710 ft. (216.4 m) for behavioral disruption. There are currently no criteria or expected occurrences of injury to fish from vibratory pile driving (Table 3.9-6).

Fish near the pile driving location may display a startle response during initial stages of pile driving, and would likely avoid the immediate area during pile driving activities. However, field investigations in Puget Sound in the state of Washington on salmonid behavior, when occurring near pile driving projects (Feist 1991; Feist et al. 1992), found little evidence that normally nearshore migrating salmonids move further offshore to avoid the general project area. In fact, some studies indicate that construction site behavioral responses, including site avoidance, may be as strongly tied to visual stimuli as well as underwater sound (Feist 1991; Feist et al. 1992; Ruggerone et al. 2008). Any fish which are behaviorally disturbed may change their normal behavior patterns (i.e., swimming speed or direction, foraging habits, etc.) or be temporarily displaced from the area of construction.

The number of fish affected by pile driving would depend on the population density in the vicinity of the location of the activity, as well as factors discussed above such as pile driving method used and fish size. The number of fish potentially killed would not, however, represent significant mortality in terms of the total population of such fish in the Study Area. Furthermore, the probability of this occurring is low based on the patchy distribution of dense schooling fish. Fish density in a given area is inherently dynamic and varies seasonally, daily, and over shorter time frames. Consequently, fish density data are not available for the Study Area and the number of fish affected by pile driving cannot be accurately quantified.

To summarize, a limited number of fish would be killed in the immediate proximity of the pile driving locations. Additional fish would be injured and could subsequently die or suffer greater rates of predation. Beyond the range of injurious effects, there could be short-term impacts such as masking, stress, behavioral changes, and hearing threshold shifts. However, given the relatively small area that would be affected, and the abundance and distribution of the species concerned, no population-level impacts would be expected. When training and testing activities are completed, any fish species disrupted by the exercise should repopulate the area over time. The regional abundance and diversity of fish are unlikely to measurably decrease.

Conclusion

Potential impacts on fish from explosions and impulsive acoustic sources can range from no impact, brief acoustic effects, tactile perception, and physical discomfort, to slight injury to internal organs and the auditory system, to death of the animal (Keevin et al. 1997). Occasional behavioral reactions to intermittent explosions and impulsive acoustic sources are unlikely to cause long-term consequences for individual fish or populations.

Fish that experience hearing loss (permanent or temporary threshold shift) as a result of exposure to explosives and impulsive acoustic sources may have a reduced ability to detect relevant sounds such as predators, prey, or social vocalizations. It is uncertain whether some permanent hearing loss over a part of a fish's hearing range would have long-term consequences for that individual. If this did affect the fitness of a few individuals, it is unlikely to have long-term consequences for the population.

It is possible for fish to be injured or killed by explosives; however, long-term consequences for a loss of a few individuals is unlikely to have measureable effects on overall stocks or populations. Therefore, long-term consequences to fish populations would not be expected.

Steelhead trout, as summarized in Section 3.9.2.3, are anadromous and spend a portion of their lives in both the marine environment as well as in the riverine and estuarine systems from the Kamchatka Peninsula in Asia, east to Alaska, and south to Southern California. Steelhead trout have the potential to be exposed to explosive energy and sound associated with training activities under the No Action Alternative in the coastal areas of the SOCAL Range Complex and SSTC. Since steelhead trout spawn in rivers and the early lifestages of the fish occur in riverine and estuarine environments, eggs and larvae would not be exposed to impulsive acoustic sources produced by explosives, weapons firing, launch, and non-explosive ordnance impact with the water's surface during training activities.

Training activities involving impulsive acoustic sources in the SOCAL Range Complex and SSTC have the possibility to affect steelhead trout, potentially resulting in short-term behavioral or physiological responses, hearing loss, injury, or mortality. However, given the infrequent nature of training activities involving impulsive acoustic sources in the SOCAL Range Complex and SSTC and the rarity of the species, the likelihood of steelhead trout encountering an explosive activity taking place anywhere within the range complex is remote. Effects to designated steelhead trout critical habitat would not occur as activities do not overlap.

Pursuant to the ESA, the use of impulsive acoustic sources for training activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of impulsive acoustic sources under the No Action Alternative during training activities would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.1.3.2 No Action Alternative – Testing Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-2 and Table 2.8-5, and Section 3.0.5.3.1.2 (Explosives), testing activities under the No Action Alternative would involve underwater detonations and explosive ordnance. No explosive bombs, Improved Extended Echo Ranging sonobuoys, or pile driving are proposed under the No Action Alternative.

Testing activities involving explosives could be conducted throughout the Study Area, although activities do not normally occur within 3 nm of shore except at designated underwater detonation areas (e.g., Puuloa Underwater Range, Barbers Point Underwater Range, Lima Landing, Ewa Training Minefield, Pyramid cove, NW Harbor, Imperial Beach, SSTC). Proposed testing activities under the No Action Alternative that involve explosives and other impulsive sources differ in number and location from training activities under the No Action Alternative, however the types and severity of impacts would not be discernable from those described in Section 3.9.3.1.3.1 (No Action Alternative – Training Activities).

As described in Tables 2.8-2 to 2.8-5, testing activities under the No Action Alternative include activities that produce in water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface. Activities are spread throughout the Study Area and could take place within coastal or open ocean area. Proposed testing activities under the No Action Alternative that produce in-water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface differ in number and location from training activities under the No Action Alternative, however the types and severity of impacts would not be discernable from those described in Section 3.9.3.1.3.1 (No Action Alternative – Training Activities).

Swimmer Defense Airguns

Testing activities under the No Action Alternative would include the use of swimmer defense airguns up to five times per year pierside in San Diego Bay, California as described in Table 2.8-3. See the discussion in Section 3.0.5.3.1.4 (Swimmer Defense Airguns) for details on swimmer defense airguns. Source levels are estimated to be 185 to 195 dB re 1 μPa^2-s at 1 m. For 100 shots, the cumulative sound exposure level would be approximately 215 to 225 dB re 1 μPa^2-s at 1 m.

Single, small airguns (60 in^3) are unlikely to cause direct trauma to marine fish. Impulses from airguns lack the strong shock wave and rapid pressure increase, as would be expected from explosive sources that can cause primary blast injury or barotrauma. As discussed in Section 3.9.3.1.1.1 (Direct Injury), there is little evidence that airguns can cause direct injury to adult fish, with the possible exception of injuring small juvenile or larval fish nearby (approximately 16 ft. [4.9 m]). Therefore, larval and small juvenile fish within a few meters of the airgun may be injured or killed. Considering the small footprint of this hypothesized injury zone, and the isolated and infrequent use of the swimmer defense airgun, population consequences would not be expected.

As discussed in Section 3.9.3.1.1.2 (Hearing Loss), temporary hearing loss in fish could occur if fish were exposed to impulses from swimmer defense airguns, although some studies have shown no hearing loss from exposure to airguns within 16 ft. (4.9 m). Therefore, fish within a few meters of the airgun may receive temporary hearing loss. However, due to the relatively small size of the airgun, and their limited use in pierside areas, impacts would be minor, and may only impact a few individual fish. Population consequences would not be expected.

Airguns do produce broadband sounds; however, the duration of an individual impulse is about one-tenth of a second. Airguns could be fired up to 100 times per activity, but would generally be used less based on the actual testing requirements. The pierside areas where these activities are proposed are inshore, with high levels of use, and therefore have high levels of ambient noise, see Section 3.0.4.5 (Ambient Noise). Auditory masking is discussed in Section 3.9.3.1.1.3 (Auditory Masking), and only occurs when the interfering signal is present. Due to the limited duration of individual shots and the limited number of shots proposed for the swimmer defense airgun, only brief, isolated auditory masking to marine fish would be expected. Population consequences would not be expected.

In addition, fish that are able to detect the airgun impulses may exhibit alterations in natural behavior. As discussed in Section 3.9.3.1.1.4 (Physiological Stress and Behavioral Reactions), some fish species with site fidelity such as reef fish may show initial startle reactions, returning to normal behavioral patterns within a matter of a few minutes. Pelagic and schooling fish that typically show less site fidelity may avoid the immediate area for the duration of the activities. Due to the limited use and relatively small footprint of swimmer defense airguns, impacts to fish are expected to be minor. Population consequences would not be expected.

Conclusion

As discussed for training activities, potential impacts on fish from explosions and impulsive acoustic sources can range from no impact, brief acoustic effects, tactile perception, and physical discomfort, to slight injury to internal organs and the auditory system, to death of the animal (Keevin et al. 1997).

Occasional behavioral reactions to intermittent explosives and impulsive acoustic sources are unlikely to cause long-term consequences for individual fish or populations.

Animals that experience hearing loss (permanent or temporary threshold shift) as a result of exposure to explosions and impulsive acoustic sources may have a reduced ability to detect relevant sounds such as predators, prey, or social vocalizations. It is uncertain whether some permanent hearing loss over a part of a fish's hearing range would have long-term consequences for that individual. If this did affect the fitness of a few individuals, it is unlikely to have long-term consequences for the population.

It is possible for fish to be injured or killed by an explosion; however, long-term consequences for a loss of a few individuals is unlikely to have measureable impacts on overall stocks or populations. Therefore, long-term consequences to fish populations would not be expected.

Underwater explosives, particularly those associated with mine warfare testing that occur in shallow water areas in the SOCAL Range Complex and SSTC, have the possibility to affect steelhead trout. Exposures may result in behavioral responses, hearing loss, physical injury, or death to fish near the activities. However, given the infrequent nature of activities involving underwater explosions in the SOCAL Range Complex and SSTC and the rarity of the species, the likelihood of steelhead trout encountering an explosive activity taking place anywhere within the range complex is remote. Effects to designated steelhead trout critical habitat would not occur as activities do not overlap.

Pursuant to the ESA, the use of impulsive acoustic sources for testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of impulsive acoustic sources under the No Action Alternative during testing activities would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.1.3.3 Alternative 1- Training Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-1, and Section 3.0.5.3.1.2 (Explosives), the number of annual training activities that use explosions under Alternative 1 would increase.

Proposed training activities under Alternative 1 that involve underwater explosives differ in number from training activities proposed under the No Action Alternative; however the locations, types, and severity of impacts would not be discernable from those described in Section 3.9.3.1.3.1 (No Action Alternative – Training Activities).

As discussed for the No Action Alternative, potential impacts on fish from explosions and impulsive sound sources can range from no impact, brief acoustic effects, tactile perception, and physical discomfort, to slight injury to internal organs and the auditory system, to death of the animal (Keevin et al. 1997). Occasional behavioral reactions to intermittent explosives and impulsive acoustic sources are unlikely to cause long-term consequences for individual fish or populations. While serious injury or mortality to individual fish would be expected if they were present in the immediate vicinity of explosive ordnance use, despite the increase in activities under Alternative 1, impacts from at-sea explosives from training activities would be temporary and localized since the activities are infrequent and widely dispersed throughout the Study Area, and the distribution of potentially affected fishes also varies.

Underwater explosives, particularly those associated with mine warfare testing that occur in shallow water areas in the SOCAL Range Complex and SSTC, have the possibility to affect steelhead trout. Exposures may result in behavioral responses, hearing loss, physical injury, or death to fish near the activities. However, given the infrequent nature of activities involving underwater explosives in the SOCAL Range Complex and SSTC and the rarity of the species, the likelihood of steelhead trout encountering an explosive activity taking place anywhere within the range complex is remote. Effects to designated steelhead trout critical habitat would not occur as activities do not overlap.

Pursuant to the ESA, the use of impulsive acoustic sources for training activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of impulsive acoustic sources under Alternative 1 during training activities would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.1.3.4 Alternative 1 – Testing Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Tables 2.8-2 to 2.8-5, and in Section 3.0.5.3.1.2 (Explosives), the number of annual testing activities that use explosives under Alternative 1 would increase over the No Action Alternative. No explosive bombs, Improved Extended Echo Ranging sonobuoys, or pile driving are proposed under Alternative 1. These activities would occur in the same general locations under Alternative 1 as under the No Action Alternative.

Testing activities involving explosives could be conducted throughout the Study Area, although activities do not normally occur within 3 nm of shore except at designated underwater detonation areas (e.g., Puuloa Underwater Range, Barbers Point Underwater Range, Lima Landing, Ewa Training Minefield, Pyramid cove, NW Harbor, Imperial Beach, SSTC). Proposed testing activities under Alternative 1 that involve explosives and other impulsive sources differ in number and location from training activities under the No Action Alternative, however the types and severity of impacts would not be discernable from those described in Section 3.9.3.1.3.1 (No Action Alternative – Training Activities).

As described in Tables 2.8-2 to 2.8-3, testing activities under Alternative 1 include activities that produce in water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface. Activities are spread throughout the Study Area and could take place within coastal or open ocean area. Proposed testing activities under Alternative 1 that produce in-water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface differ in number and location from testing activities under the No Action Alternative, however the types and severity of impacts would not be discernable from those described in Section 3.9.3.1.3.1 (No Action Alternative – Training Activities).

As discussed for training activities, potential impacts on fish from explosives and impulsive acoustic sources can range from no effect, brief acoustic effects, tactile perception, and physical discomfort, to slight injury to internal organs and the auditory system, to death of the animal (Keevin et al. 1997). Occasional behavioral reactions to intermittent explosives and impulsive acoustic sources are unlikely to cause long-term consequences for individual fish or populations. While serious injury or mortality to individual fish would be expected if they were present in the immediate vicinity of explosive ordnance use, impacts from at-sea explosives from testing activities would be temporary and localized since activities are infrequent and widely dispersed throughout the Study Area.

Underwater explosives, particularly those associated with mine warfare testing that occur in shallow water areas in the SOCAL Range Complex and SSTC, have the possibility to affect steelhead trout. Exposures may result in behavioral responses, hearing loss, physical injury, or death to fish near the activities. However, given the infrequent nature of activities involving underwater explosives in the SOCAL Range Complex and SSTC and the rarity of the species, the likelihood of steelhead trout encountering an explosive activity taking place anywhere within the range complex is remote. Effects to designated steelhead trout critical habitat would not occur as activities do not overlap.

Pursuant to the ESA, the use of impulsive acoustic sources for testing activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed steelhead trout

The use of impulsive acoustic sources under Alternative 1 during testing activities would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.1.3.5 Alternative 2 – Training Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Table 2.8-1, and Section 3.0.5.3.1.2 (Explosives), the total number of explosive bombs, missiles, rockets, gun rounds, underwater explosives, and Improved Extended Echo Ranging sonobuoys proposed under Alternative 2 to be expended during training activities in the Study Area would be the same as Alternative 1.

As discussed for the No Action Alternative, potential impacts on fish from explosives and impulsive acoustic sources can range from no effect, brief acoustic effects, tactile perception, and physical discomfort, to slight injury to internal organs and the auditory system, to death of the animal (Keevin et al. 1997). Occasional behavioral reactions to intermittent explosions and impulsive acoustic sources are unlikely to cause long-term consequences for individual fish or populations. While serious injury or mortality to individual fish would be expected if they were present in the immediate vicinity of explosive ordnance use, impacts from at-sea explosion from training activities would be temporary and localized since the activities are infrequent and widely dispersed throughout the Study Area, and the distribution of potentially affected fishes also varies.

Underwater explosives, particularly those associated with mine warfare testing that occur in shallow water areas in the SOCAL Range Complex and SSTC, have the possibility to affect steelhead trout. Exposures may result in behavioral responses, hearing loss, physical injury, or death to fish near the activities. However, given the infrequent nature of activities involving underwater explosives in the SOCAL Range Complex and SSTC and the rarity of the species, the likelihood of steelhead trout encountering an explosive activity taking place anywhere within the range complex is remote. Effects to designated steelhead trout critical habitat would not occur as activities do not overlap.

Pursuant to the ESA, the use of impulsive acoustic for training activities under Alternative 2 may affect, but is not likely to adversely affect ESA-listed steelhead trout

The use of impulsive acoustic sources under Alternative 2 during training activities would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.1.3.6 Alternative 2 – Testing Activities

As described in Chapter 2 (Description of Proposed Action and Alternatives), Tables 2.8-2 to 2.8-3, and in Section 3.0.5.3.1.2 (Explosives), the number of annual testing activities that use explosions under Alternative 2 would increase over the No Action Alternative. These activities would happen in the same general locations under Alternative 2 as under the No Action Alternative.

Testing activities involving explosives could be conducted throughout the Study Area, although activities do not normally occur within 3 nm of shore except at designated underwater detonation areas (e.g., Puuloa Underwater Range, Barbers Point Underwater Range, Lima Landing, Ewa Training Minefield, Pyramid cove, NW Harbor, Imperial Beach, SSTC). Proposed testing activities under Alternative 2 that involve explosives and other impulsive sources differ in number and location from training activities under the No Action Alternative, however the types and severity of impacts would not be discernable from those described in Section 3.9.3.1.3.1 (No Action Alternative – Training Activities).

As described in Tables 2.8-2 to 2.8-3, testing activities under Alternative 2 include activities that produce in water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface. Activities are spread throughout the Study Area and could take place within coastal or open ocean area. Proposed testing activities under Alternative 2 that produce in-water noise from weapons firing, launch, and non-explosive ordnance impact with the water's surface differ in number and location from training activities under the No Action Alternative, however the types and severity of impacts would not be discernable from those described in Section 3.9.3.1.3.1 (No Action Alternative – Training Activities).

As discussed for training activities, potential impacts on fish from explosives and impulsive acoustic sources can range from no effect, brief acoustic effects, tactile perception, and physical discomfort, to slight injury to internal organs and the auditory system, to death of the animal (Keevin et al. 1997). Occasional behavioral reactions to intermittent explosions and impulsive acoustic are unlikely to cause long-term consequences for individual fish or populations. While serious injury or mortality to individual fish would be expected if they were present in the immediate vicinity of explosive ordnance use, impacts from at-sea explosives from testing activities would be temporary and localized since activities are infrequent and widely dispersed throughout the Study Area, and the distribution of potentially affected fishes also varies.

Underwater explosives, particularly those associated with mine warfare testing that occur in shallow water areas in the SOCAL Range Complex and SSTC, have the possibility to affect steelhead trout. Exposures may result in behavioral responses, hearing loss, physical injury, or death to fish near the activities. However, given the infrequent nature of activities involving underwater explosives in the SOCAL Range Complex and SSTC and the rarity of the species, the likelihood of steelhead trout encountering an explosive activity taking place anywhere within the range complex is remote. Effects to designated steelhead trout critical habitat would not occur as activities do not overlap.

Pursuant to the ESA, the use of impulsive acoustic sources for testing activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout .

The use of impulsive acoustic sources under Alternative 2 during testing activities would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.1.3.7 Summary of Effects to Marine Fish from Acoustic Stressors

Under the No Action Alternative, Alternative 1 or Alternative 2, potential impacts on fish from acoustic and explosive stressors can range from no impact brief acoustic effects, tactile perception, and physical discomfort, to slight injury to internal organs and the auditory system, to death of the animal (Keevin et al. 1997). Occasional behavioral reactions to intermittent explosives and impulsive acoustic sources are unlikely to cause long-term consequences for individual fish or populations. While serious injury or mortality to individual fish would be expected if they were present in the immediate vicinity of explosive ordnance use, impacts from acoustic and explosive stressors would be temporary and localized since the activities are infrequent and widely dispersed throughout the Study Area, and the distribution of potentially affected fishes also varies.

Pursuant to the ESA, the use of acoustic stressors under the No Action Alternative, Alternative 1, or Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

Acoustic stressors under the No Action Alternative, Alternative 1, or Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.2 Energy Stressors

This section analyzes the potential impacts of energy stressors that can occur during training and testing activities within the Study Area, and for HSTT only includes potential impacts from electromagnetic devices.

3.9.3.2.1 Impacts from Electromagnetic Devices

Several different electromagnetic devices are used during training and testing activities. A discussion of the type, number, and location of activities using these devices under each alternative is presented in Section 3.0.5.3.2.1 (Electromagnetic Devices).

A comprehensive review of information regarding the sensitivity of marine organisms to electric and magnetic impulses, including fishes comprising the subclass elasmobranchii (sharks, skates, and rays; hereafter referred to as elasmobranchs), as well as other bony fishes, is presented in Normandeau (2011). The synthesis of available data and information contained in this report suggests that while many fish species (particularly elasmobranchs) are sensitive to electromagnetic fields, further investigation is necessary to understand the physiological response and magnitude of the potential effects. Most examinations of electromagnetic fields on marine fishes have focused on buried undersea cables associated with offshore wind farms in European waters (Boehlert and Gill 2010; Gill 2005; Ohman et al. 2007).

Many fish groups including lamprey, elasmobranchs, eels, salmonids, stargazers, and others, have an acute sensitivity to electrical fields, known as electroreception (Bullock et al. 1983; Helfman et al. 2009b). Electroreceptors are thought to aid in navigation, orientation, and migration of sharks and rays (Kalmijn 2000). In elasmobranchs, behavioral and physiological response to electromagnetic stimulus varies by species and age, and appears to be related to foraging behavior (Rigg et al. 2009). Many elasmobranchs respond physiologically to electric fields of 10 nanovolts (nV) per cm and behaviorally at 5 nV per cm (Collin and Whitehead 2004). Electroreceptive marine fishes with ampullary (pouch) organs can detect considerably higher frequencies of 50 hertz (Hz) to more than 2 kilohertz (kHz) (Helfman et al. 2009b). The distribution of electroreceptors on the head of these fishes, especially around the mouth suggests that these sensory organs may be used in foraging. Additionally, some researchers hypothesize that the electroreceptors aid in social communication (Collin and Whitehead 2004). The ampullae of some fishes are sensitive to low frequencies (< 0.1–25 Hz) of electrical energy (Helfman et al. 2009b), which may be of physical or biological origin, such as muscle contractions. For example, the ampullae of the shovelnose sturgeon (*Scaphirhynchus platorynchus*), were shown to respond to electromagnetic stimuli in a way comparable to the well-studied elasmobranchs, which are sensitive to electric fields as low as 1 microvolt (μV) per cm with a magnetic field of 100 gauss (Bleckmann and Zelick 2009).

While elasmobranchs and other fishes can sense the level of the earth's electromagnetic field, the potential effects on fish resulting from changes in the strength or orientation of the background field are not well understood. When the electromagnetic field is enhanced or altered, sensitive fishes may experience an interruption or disturbance in normal sensory perception. Research on the electrosensitivity of sharks indicates that some species respond to electrical impulses with an apparent avoidance reaction (Helfman et al. 2009b; Kalmijn 2000). This avoidance response has been exploited as a shark deterrent, to repel sharks from areas of overlap with human activity (Marcotte and Lowe 2008).

Experiments with electromagnetic pulses can provide indirect evidence of the range of sensitivity of fishes to similar stimuli. Two studies reported that exposure to electromagnetic pulses do not have any effect on fishes (Hartwell et al. 1991; Nemeth and Hocutt 1990). The observed 48-hour mortality of small estuarine fishes (sheepshead minnow, mummichog, Atlantic menhaden, striped bass, Atlantic silverside, fourspine stickleback, and rainwater killifish) exposed to electromagnetic pulses of 100 to 200 kilovolts (kV) per m (10 nanoseconds per pulse) from distances greater than 164 ft. (50 m) was not statistically different than the control group (Hartwell et al. 1991; Nemeth and Hocutt 1990). During a study of Atlantic menhaden, there were no statistical differences in swimming speed and direction (toward or away from the electromagnetic pulse source), between a group of individuals exposed to electromagnetic pulses and the control group (Hartwell et al. 1991; Nemeth and Hocutt 1990).

Both laboratory and field studies confirm that elasmobranchs (and some teleost [bony] fishes) are sensitive to electromagnetic fields, but the long-term impacts are not well-known. Electromagnetic sensitivity in some marine fishes (e.g., salmonids) is already well-developed at early life stages (Ohman et al. 2007), with sensitivities reported as low as 0.6 millivolt per centimeter (mV/cm) in Atlantic salmon (Formicki et al. 2004); however, most of the limited research that has occurred focuses on adults. Some species appear to be attracted to undersea cables, while others show avoidance (Ohman et al. 2007). Under controlled laboratory conditions, the scalloped hammerhead (*Sphyrna lewini*) and sandbar shark (*Carcharhinus plumbeus*) exhibited altered swimming and feeding behaviors in response to very weak electric fields (less than 1 nV per cm) (Kajiura and Holland 2002). In a test of sensitivity to fixed magnets, five Pacific sharks were shown to react to magnetic field strengths of 25 to 234 gauss at distances ranging between 0.85 and 1.90 ft. (0.26 and 0.58 m) and avoid the area (Rigg et al. 2009). A field trial in the Florida Keys demonstrated that southern stingray (*Dasyatis americana*) and nurse shark (*Ginglymostoma cirratum*) detected and avoided a fixed magnetic field producing a flux of 950 gauss (O'Connell et al. 2010).

Potential impacts of electromagnetic activity on adult fishes may not be relevant to early life stages (eggs, larvae, juveniles) due to ontogenic (lifestage-based) shifts in habitat utilization (Botsford et al. 2009; Sabates et al. 2007). Some skates and rays produce egg cases that occur on the bottom, while many neonate and adult sharks occur in the water column or near the water surface. Other species may have an opposite life history, with egg and larval stages occurring near the water surface, while adults may be demersal.

Based on current literature, only the fish groups identified above as capable of detecting electromagnetic fields (primarily elasmobranchs, salmonids, tuna, eels, and stargazers) will be carried forward in this analysis and the remaining taxonomic groups (from Table 3.9-2) will not be discussed further.

3.9.3.2.1.1 No Action Alternative, Alternative 1, and Alternative 2 – Training Activities

Table 3.0-18 lists the number and location of activities that include the use of electromagnetic devices, which are similar under all Alternatives, with discountable increases under Alternatives 1 and 2. As indicated in Section 3.0.5.3.2.1 (Electromagnetic Devices), training activities involving electromagnetic devices occur in the Hawaii and SOCAL Range Complexes, and SSTC. Exposure of fishes to electromagnetic stressors is limited to those fish groups identified in Section 3.9.2.4 to 3.9.2.22 (Marine Fish Groups) that are able to detect the electromagnetic properties in the water column (Bullock et al. 1983; Helfman et al. 2009b). Species that do occur within the areas listed above, including the ESA-listed steelhead trout would have the potential to be exposed to the electromagnetic fields.

Electromagnetic devices are used primarily during mine detection/neutralization activities, and in most cases, the devices simply mimics the electromagnetic signature of a vessel passing through the water. None of the devices include any type of electromagnetic "pulse." The towed body used for mine sweeping is designed to simulate a ship's electromagnetic signal in the water, and so would not be experienced by fishes as anything unusual. The static magnetic field generated by the electromagnetic systems is of relatively minute strength, typically 23 gauss at the cable surface and 0.002 gauss at a radius of 656 ft. (199.9 m). The strength of the electromagnetic field decreases quickly away from the cable down to the level of earth's magnetic field (0.5 gauss) at less than 13 ft. (3.9 m) from the source (Department of Navy 2005a). In addition, training activities generally occur offshore in the water column, where fishes with high mobility predominate and fish densities are relatively low, compared with nearshore benthic habitat. Because the towed body is continuously moving, most fishes are expected to move away from it or follow behind it, in ways similar to responses to a vessel.

For any electromagnetically sensitive fishes in close proximity to the source, the generation of electromagnetic fields during training activities has the potential to interfere with prey detection and navigation. They may also experience temporary disturbance of normal sensory perception or could experience avoidance reactions (Kalmijn 2000), resulting in alterations of behavior and avoidance of normal foraging areas or migration routes. Mortality from electromagnetic devices is not expected.

Therefore, the electromagnetic devices used would not cause any potential risk to fishes because (1) the range of impact (i.e., greater than earth's magnetic field) is small (i.e., 13 ft. [3.9 m] from the source); (2) the electromagnetic components of these activities are limited to simulating the electromagnetic signature of a vessel as it passes through the water; and (3) the electromagnetic signal is temporally variable and would cover only a small spatial range during each activity in the Study Area. Some fishes could have a detectable response to electromagnetic exposure, but any impacts would be temporary with no anticipated impact on an individual's growth, survival, annual reproductive success, or lifetime reproductive success (i.e., fitness). Fitness refers to changes in an individual's growth, survival, annual reproductive success, or lifetime reproductive success. Electromagnetic exposure of eggs and larvae of sensitive bony fishes would be low relative to their total ichthyoplankton biomass (Able and Fahay 1998) and; therefore, potential impacts on recruitment would not be expected.

The only ESA-listed fish species capable of detecting electromagnetic energy occurring in the area where electromagnetic training activities are planned is the steelhead trout. Steelhead trout generally occur in shallow nearshore and coastal waters, and therefore could encounter electromagnetic devices used in training activities in the SOCAL Range Complex and SSTC. Other locations of electromagnetic training activities include offshore areas that do not overlap with the normal distribution of this species. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, none of the electromagnetic stressors would affect steelhead trout critical habitat. If located in the immediate area where electromagnetic devices are being used, steelhead trout could experience temporary disturbance in normal sensory perception during migratory or foraging movements, or avoidance reactions (Kalmijn 2000), but any disturbance would be inconsequential.

Pursuant to the ESA, the use of electromagnetic devices during training activities under the No Action Alternative, Alternative 1, and Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of electromagnetic devices during training activities under the No Action Alternative, Alternative 1, and Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.2.1.2 No Action Alternative– Testing Activities

Table 3.0-18 lists the number and location of activities that include the use of electromagnetic devices. As indicated in Section 3.0.5.3.2.1 (Electromagnetic Devices), testing activities involving electromagnetic devices occur only in the SOCAL Range Complex.

The electromagnetic devices used in testing activities would not cause any potential risk to fishes for the same reasons stated for training activities above.

Pursuant to the ESA, use of electromagnetic devices during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

Electromagnetic activities under the No Action Alternative would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.2.1.3 Alternative 1 – Testing Activities

Table 3.0-18 lists the number and location of activities that include the use of electromagnetic devices. As indicated in Section 3.0.5.3.2.1 (Electromagnetic Devices), testing activities involving electromagnetic devices occur only in the SOCAL Range Complex.

Under Alternative 1, a total of 27 electromagnetic testing activities are planned (an increase of 12 activities per year over the No Action Alternative). The increase in number of testing activities under Alternative 1 would not increase the potential for impact on fishes within the Study Area, for reasons described in Section 3.9.3.2.1.1 (No Action Alternative – Training Activities).

Pursuant to the ESA, the use of electromagnetic devices during testing activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

Electromagnetic activities under Alternative 1 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.2.1.4 Alternative 2 - Testing Activities

Table 3.0-18 lists the number and location of activities that include the use of electromagnetic devices. As indicated in Section 3.0.5.3.2.1 (Electromagnetic Devices), under Alternative 2, testing activities involving electromagnetic devices occur only in the SOCAL Range Complex.

Under Alternative 2, a total of 31 electromagnetic testing activities are planned (an increase of 16 activities per year over the No Action Alternative). The increase in number of testing activities under Alternative 2 would not increase the potential for impact on fishes within the Study Area, for reasons described in Section 3.9.3.2.1.1 (No Action Alternative – Training Activities).

Pursuant to the ESA, the use of electromagnetic devices during testing activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

Electromagnetic activities under Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.2.2 Summary and Conclusions of Energy Impacts

Under the No Action Alternative, Alternative 1 or Alternative 2, disturbance from activities involving the use of electromagnetic devices could be expected to elicit brief behavioral or physiological responses only in those exposed fishes with sensitivities/detection abilities (primarily sharks and rays) within the corresponding portion of the electromagnetic spectrum that these activities use. For electromagnetic devices, the typical reaction would be for the fish to avoid (move away from) the signal upon detection. The impact of electromagnetic signals are expected to be inconsequential on fishes or fish populations because signals are similar to regular vessel traffic, and the electromagnetic signal would be continuously moving and cover only a small spatial area during use.

Pursuant to the ESA, energy stressors under the No Action Alternative, Alternative 1, or Alternative 2 may affect, but are not likely to adversely affect, ESA-listed steelhead trout.

Energy stressors under the No Action Alternative, Alternative 1, or Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.3 Physical Disturbance and Strike Stressors

This section evaluates the potential effects of various types of physical disturbance and strike stressors used by Navy during training and testing activities within the Study Area. A list of these activities is presented in Table 3.0-7.

Physical disturbance and strike stressors from vessels and in-water devices, military expended materials, and seafloor devices have the potential to affect all marine fish groups found within the Study Area (Tables 3.9-1 and 3.9-2), although some fish groups are more susceptible to strike potential than others. The potential responses to physical strikes are varied, but include behavioral changes such as avoidance, altered swimming speed and direction, physiological stress, and physical injury or mortality. Despite their ability to detect approaching vessels using a combination of sensory cues (sight, hearing, lateral line), larger slow-moving fishes (e.g., ocean sunfish, basking sharks, manta rays) cannot avoid all collisions, with some collisions resulting in mortality (Speed et al. 2008).

How a physical strike impacts a fish depends on the relative size of the object potentially striking the fish and the location of the fish in the water column. Before being struck by an object, Atlantic salmon for example, would sense a pressure wave through the water (Hawkins and Johnstone 1978a) and have the ability to swim away from the oncoming object. The movement generated by a large object moving through the water would simply displace small fishes in open water, such as Atlantic herring. Some fish might have time to detect the approaching object and swim away; others could be struck before they become aware of the object. An open-ocean fish that is displaced a small distance by movements from an object falling into the water nearby would likely continue on its original path as if nothing had happened. However, a bottom-dwelling fish near a sinking object would likely be disturbed, and may exhibit a general stress response, as described in Section 3.0.5.7 (Biological Resource Methods). As in all vertebrates, the function of the stress response in fishes is to rapidly raise the blood sugar level to prepare the fish to flee or fight (Helfman et al. 2009b). This generally adaptive physiological response can become a liability to the fish if the stressor persists and the fish is not able to return to its baseline physiological state. When stressors are chronic, the fish may experience reduced growth, health, or survival (Wedemeyer et al. 1990). If the object hits the fish, direct injury (in addition to stress) or death may result.

Many fishes respond to a sudden physical approach or contact by darting quickly away from the stimulus. Some other species may respond by freezing in place and adopting cryptic coloration. Some other species may respond in an unpredictable manner. Regardless of the response, the individual must stop its current activity and divert its physiological and cognitive attention to responding to the stressor (Helfman et al. 2009b). The energy costs of reacting to a stressor depend on the specific situation, but in all cases the caloric requirements of stress reactions reduce the amount of energy available to the fish for other functions, such as predator avoidance, reproduction, growth, and maintenance (Wedemeyer et al. 1990).

The ability of a fish to return to its previous activity following a physical strike (or near-miss resulting in a stress response) is a function of a variety of factors. Some fish species are more tolerant of stressors than others and become re-acclimated more easily. Experiments with species for use in aquaculture have revealed the immense variability among species in their tolerance to physical stressors. Within a species, the rate at which an individual recovers from a physical strike may be influenced by its age, sex, reproductive state, and general condition. A fish that has reacted to a sudden disturbance by swimming at burst speed would tire after only a few minutes; its blood hormone and sugar levels (cortisol and glucose) may not return to normal for up to, or longer than, 24 hours. During its recovery period, the fish would not be able to attain burst speeds and would be more vulnerable to predators (Wardle 1986). If the individual were not able to regain a steady state following exposure to a physical stressor, it may suffer reduced immune function and even death (Wedemeyer et al. 1990).

Potential impacts of physical disturbance or strike to adults may be different than for other life stages (eggs, larvae, juveniles) because these life stages do not necessarily occur together in the same location (Botsford et al. 2009; Sabates et al. 2007), and because they have different response capabilities. The numbers of eggs and larvae exposed to vessel movements would be low relative to total ichthyoplankton biomass (Able and Fahay 1998); therefore, measurable effects on fish recruitment would not be expected. Also, the early life stages of most marine fishes (excluding sharks and other livebearers) already have extremely high natural mortality rates (10 to 85 percent per day) from predation on these life stages (Helfman et al. 2009b), and therefore, most eggs and larvae are not expected to survive to the next life stage, as demonstrated by equivalent adult modeling (Horst 1977).

3.9.3.3.1 Impacts from Vessels and In-Water Devices

The majority of the activities under all alternatives involve vessels, and a few of the activities involve the use of in-water devices. For a discussion of the types of activities that use vessels and in-water devices, where they are used, and how many activities would occur under each Alternative, see Section 3.0.5.3.3 (Physical Disturbance and Strike Stressors). See Table 3.0-19 for a representative list of Navy vessel sizes and speeds and Table 3.0-31 for the types, sizes, and speeds of Navy in-water devices used in the Study Area. Vessels and in-water devices are covered together in this section because they both present similar potential impacts to fishes.

Vessels and in-water devices do not normally collide with adult fish, most of which can detect and avoid them. One study on fishes' behavioral responses to vessels showed that most adults exhibit avoidance responses to engine noise, sonar, depth finders, and fish finders (Jørgensen et al. 2004), reducing the potential for vessel strikes. Misund (1997b) found that fishes ahead of a ship that showed avoidance reactions did so at ranges of 160 to 490 ft. (48.8 to 149.4 m). When the vessel passed over them, some fishes responded with sudden escape responses that included lateral avoidance or downward compression of the school. Conversely, Rostad (2006) observed that some fishes are attracted to different types of vessels (e.g., research vessels, commercial vessels) of varying sizes, noise levels, and habitat locations. Fish behavior in the vicinity of a vessel is therefore quite variable, depending on the type of fish, its life history stage, behavior, time of day, and the sound propagation characteristics of the water (Schwarz 1985). Early life stages of most fishes could be displaced by vessels and not struck in the same manner as adults of larger species. However, a vessel's propeller movement or propeller wash could entrain early life stages. The low-frequency sounds of large vessels or accelerating small vessels caused avoidance responses among herring (Chapman and Hawkins 1973a), but avoidance ended within 10 seconds (s) after the vessel departed. Because a towed in-water device is continuously moving, most fishes are expected to move away from it or to follow behind it, in a manner similar to their responses to a vessel. When the device is removed, most fishes would simply move to another area.

There are a few notable exceptions to this assessment of potential vessel strike impacts on marine fish groups. Large slow-moving fish such as ocean sunfish, whale sharks, basking sharks, and manta rays occur near the surface in open-ocean and coastal areas, and are more susceptible to ship strikes, causing blunt trauma, lacerations, fin damage, or mortality. Speed et al. (2008) evaluated this specifically for whale sharks, but these other large slow-moving fishes are also likely to be susceptible because of their similar behavior and location in the water column. Increases in the numbers and sizes of shipping vessels in the modern cargo fleets make it difficult to gather mortality data because personnel on large ships are often unaware of whale shark collisions (Stevens 2007), therefore, the occurrence of whale shark strikes is likely much higher than has been documented by the few studies that have been conducted. The results of a whale shark study outside of the Study Area in the Gulf of Tadjoura, Djibouti, revealed that of the 23 whale sharks observed during a five-day period, 65 percent had scarring from boat and propeller strikes (Rowat et al. 2007a). Based on the typical physiological responses described in Section 3.9.3.3, vessel movements are not expected to compromise the general health or condition of individual fishes, except for whale sharks, basking sharks, manta rays, and ocean sunfish.

3.9.3.3.1.1 No Action Alternative, Alternative 1 and Alternative 2 – Training Activities

Exposure of fishes to vessel strike stressors is limited to those fish groups identified in Section 3.9.2.4 to 3.9.2.22 (Marine Fish Groups) that are large, slow-moving, and may occur near the surface, such as ocean sunfish, whale sharks, basking sharks, and manta rays. These species are distributed widely in offshore and nearshore portions of the Study Area. Any isolated cases of a Navy vessel striking an individual could injure that individual, impacting the fitness of an individual fish, but not to the extent that the viability of populations would be impacted. Vessel strikes would not pose a risk to most of the other marine fish groups, because many fish can detect and avoid vessel movements, making strikes rare and allowing the fish to return to their normal behavior after the ship or device passes. As a vessel approaches a fish, they could have a detectable behavioral or physiological response (e.g., swimming away and increased heart rate) as the passing vessel displaces them. However, such reactions are not expected to have lasting effects on the survival, growth, recruitment, or reproduction of these marine fish groups at the population level.

As indicated in Sections 3.0.5.3.3.1 (Vessels) and 3.0.5.3.3.2 (In-Water Devices), training activities involving in-water devices can occur anywhere in the Study Area. Navy vessel activity primarily occurs within the U.S. Exclusive Economic Zone, and certain portions of the Study Area, such as areas near ports or naval installations and training ranges (e.g., San Diego, SSTC, San Clemente Island, Pearl Harbor) are used more heavily by vessels than other portions of the Study Area. These activities do not differ seasonally and could be widely dispersed throughout the Study Area. The differences in the number of in-water device activities between alternatives increases by less than 2 percent under Alternative 1 and Alternative 2 compared to the No Action Alternative. Species that do not occur near the surface within the Study Area would not be exposed to in-water device strike potential. Species that occur near the surface within the Study Area—including the ESA-listed steelhead trout—would have the potential to be exposed to in-water device strikes.

Operational features of in-water devices and their use substantially limit the exposure of fish to potential strikes. First, in-water devices would not pose any strike risk to benthic fishes because the towed equipment is designed to stay off the bottom. Prior to deploying a towed in-water device, there is a standard operating procedure to search the intended path of the device for any floating debris (i.e., driftwood) or other potential obstructions, since they have the potential to cause damage to the device.

The likelihood of strikes by towed mine warfare devices on adult fish, which could result in injury or mortality, would be extremely low because these life stages are highly mobile. The use of in-water devices may result in short-term and local displacement of fishes in the water column. However, these behavioral reactions are not expected to result in substantial changes to an individual's fitness, or species recruitment, and are not expected to result in population-level impacts. Ichthyoplankton (fish eggs and larvae) in the water column could be displaced, injured, or killed by towed mine warfare devices. The numbers of eggs and larvae exposed to vessels or in-water devices would be extremely low relative to total ichthyoplankton biomass (Able and Fahay 1998); therefore, measurable changes on fish recruitment would not occur.

The risk of a strike from vessels and in-water devices used in training activities would be extremely low because: 1) most fish can detect and avoid vessel and in-water device movements, and (2) the types of fish that are likely to be exposed to vessel and in-water device strike are limited and occur in low concentrations where vessels and in-water devices are used. Potential impacts from exposure to vessels and in-water devices are not expected to result in substantial changes to an individual's behavior, fitness, or species recruitment, and are not expected to result in population-level impacts. Since impacts from strikes would be rare, and although any increase in vessel and in-water device use proposed under Alternatives 1 and 2 could potentially increase the probability of a strike, impacts on fish or fish populations would be negligible.

Based on the primarily nearshore distribution of steelhead trout and overlap of vessel and in-water device use, potential strike risk would be greatest in the coastal areas of the SOCAL Range Complex and SSTC. Similar to other salmon species, steelhead trout can sense pressure changes in the water column and swim quickly (Baum 1997; Popper and Hastings 2009a), and are likely to escape collision with vessels and in-water devices. However, since vessels and in-water devices could overlap with steelhead trout, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, vessel and in-water device use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of vessels and in-water devices during training activities under the No Action Alternative, Alternative 1, and Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of vessels and in-water devices under the No Action Alternative, Alternative 1, and Alternative 2 during training activities would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.3.1.2 Testing Activities

As indicated in Sections 3.0.5.3.3.1 (Vessel Strikes) and 3.0.5.3.3.2 (In-Water Devices), testing activities involving vessels and in-water devices can occur anywhere in the Study Area.

As discussed for training activities, the risk of a strike from vessels and in-water devices used in testing activities would be extremely low because: (1) most fish can detect and avoid vessel and in-water device movements, and (2) the types of fish that are likely to be exposed to vessel and in-water device strike are limited and occur in low concentrations where vessels and in-water devices are used. Potential impacts of exposure to vessels and in-water devices are not expected to result in substantial changes to an individual’s behavior, fitness, or species recruitment, and are not expected to result in population-level impacts. Since impacts from strikes would be rare, and although any increase in vessel and in-water device use proposed under Alternatives 1 and 2 could potentially increase the probability of a strike, for the reasons stated above for the No Action Alternative, impacts on fish or fish populations would be negligible.

Based on the primarily nearshore distribution of steelhead trout and overlap of vessel and in-water device use, potential strike risk would be greatest in the coastal areas of the SOCAL Range Complex and SSTC. Similar to other salmon species, steelhead trout can sense pressure changes in the water column and swim quickly (Baum 1997; Popper and Hastings 2009a), and are likely to escape collision with vessels and in-water devices. However, since vessels and in-water devices could overlap with steelhead trout, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, vessel and in-water device use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of vessels and in-water devices during testing activities under the No Action Alternative, Alternative 1, and Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of vessels and in-water devices under the No Action Alternative, Alternative 1, and Alternative 2 during testing activities would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.3.2 Impacts from Military Expended Materials

Navy training and testing activities in the Study Area include firing a variety of weapons and employing a variety of explosive and non-explosive rounds including bombs, and small-, medium-, and large-caliber projectiles, or even entire ship hulks during a sinking exercise. During these training and testing activities, various items may be introduced and expended into the marine environment and are referred to as military expended materials.

This section analyzes the strike potential to marine fish of the following categories of military expended materials: (1) non-explosive practice munitions, (2) fragments from high-explosive munitions, and (3) expended materials other than ordnance, such as sonobuoys, vessel hulks, and expendable targets. For a discussion of the types of activities that use military expended materials, where they are used, and how many activities would occur under each alternative, see Section 3.0.5.3.3.3 (Military Expended Materials).

While disturbance or strike from any of these objects as they sink through the water column is possible, it is not very likely for most expended materials because the objects generally sink through the water slowly and can be avoided by most fishes. Therefore, with the exception of sinking exercises, the discussion of military expended materials strikes focuses on strikes at the surface or in the upper water column from fragments (of high-explosives) and projectiles because those items have a greater potential for a fish strike as they hit the water, before slowing down as they move through the water column.

Vessel Hulk. During a sinking exercise, aircraft, ship, and submarine crews deliver ordnance on a seaborne target, usually a clean deactivated ship (Section 3.1, Water and Sediment Quality), which is deliberately sunk using multiple weapon systems. Sinking exercises occur in specific open ocean areas, outside of the coastal range complexes, in waters exceeding 6,000 ft. (1,830 m) in depth. Direct ordnance strikes from the various weapons used in these exercises are a source of potential impact. However, these impacts are discussed for each of those weapons categories in this section and are not repeated here. Therefore, the analysis of sinking exercises as a strike potential for benthic fishes is discussed in terms of the ship hulk landing on the seafloor.

Small-, Medium-, and Large-Caliber Projectiles. Various types of projectiles could cause a temporary (seconds), localized impact when they strike the surface of the water. Current Navy training and testing in the Study Area, such as gunnery exercises, include firing a variety of weapons and using a variety of non-explosive training and testing rounds, including 5 in. (12.7 centimeters [cm]) naval gun shells, torpedoes, and small-, medium-, and large-caliber projectiles. See Table 3.0-65 for information regarding the number and location of activities involving small- and medium-caliber non-explosive practice munitions. The larger-caliber projectiles are primarily used in the open ocean beyond 20 nm. Direct ordnance strikes from firing weapons are potential stressors to fishes. There is a remote possibility that an individual fish at or near the surface may be struck directly if it is at the point of impact at the time of non-explosive ordnance delivery. Expended rounds may strike the water surface with sufficient force to cause injury or mortality. However, limited fish species swim right at, or near, the surface of the water (e.g., with the exception of pelagic sharks, herring, salmonids, flying fishes, jacks, tuna, mackerels, billfishes, ocean sunfishes, and other similar species.

Various projectiles would fall on soft or hard bottom habitats, where they could either become buried immediately in the sediments, or sit on the bottom for an extended time period (See Figures 3.3-1 through 3.3-6). Except for the 5 in. (12.7 cm) and the 30 mm rounds, which are fired from a helicopter, all projectiles would be aimed at surface targets. These targets would absorb most of the projectiles' energy before they strike the surface of the water and sink. This factor would limit the possibility of high-velocity impacts with fish from the rounds entering the water. Furthermore, fish can quickly and easily leave an area temporarily when vessels or helicopters approach. It is reasonable to assume, therefore, that fish would leave an area prior to, or just after the onset of, projectile firing and would return once tests are completed.

Most ordnance would sink through the water column and come to rest on the seafloor, stirring up sediment and possibly inducing a startle response, displacing, or injuring nearby fishes in extremely rare cases. Particular impacts on a given fish species would depend on the size and speed of the ordnance, the water depth, the number of rounds delivered, the frequency of training and testing, and the sensitivity of the fish.

Bombs, Missiles, and Rockets. Direct ordnance strikes from bombs, missiles, and rockets are potential stressors to fishes. Some individual fish at or near the surface may be struck directly if they are at the point of impact at the time of non-explosive ordnance delivery. However, most missiles hit their target or are disabled before hitting the water. Thus, most of these missiles and aerial targets hit the water as fragments, which quickly dissipates their kinetic energy within a short distance of the surface. A limited number of fishes swim right at, or near, the surface of the water, as described for small-, medium-, and large-caliber projectiles.

As discussed in Appendix I, statistical modeling conducted for the Study Area indicates that the probability of military expended materials striking marine mammals is extremely low. Statistical modeling could not be conducted to estimate the probability of military expended material strikes on fish, because fish density data are not available at the scale of an OPAREA or testing range.

In lieu of strike probability modeling, the number, size, and area of potential impact (or "footprints") of each type of military expended material is presented in Tables 3.3-5 through 3.3-7. The application of this type of footprint analysis to fish follows the notion that a fish occupying the impact area could be susceptible to potential impacts, either at the water surface (e.g., pelagic sharks, salmonids, flying fishes, jacks, tuna, mackerels, billfishes, and ocean sunfishes [Table 3.9-2]) or as military expended material falls through the water column and settles to the bottom (e.g., flounders, skates, and other benthic fishes listed in Table 3.9-2). Furthermore, most of the projectiles fired during training and testing activities are fired at targets, and most projectiles hit those targets, so only a very small portion of those would hit the water with their maximum velocity and force. Of that small portion, a small number of fish at or near the surface (pelagic fishes) or near the bottom (benthic fishes) may be directly impacted if they are in the target area and near the expended item that hits the water surface (or bottom), but population-level effects would not occur.

Propelled fragments are produced by an exploding bomb. Close to the explosion, fishes could potentially sustain injury or death from propelled fragments (Stuhmiller et al. 1990). However, studies of underwater bomb blasts have shown that fragments are larger than those produced during air blasts and decelerate much more rapidly (O'Keefe and Young 1984; Swisdak Jr. and Montaro 1992), reducing the risk to marine organisms.

Fish disturbance or strike could result from bomb fragments (after explosion) falling through the water column in very small areas compared to the vast expanse of the testing ranges, OPAREAs, range complexes, or the Study Area. The expected reaction of fishes exposed to this stressor would be to immediately leave the area where bombing is occurring, thereby reducing the probability of a fish strike after the initial expended materials hit the water surface. When a disturbance of this type concludes, the area would be repopulated and the fish stock would rebound with inconsequential impacts on the resource (Lundquist et al. 2010).

3.9.3.3.2.1 No Action Alternative – Training Activities

Tables 3.0-65 to 3.0-67 list the number and location of military expended materials, most of which are small- and medium caliber projectiles. As indicated in Section 3.0.5.3.3.3 (Military Expended Materials), under the No Action Alternative, military expended material use can occur throughout the Study Area.

Marine fish groups identified in Section 3.9.2.4 to 3.9.2.22 (Marine Fish Groups) that are particularly susceptible to military expended material strikes are those occurring at the surface, within the offshore and continental shelf portions of the range complexes (where the strike would occur). Those groups include pelagic sharks, salmonids, flying fishes, jacks, tuna, mackerels, billfishes, ocean sunfishes, and other similar species (Table 3.9-2). Additionally, certain deep-sea fishes would be exposed to strike risk as a ship hulk, expended during a sinking exercise, settles to the seafloor. These groups include hagfishes, dragonfishes, lanternfishes, anglerfishes, and oarfishes.

Projectiles, bombs, missiles, rockets, projectiles and associated fragments have the potential to directly strike fish as they hit the water surface and below the surface to the point where the projectile loses its forward momentum. Fish at and just below the surface would be most susceptible to injury from strikes because velocity of these materials would rapidly decrease upon contact with the water and as it travels through the water column. Consequently, most water column fishes would have ample time to detect and avoid approaching munitions or fragments as they fall through the water column. The probability of strike based on the “footprint” analysis included in Table 3.3-5 indicates that even for an extreme case of expending all small-caliber projectiles within a single gunnery box, the probability of any of these items striking a fish (even as large as bluefin tuna or whale sharks) is extremely low. Therefore, since most fishes are smaller than bluefin tuna or whale sharks, and most military expended materials are less abundant than small-caliber projectiles, the risk of strike by these items is exceedingly low for fish overall. A possibility exists that a small number of fish at or near the surface may be directly impacted if they are in the target area and near the point of physical impact at the time of military expended material strike, but population-level impacts would not occur.

Sinking exercises occur in open-ocean areas, outside of the coastal range complexes. While serious injury or mortality to individual fish would be expected if they were present within range of high explosive activities (analyzed in Section 3.9.3.1, Acoustic Stressors), sinking exercises under the No Action Alternative would not result in impacts on pelagic fish populations at the surface based on the low number of fish in the immediate area and the placement of these activities in deep, ocean areas where fish abundance is low or widely dispersed. Disturbances to benthic fishes from sinking exercises would be highly localized. Any deep sea fishes located on the bottom where a ship hulk would settle could experience displacement, injury, or death. However, population level impacts on the deep sea fish community would not occur because of the limited spatial extent of the impact and the wide dispersal of fishes in deep ocean areas.

The impact of military expended material strikes would be inconsequential due to the (1) limited number of species found directly at the surface where military expended material strikes could occur; (2), the rare chance that a fish might be directly struck at the surface by military expended materials, and; (3) the ability of most fish to detect and avoid an object falling through the water below the surface. The potential impacts of military expended material strikes would be short term and localized disturbances of the water column (and seafloor areas within sinking exercise locations).

Based on the primarily nearshore distribution of steelhead trout and overlap of military expended materials use, potential strike risk would be greatest in the coastal areas of the SOCAL Range Complex and SSTC. While military expended materials use could overlap with steelhead trout, the likelihood of a strike would be extremely low given the low abundance of steelhead trout in the Study Area and the dispersed nature of the activity. However, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, military expended materials use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of military expended materials during training activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

Military expended material strikes during training activities under the No Action Alternative would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.3.2.2 Testing Activities

Tables 3.0-65 to 3.0-67 list the number and location of military expended materials, most of which are small- and medium-caliber projectiles. As indicated in Section 3.0.5.3.3.3 (Military Expended Materials), under the No Action Alternative, military expended material use can occur throughout the Study Area.

The potential impacts of military expended material strikes would be short term and localized disturbances of the water surface and seafloor areas and would be inconsequential for the same reasons stated under the analysis under the No Action Alternative for training activities.

Based on the primarily nearshore distribution of steelhead trout and overlap of military expended materials use, potential strike risk would be greatest in the coastal areas of the SOCAL Range Complex and SSTC. While military expended materials use could overlap with steelhead trout, the likelihood of a strike would be extremely low given the low abundance of steelhead trout in the Study Area and the dispersed nature of the activity. However, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, military expended materials use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of military expended materials during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

Military expended material strikes during testing activities under the No Action Alternative would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.3.2.3 Alternative 1 – Training Activities

Tables 3.0-65 to 3.0-67 list the number and location of military expended materials, most of which are small- and medium-caliber projectiles. As indicated in Section 3.0.5.3.3.3 (Military Expended Materials), under Alternative 1, military expended material use can occur throughout the Study Area.

Compared to the No Action Alternative, the overall increase in military expended materials used under Alternative 1 is due primarily to a large increase in small-caliber projectiles, and a relatively smaller increase in the number of medium-caliber projectiles. These changes would result in increased exposure of fish to military expended materials; however, the probability of strike based on the "footprint" analysis included in Table 3.3-6 indicates that even for an extreme case of expending all small-caliber projectiles within a single gunnery box, the probability of any of these items striking a fish (even as large as bluefin tuna or whale sharks) is extremely low. The potential impacts of military expended material strikes would be short term and localized disturbances of the water surface (and seafloor areas within sinking exercise locations) and would be inconsequential for the same reasons stated under the analysis under the No Action Alternative for training activities.

Based on the primarily nearshore distribution of steelhead trout and overlap of military expended materials use, potential strike risk would be greatest in the coastal areas of the SOCAL Range Complex and SSTC. While military expended materials use could overlap with steelhead trout, the likelihood of a strike would be extremely low given the low abundance of steelhead trout in the Study Area and the dispersed nature of the activity. However, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, military expended materials use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of military expended materials during training activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

Military expended material strikes during training activities under Alternative 1 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.3.2.4 Testing Activities

Tables 3.0-65 to 3.0-67 list the number and location of military expended materials, most of which are small- and medium-caliber projectiles. As indicated in Section 3.0.5.3.3.3 (Military Expended Materials), under Alternative 1, military expended material use can occur throughout the Study Area.

Compared to the No Action Alternative, the overall increase in military expended materials used under Alternative 1 is due primarily to a large increase in small-caliber projectiles, and a relatively smaller increase in the number of medium-caliber projectiles. These changes would result in increased exposure of fish to military expended materials; however, the probability of strike based on the "footprint" analysis included in Table 3.3-6 indicates that even for an extreme case of expending all small-caliber projectiles within a single gunnery box, the probability of any of these items striking a fish (even as large as bluefin tuna or whale sharks) is extremely low. The potential impacts of military expended material strikes would be short term and localized disturbances of the water surface (and seafloor areas within sinking exercise locations) and would be inconsequential for the same reasons stated under the analysis under the No Action Alternative for training activities.

Based on the primarily nearshore distribution of steelhead trout and overlap of military expended materials use, potential strike risk would be greatest in the coastal areas of the SOCAL Range Complex and SSTC. While military expended materials use could overlap with steelhead trout, the likelihood of a strike would be extremely low given the low abundance of steelhead trout in the Study Area and the dispersed nature of the activity. However, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, military expended materials use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of military expended materials during testing activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

Military expended material strikes during training activities under Alternative 1 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.3.2.5 Alternative 2 – Training Activities

The number and location of training activities under Alternative 2 are identical to training activities under Alternative 1. Therefore, impacts and comparisons to the No Action Alternative would also be identical as described in Section 3.9.3.3.2.2 (Alternative 1).

Pursuant to the ESA, the use of military expended materials during training activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

Military expended material strikes during training activities under Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.3.2.6 Alternative 2 – Testing Activities

Tables 3.0-65 to 3.0-67 list the number and location of military expended materials, most of which are small- and medium-caliber projectiles. As indicated in Section 3.0.5.3.3.3 (Military Expended Materials), under Alternative 2, military expended material use can occur throughout the Study Area.

Compared to the No Action Alternative, the overall increase in military expended materials used under Alternative 2 is due primarily to a large increase in small-caliber projectiles, and a relatively smaller increase in the number of medium-caliber projectiles. These changes would result in increased exposure of fish to military expended materials; however, the probability of strike based on the “footprint” analysis included in Table 3.3-7 indicates that even for an extreme case of expending all small-caliber projectiles within a single gunnery box, the probability of any of these items striking a fish (even as large as bluefin tuna or whale sharks) is extremely low. The potential impacts of military expended material strikes would be short term and localized disturbances of the water surface (and seafloor areas within sinking exercise locations) and would be inconsequential for the same reasons stated under the analysis under the No Action Alternative for training activities.

Based on the primarily nearshore distribution of steelhead trout and overlap of military expended materials use, potential strike risk would be greatest in the coastal areas of the SOCAL Range Complex and SSTC. While military expended materials use could overlap with steelhead trout, the likelihood of a strike would be extremely low given the low abundance of steelhead trout in the Study Area and the dispersed nature of the activity. However, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, military expended materials use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of military expended materials during testing activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

Military expended material strikes during training activities under Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.3.3 Impacts from Seafloor Devices

For a discussion of the types of activities that use seafloor devices, where they are used, and how many activities would occur under each alternative, see Section 3.0.5.3.3.4 (Seafloor Devices). Seafloor devices include items that are placed on, dropped on, or moved along the seafloor such as mine shapes, anchor blocks, anchors, bottom-placed instruments, bottom-crawling unmanned undersea vehicles, and bottom-placed targets that are not expended. As discussed in the military expended materials strike section, objects falling through the water column would slow in velocity as they sink toward the bottom and could be avoided by most fish.

Seafloor devices with a strike potential for fish include those items temporarily deployed on the seafloor. The potential strike impacts of unmanned underwater vehicles, including bottom crawling types, are also included here. Entanglement in seafloor cables is discussed in Section 3.9.3.4 (Entanglement Stressors). Some fishes are attracted to virtually any tethered object in the water column for food or refuge (Dempster and Taquet 2004) and could be attracted to an inert mine assembly. However, while a fish might be attracted to the object, their sensory abilities allow them to avoid colliding with fixed tethered objects in the water column (Bleckmann and Zelick 2009), so the likelihood of a fish striking one of these objects is implausible. Therefore, strike hazards associated with collision into other seafloor devices such as deployed mine shapes or anchored devices are highly unlikely to pose any strike hazard to fishes and are not discussed further.

3.9.3.3.3.1 No Action Alternative – Training Activities

Table 3.0-70 lists the number and location of activities that use seafloor devices. As indicated in Section 3.0.5.3.3.4 (Seafloor Devices), under the No Action Alternative, activities that use seafloor devices occur in the SSTC, Hawaii, and SOCAL Range Complexes.

Seafloor devices have the potential to directly strike fish as they hit the water surface and below the surface to the point where the projectile strikes the bottom. Fish at and just below the surface, as well as those on the bottom would be most susceptible to injury from strikes because velocity of these materials would rapidly decrease upon contact with the water and as it travels through the water column. Consequently, most water column fishes would have ample time to detect and avoid approaching devices as they fall through the water column. A possibility exists that a small number of fish at or near the surface or resting on the bottom may be directly impacted if they are in the target area and near the point of physical impact at the time of seafloor device strike, but the likelihood of one of these objects striking a fish is implausible and in the rare event that a strike occurred, population-level impacts would not occur.

Based on the primarily nearshore distribution of steelhead trout and overlap of seafloor device use, potential strike risk would be greatest in the coastal areas of the SOCAL Range Complex. While seafloor device use could overlap with steelhead trout, the likelihood of a strike would be extremely low given the low abundance of steelhead trout in the Study Area and the dispersed nature of the activity. However, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, seafloor device use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of seafloor devices during training activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of seafloor devices during training activities under the No Action Alternative would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.3.3.2 No Action Alternative – Testing Activities

Table 3.0-70 lists the number and location of activities that use seafloor devices. As indicated in Section 3.0.5.3.3.4 (Seafloor Devices), under the No Action Alternative, testing activities that use seafloor devices occur only in the SOCAL Range Complex.

Seafloor devices have the potential to directly strike fish as they hit the water surface and below the surface to the point where the projectile strikes the bottom. Fish at and just below the surface, as well as those on the bottom would be most susceptible to injury from strikes because velocity of these materials would rapidly decrease upon contact with the water and as it travels through the water column. Consequently, most water column fishes would have ample time to detect and avoid approaching devices as they fall through the water column. A possibility exists that a small number of fish at or near the surface or resting on the bottom may be directly impacted if they are in the target area and near the point of physical impact at the time of seafloor device strike, but the likelihood of one of these objects striking a fish is implausible and in the rare event that a strike occurred, population-level impacts would not occur.

Based on the primarily nearshore distribution of steelhead trout and overlap of seafloor device use, potential strike risk would be greatest in the coastal areas of the SOCAL Range Complex and SSTC. While seafloor device use could overlap with steelhead trout, the likelihood of a strike would be extremely low given the low abundance of steelhead trout in the Study Area and the dispersed nature of the activity. However, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, seafloor device use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of seafloor devices during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of seafloor devices during testing activities under the No Action Alternative would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.3.3.3 Alternative 1 – Training Activities

Training activities that deploy seafloor devices under Alternative 1 would occur in the same geographic areas as under the No Action Alternative, Section 3.9.3.3.3.1 (No Action Alternative), and are expected to decrease by approximately 7 percent.

Similar to the No Action Alternative, a possibility exists that a small number of fish at or near the surface or resting on the bottom may be directly impacted if they are in the target area and near the point of physical impact at the time of seafloor device strike, but the likelihood of one of these objects striking a fish is implausible and in the rare event that a strike occurred, population-level impacts would not occur.

Based on the primarily nearshore distribution of steelhead trout and overlap of seafloor device use, potential strike risk would be greatest in the coastal areas of the SOCAL Range Complex. While seafloor device use could overlap with steelhead trout, the likelihood of a strike would be extremely low given the low abundance of steelhead trout in the Study Area and the dispersed nature of the activity. However, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, seafloor device use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of seafloor devices during training activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of seafloor devices during training activities under Alternative 1 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.3.3.4 Alternative 1 – Testing Activities

Table 3.0-70 lists the number and location of activities that use seafloor devices. As indicated in Section 3.0.5.3.3.4 (Seafloor Devices), under Alternative 1, the number of activities using seafloor devices is approximately twice that of the No Action Alternative. The activities using seafloor devices under Alternative 1 would occur in the same geographic location as the No Action Alternative. In addition, seafloor devices would be used in the Hawaii Range Complex. As discussed in Section 3.9.3.3.2 (Impacts from Military Expended Materials Strike), and similar to the No Action Alternative, a possibility exists that a small number of fish at or near the surface or resting on the bottom may be directly impacted if they are in the target area and near the point of physical impact at the time of seafloor device strike, but the likelihood of one of these objects striking a fish is implausible and in the rare event that a strike occurred, population-level impacts would not occur.

Based on the primarily nearshore distribution of steelhead trout and overlap of seafloor device use, potential strike risk would be greatest in the coastal areas of the SOCAL Range Complex and SSTC. While seafloor device use could overlap with steelhead trout, the likelihood of a strike would be extremely low given the low abundance of steelhead trout in the Study Area and the dispersed nature of the activity. However, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, seafloor device use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of seafloor devices during testing activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of seafloor devices during testing activities under Alternative 1 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.3.3.5 Alternative 2 – Training Activities

The number and location of training activities under Alternative 2 are identical to training activities under Alternative 1. Therefore, impacts and comparisons to the No Action Alternative would also be identical as described in Section 3.9.3.3.3.2, Alternative 1.

Pursuant to the ESA, the use of seafloor devices during training activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of seafloor devices during training activities under Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.3.3.6 Alternative 2 – Testing Activities

Table 3.0-70 lists the number and location where seafloor devices are used. As indicated in Section 3.0.5.3.3.4 (Seafloor Devices), under Alternative 2, the number of activities using seafloor devices is approximately twice that of the No Action Alternative. The activities using seafloor devices under Alternative 2 would occur in the same geographic location as the No Action Alternative. In addition, seafloor devices would be used in the Hawaii Range Complex. As discussed in Section 3.9.3.3.2 (Impacts from Military Expended Materials Strike), and similar to the No Action Alternative and Alternative 1, a possibility exists that a small number of fish at or near the surface or resting on the bottom may be directly impacted if they are in the target area and near the point of physical impact at the time of seafloor device strike, but the likelihood of one of these objects striking a fish is implausible and in the rare event that a strike occurred, population-level impacts would not occur.

Based on the primarily nearshore distribution of steelhead trout and overlap of seafloor device use, potential strike risk would be greatest in the coastal areas of the SOCAL Range Complex and SSTC. While seafloor device use could overlap with steelhead trout, the likelihood of a strike would be extremely low given the low abundance of steelhead trout in the Study Area and the dispersed nature of the activity. However, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, seafloor device use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of seafloor devices during testing activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of seafloor devices during testing activities under Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.3.4 Summary and Conclusions of Physical Disturbance and Strike Impacts

The greatest potential for combined impacts of physical disturbance and strike stressors under the Proposed Action, would occur for sinking exercises because of multiple opportunities for potential strike by vessel, ordnance, or other military expended material. Under the Proposed Action, no more than eight sinking exercises would occur per year. Sinking exercises were specifically chosen to evaluate impacts on military expended material strike because sinking exercises represent the activity with the greatest amount of military expended materials by weight. During each sinking exercise, approximately 725 objects would be expended, including large bombs, missiles, large projectiles, torpedoes, and one target vessel. Therefore, during each sinking exercise, approximately 105 objects per km^2 would sink to the ocean floor. These items, combined with the mass and size of the ship hulk itself, are representative of an extreme case for military expended materials of all types striking benthic fishes. However, the overlap of these activities would only occur during a limited number of activities and only within the open ocean areas where the sinking exercises areas are located.

A less intensive example of potential impacts of combined strike stressors would be for cases where a fish could be displaced by a vessel in the water column during any number of activities utilizing bombs, missiles, rockets, or projectiles. As the vessel maneuvers during the exercise, any fishes displaced by that vessel movement could potentially be struck by munitions expended by that vessel during that same exercise. This would be more likely to occur in concentrated areas of this type of activity (e.g., a gunnery exercise inside a gunnery box). However, the likelihood of this occurring is probably quite low anywhere else, because most activities do not expend their munitions towards, or in proximity to, a training or testing vessel for safety reasons. While small-caliber projectiles are expended away from but often close to the vessel from which the projectiles are fired, this does not necessarily increase the risk of strike. During the initial displacement of the fish from vessel activity, or after the first several projectiles are fired, most fishes would disperse widely and the probability of strike may actually be reduced in most cases. Also, the combination of these stressors would cease immediately when the activity ends; therefore, combination is possible but not reasonably foreseeable.

3.9.3.3.5 Summary of Physical Disturbance and Strike Stressors and General Conclusions

Exposures to physical disturbance and strike stressors occur primarily within the range complexes and operating areas associated with the Study Area. Research suggests that only a limited number of marine fish species are susceptible to being struck by a vessel. Most fishes would not respond to vessel disturbance beyond a temporary displacement from their normal activity, which would be inconsequential and not detectable. The Navy identified and analyzed three physical disturbance or strike substressors that have potential to impact fishes: vessel and in-water device strikes, military expended material strikes, and seafloor device strikes. While the potential for vessel strikes on fish can occur anywhere vessels are operated, most fishes are highly mobile and capable of avoiding vessels, expended materials, or objects in the water column. For the larger slower-moving species (e.g., basking shark, manta ray, and ocean sunfish) the potential for a vessel or military expended material strike increases, as discussed in the analysis. The potential for a seafloor device striking a fish is very low because the sensory capabilities of most fishes allow them to detect and avoid underwater objects.

Pursuant to the ESA, physical disturbance and strikes under the No Action Alternative, Alternative 1, or Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

Physical disturbance and strikes under the No Action Alternative, Alternative 1, or Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.4 Entanglement Stressors

This section evaluates potential entanglement impacts of various types of expended materials used by the Navy during training and testing activities within the Study Area. The likelihood of fish being affected by an entanglement stressor is a function of the physical properties, location, and buoyancy of the object and the behavior of the fish as described in Section 3.0.5.7.4 (Conceptual Framework for Assessing Effects from Entanglement). Two types of military expended materials are considered here: (1) fiber optic cables and guidance wires, and (2) parachutes.

Most entanglement observations involve abandoned or discarded nets, lines, and other materials that form loops or incorporate rings (Derraik 2002; Keller et al. 2010; Laist 1987; Macfadyen et al. 2009). A 25-year dataset assembled by the Ocean Conservancy reported that fishing line, rope, and fishing nets accounted for approximately 68 percent of fish entanglements, with the remainder due to encounters with various items such as bottles, cans, and plastic bags (Ocean Conservancy 2010). No occurrences involving military expended materials were documented.

Fish entanglement occurs most frequently at or just below the surface or in the water column where objects are suspended. A smaller number involve objects on the seafloor, particularly abandoned fishing gear designed to catch bottom fish or invertebrates (Ocean Conservancy 2010). More fish species are entangled in coastal waters and the continental shelf than elsewhere in the marine environment because of higher concentrations of human activity (e.g., fishing, sources of entangling debris), higher fish abundances, and greater species diversity (Helfman et al. 2009b; Macfadyen et al. 2009). The consequences of entanglement range from temporary and inconsequential to major physiological stress or mortality.

Some fish are more susceptible to entanglement in derelict fishing gear and other marine debris, compared to other fish groups. Physical features, such as rigid or protruding snouts of some elasmobranchs (e.g., the wide heads of hammerhead sharks), increase the risk of entanglement compared to fish with smoother, more streamlined bodies (e.g., lamprey and eels). Most other fish, except for jawless fish and eels that are too smooth and slippery to become entangled, are susceptible to entanglement gear specifically designed for that purpose (e.g., gillnets); however, the Navy does not expend any items that are designed to function as entanglement objects.

The overall effects of entanglement are highly variable, ranging from temporary disorientation to mortality due to predation or physical injury. The evaluation of a species' entanglement potential should consider the size, location, and buoyancy of an object as well as the behavior of the fish species.

The following sections seek to identify entanglement potential due to military expended material. Where appropriate, specific geographic areas (open ocean areas, range complexes, testing ranges, and bays and inland waters) of potential impact are identified.

3.9.3.4.1 Impacts from Fiber Optic Cables and Guidance Wires

Fiber optic cables and guidance wires are used during training and testing activities. A discussion of the types of activities, physical characteristics, location of use, and the number of items expended under each alternative is presented in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires).

Marine fish groups identified in Sections 3.9.2 (Affected Environment), that could be susceptible to entanglement in expended cables and wires are those with elongated snouts lined with tooth-like structures that easily snag on other similar marine debris, such as derelict fishing gear (Macfadyen et al. 2009). Some elasmobranchs (hammerhead sharks) and billfish occurring within the offshore and continental shelf portions of the range complexes (where the potential for entanglement would occur) could be susceptible to entanglement in cables and wires. Species occurring outside the specified areas within these range complexes would not be exposed to fiber optic cables or guidance wires.

Once a guidance wire is released, it is likely to sink immediately and remain on the seafloor. In some cases, the wire may snag on a hard structure near the bottom and remain partially or completely suspended. The types of fish that encounter any given wire would depend, in part, on its geographic location and vertical location in the water column. In any situation, the most likely mechanism for entanglement would involve fish swimming through loops in the wire that tighten around it; however, loops are unlikely to form in guidance wire (Environmental Sciences Group 2005).

Because of their physical characteristics, guidance wires and fiber optic cables pose a potential, though unlikely, entanglement risk to susceptible fish. Potential entanglement scenarios are based on fish behavior in abandoned monofilament, nylon, and polypropylene lines used in commercial nets. Such derelict fishing gear is abundant in the ocean (Macfadyen et al. 2009) and pose a greater hazard to fish than the very thin wire expended by the Navy. Fishing gear materials often have breaking strengths that can be up to orders of magnitude greater than that of guidance wire and fiber optic cables (Environmental Sciences Group 2005), and are far more prone to tangling, as discussed in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires). Fiber optic cables do not easily form loops, are brittle, and break easily if bent, so they pose a negligible entanglement risk. Additionally, the encounter rate and probability of impact from guidance wires and fiber optic cables are low, as few are expended.

3.9.3.4.1.1 No Action Alternative – Training Activities

Tables 3.0-80 and 3.0-83 list the number and locations of activities that expend fiber optic cables and guidance wires. As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), under the No Action Alternative, activities that expend fiber optic cables occur in the SOCAL Range Complex and the SSTC, while expended guidance wires would occur in the Hawaii and SOCAL Range Complexes. While individual fish susceptible to entanglement could encounter guidance wires and cables, the long-term consequences of entanglement are unlikely for either individuals or populations because: (1) the encounter rate is low given the low number of items expended, (2) the types of fish that are susceptible to these items is limited, (3) the restricted overlap with susceptible fish, and (4) the properties of guidance wires and fiber optic cables reduce entanglement risk to fish. Potential impacts from exposure to guidance wires and fiber optic cables are not expected to result in substantial changes to an individual's behavior, fitness, or species recruitment, and are not expected to result in population-level impacts.

Expended torpedo guidance wire would not co-occur with the distribution and habitat of steelhead trout. The sink rates of these guidance wires would rule out the possibility of it drifting great distances into nearshore and coastal areas where steelhead trout are found, or into designated river or estuarine critical habitat.

Pursuant to the ESA, the use of fiber optic cables and guidance wires for training activities under the No Action Alternative would have no effect on ESA-listed steelhead trout.

The use of fiber optic cables and guidance wires for training activities under the No Action Alternative would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.4.1.2 No Action Alternative - Testing Activities

Tables 3.0-80 and 3.0-83 list the number and locations of activities that expend fiber optic cables and guidance wires. As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), under the No Action Alternative, activities that expend fiber optic cables occur only in the SOCAL Range Complex, while expended guidance wires would occur in the Hawaii and SOCAL Range Complexes. Risk of entanglement resulting from proposed testing activities would be low as described in the analysis for the No Action Alternative – Training Activities; therefore, testing activities are not expected to result in substantial changes to an individual's behavior, fitness, or species recruitment, and are not expected to result in population-level impacts.

Pursuant to the ESA, the use of fiber optic cables and guidance wires for testing activities under the No Action Alternative would have no effect on ESA-listed steelhead trout.

The use of fiber optic cables and guidance wires for testing activities under the No Action Alternative would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.4.1.3 Alternative 1 – Training Activities

Tables 3.0-80 and 3.0-83 list the number and locations of activities that expend fiber optic cables and guidance wires. As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), under Alternative 1, activities that expend fiber optic cables occur in the SOCAL Range Complex and the SSTC, while expended guidance wires would occur in the Hawaii and SOCAL Range Complexes. Despite the slight increase from the No Action Alternative, the risk of entanglement resulting from proposed training activities would be low as described in the analysis for the No Action Alternative – Training Activities; therefore, training activities are not expected to result in substantial changes to an individual's behavior, fitness, or species recruitment, and are not expected to result in population-level impacts.

Pursuant to the ESA, the use of fiber optic cables and guidance wires for training activities under Alternative 1 would have no effect on ESA-listed steelhead trout.

The use of fiber optic cables and guidance wires for training activities under Alternative 1 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.4.1.4 Alternative 1 – Testing Activities

Tables 3.0-80 and 3.0-83 list the number and locations of activities that expend fiber optic cables and guidance wires. As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), under Alternative 1, activities that expend fiber optic cables occur only in the SOCAL Range Complex, while expended guidance wires would occur in the Hawaii and SOCAL Range Complexes. Despite the approximately 20 percent increase from the No Action Alternative, the risk of entanglement resulting from proposed testing activities would be low as described in the analysis for the No Action Alternative – Training Activities; therefore, testing activities are not expected to result in substantial changes to an individual's behavior, fitness, or species recruitment, and are not expected to result in population-level impacts.

Pursuant to the ESA, the use of fiber optic cables and guidance wires for testing activities under Alternative 1 would have no effect on ESA-listed steelhead trout.

The use of fiber optic cables and guidance wires for testing activities under Alternative 1 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.4.1.5 Alternative 2 – Training Activities

The number and location of training activities under Alternative 2 are identical to training activities under Alternative 1. Therefore, impacts and comparisons to the No Action Alternative would also be identical as described in Section 3.9.3.4.1.2 (Alternative 1 – Training). Despite the slight increase from the No Action Alternative, the risk of entanglement resulting from proposed training activities would be low as described in the analysis for the No Action Alternative – Training Activities; therefore, training activities are not expected to result in substantial changes to an individual's behavior, fitness, or species recruitment, and are not expected to result in population-level impacts.

Pursuant to the ESA, the use of fiber optic cables and guidance wires for training activities under Alternative 2 would have no effect on ESA-listed steelhead trout.

The use of fiber optic cables and guidance wires for training activities under Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.4.1.6 Alternative 2 – Testing Activities

Tables 3.0-80 and 3.0-83 list the number and locations of activities that expend fiber optic cables and guidance wires. As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires), under Alternative 2, activities that expend fiber optic cables occur only in the SOCAL Range Complex, while expended guidance wires would occur in the Hawaii and SOCAL Range Complexes. As indicated in Section 3.0.5.3.4.1 (Fiber Optic Cables and Guidance Wires) under Alternative 2, the number of activities that expend fiber optic cables is nearly the same as that of the No Action Alternative. The activities using fiber optic cables under Alternative 2 would occur in the same geographic locations as the No Action Alternative. The number of torpedo activities that expend guidance wire is nearly two times that of the No Action Alternative. These activities under Alternative 2 would occur in the same geographic locations as the No Action Alternative. Despite the increase from the No Action Alternative, the risk of entanglement resulting from proposed testing activities would be low as described in the analysis for the No Action Alternative – Training Activities; therefore, testing activities are not expected to result in substantial changes to an individual's behavior, fitness, or species recruitment, and are not expected to result in population-level impacts.

Pursuant to the ESA, the use of fiber optic cables and guidance wires for testing activities under Alternative 2 would have no effect on ESA-listed steelhead trout.

The use of fiber optic cables and guidance wires for testing activities under Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.4.2 Impacts from Parachutes

Parachutes of varying sizes are used during training and testing activities. The types of activities that use parachutes, physical characteristics and size of parachutes, locations where parachutes are used, and the number of parachute activities proposed under each alternative are presented in Section 3.0.5.3.4.2 (Parachutes).

Fish face many potential entanglement scenarios in abandoned monofilament, nylon, polypropylene line, and other derelict fishing gear in the nearshore and offshore marine habitats of the Study Area (Macfadyen et al. 2009; Ocean Conservancy 2010). Abandoned fishing gear is dangerous to fish because it is abundant, essentially invisible, strong, and easily tangled. In contrast, parachutes are rare, highly visible, and not designed to capture fish. The combination of low encounter rates and weak entangling features reduce the risk that steelhead trout would be adversely impacted by parachutes.

Once a parachute has been released to the water, it poses a potential entanglement risk to fish. The Naval Ocean Systems Center identified the potential impacts of torpedo air launch accessories, including parachutes, on fish (U.S. Department of the Navy 1996). Unlike other materials in which fish become entangled (such as gill nets and nylon fishing line), the parachute is relatively large and visible, reducing the chance that visually oriented fish would accidentally become entangled in it. No cases of fish entanglement have been reported for parachutes (Ocean Conservancy 2010,U.S. Department of the Navy 2001a). Entanglement in a newly-expended parachute while it is in the water column is unlikely because fish generally react to sound and motion at the surface with a behavioral reaction by swimming away from the source (see Section 3.9.3.3.2, Impacts from Military Expended Material Strikes) and would detect the oncoming parachute in time to avoid contact. While the parachute is sinking, fish would have ample opportunity to swim away from the large moving object. Even if the parachute landed directly on a fish, it would likely be able to swim away faster than the parachute would sink because the resistance of the water would slow the parachute’s downward motion.

Once the parachute is on the bottom, however, it is feasible that a fish could become entangled in the parachute or its suspension lines while diving and feeding, especially in deeper waters where it is dark. If the parachute dropped in an area of strong bottom currents, it could billow open and pose a short-term entanglement threat to large fish feeding on the bottom. Benthic fish with elongated spines could become caught on the parachute or lines. Most sharks and other smooth-bodied fish are not expected to become entangled because their soft, streamlined bodies can more easily slip through potential snares. A fish with spines or protrusions (e.g., some sharks, billfish, sturgeon, or sawfish) on its body that swam into the parachute or a loop in the lines, and then struggled, could become bound tightly enough to prevent escape. Although this scenario is possible based on the structure of the materials and the shape and behavior of fish, it is not considered a likely event.

Aerial-launched sonobuoys are deployed with a parachute. The sonobuoy itself is not considered an entanglement hazard for upon deployment (Environmental Sciences Group 2005), but their components may pose an entanglement hazard once released into the ocean. Sonobuoys contain cords, electronic components, and plastic mesh that may entangle fish (Environmental Sciences Group 2005). Open-ocean filter feeding species, such as basking sharks, whale sharks, and manta rays could become entangled in these items, whereas smaller species could become entangled in the plastic mesh in the same manner as a small gillnet. Since most sonobuoys are expended in offshore areas, many coastal fish would not encounter or have any opportunity to become entangled in materials associated with sonobuoys, apart from the risk of entanglement in parachutes described above.

3.9.3.4.2.1 No Action Alternative – Training Activities

Table 3.0-84 lists the number and locations of activities that expend parachutes. The number and footprint of parachutes are detailed in Table 3.3-5 (Marine Habitats). As indicated in Section 3.0.5.3.4.2 (Parachutes) under the No Action Alternative, activities involving parachute use would occur in the open ocean portions of the Study Area. Given the size of the range complexes and the resulting widely scattered parachutes (0.12 per nm^2), it would be very unlikely that fishes would encounter and become entangled in any parachutes or sonobuoy accessories. If a fish were to encounter and become entangled in any of these items, the growth, survival, annual reproductive success, or lifetime reproductive success of populations would not be impacted directly or indirectly.

Expended parachutes generally would not co-occur with the distribution and critical habitat of steelhead trout. However, if an expended parachute were encountered, the steelhead trout, like all salmonids, is a strong swimmer with a streamlined body that is unlikely to become entangled in parachutes or lines, but there would be the potential for effect.

Pursuant to the ESA, the use of parachutes for training activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of parachutes for training activities under the No Action Alternative would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.4.2.2 No Action Alternative – Testing Activities

Table 3.0-84 lists the number and locations of activities that expend parachutes. The number and footprint of parachutes are detailed in Table 3.3-5. As indicated in Section 3.0.5.3.4.2 (Parachutes) under the No Action Alternative, activities involving parachute use would occur in the open ocean portions of the Hawaii and SOCAL Range Complexes. Given the size of the range complexes and the resulting widely scattered parachutes (0.02 per nm^2), it would be very unlikely that fishes would encounter and become entangled in any parachutes or sonobuoy accessories. If a fish were to encounter and become entangled in any of these items, the growth, survival, annual reproductive success, or lifetime reproductive success of populations would not be impacted directly or indirectly.

Expended parachutes generally would not co-occur with the distribution and critical habitat of steelhead trout. However, if an expended parachute were encountered, the steelhead trout, like all salmonids, is a strong swimmer with a streamlined body that is unlikely to become entangled in parachutes or lines, but there would be the potential for effect.

Pursuant to the ESA, the use of parachutes for testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of parachutes for testing activities under the No Action Alternative would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.4.2.3 Alternative 1 – Training Activities

Table 3.0-84 lists the number and locations of activities that expend parachutes. The number and footprint of parachutes are detailed in Table 3.3-6. As indicated in Section 3.0.5.3.4.2 (Parachutes) under Alternative 1, activities involving parachute use would occur in the open ocean portions of the Study Area. Given the size of the range complexes and the resulting widely scattered parachutes (0.14 per nm^2), it would be very unlikely that fishes would encounter and become entangled in any parachutes or sonobuoy accessories. If a fish were to encounter and become entangled in any of these items, the growth, survival, annual reproductive success, or lifetime reproductive success of populations would not be impacted directly or indirectly.

Expended parachutes generally would not co-occur with the distribution and critical habitat of steelhead trout. However, if an expended parachute were encountered, the steelhead trout, like all salmonids, is a strong swimmer with a streamlined body that is unlikely to become entangled in parachutes or lines, but there would be the potential for effect.

Pursuant to the ESA, the use of parachutes for training activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of parachutes for training activities under Alternative 1 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.4.2.4 Alternative 1 – Testing Activities

Table 3.0-84 lists the number and locations of activities that expend parachutes. The number and footprint of parachutes are detailed in Table 3.3-6. As indicated in Section 3.0.5.3.4.2, (Parachutes) under Alternative 1, activities involving parachute use would occur in the open ocean portions of the Hawaii and SOCAL Range Complexes, with the number of activities involving the use of parachutes being approximately two times that of the No Action Alternative. The activities using parachutes under Alternative 1 would occur in the same geographic locations as the No Action Alternative. Given the size of the range complexes and the resulting widely scattered parachutes (0.03 per nm^2), it would be very unlikely that fishes would encounter and become entangled in any parachutes or sonobuoy accessories. If a fish were to encounter and become entangled in any of these items, the growth, survival, annual reproductive success, or lifetime reproductive success of populations would not be impacted directly or indirectly.

Expended parachutes generally would not co-occur with the distribution and critical habitat of steelhead trout. However, if an expended parachute were encountered, the steelhead trout, like all salmonids, is a strong swimmer with a streamlined body that is unlikely to become entangled in parachutes or lines, but there would be the potential for effect.

Pursuant to the ESA, the use of parachutes for testing activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of parachutes for testing activities under Alternative 1 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.4.2.5 Alternative 2 – Training Activities

The number and location of training activities under Alternative 2 are identical to training activities under Alternative 1. Therefore, impacts and comparisons to the No Action Alternative would also be identical as described in Section 3.9.3.4.2.2, Alternative 1.

Pursuant to the ESA, the use of parachutes for training activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of parachutes for training activities under Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.4.2.6 Alternative 2 – Testing Activities

Table 3.0-84 lists the number and locations of activities that expend parachutes. The number and footprint of parachutes are detailed in Table 3.3-7. As indicated in Section 3.0.5.3.4.2 (Parachutes) under Alternative 2, activities involving parachute use would occur in the open ocean portions of the Hawaii and SOCAL Range Complexes, with the number of activities involving the use of parachutes being approximately two times that of the No Action Alternative. The activities using parachutes under Alternative 2 would occur in the same geographic locations as the No Action Alternative. Given the size of the range complexes and the resulting widely scattered parachutes (0.03 per nm^2), it would be very unlikely that fishes would encounter and become entangled in any parachutes or sonobuoy accessories. If a fish were to encounter and become entangled in any of these items, the growth, survival, annual reproductive success, or lifetime reproductive success of populations would not be impacted directly or indirectly.

Expended parachutes generally would not co-occur with the distribution and critical habitat of steelhead trout. However, if an expended parachute were encountered, the steelhead trout, like all salmonids, is a strong swimmer with a streamlined body that is unlikely to become entangled in parachutes or lines, but there would be the potential for effect.

Pursuant to the ESA, the use of parachutes for testing activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of parachutes for testing activities under Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.4.3 Summary and Conclusions of Entanglement Impacts

While most fish species are susceptible to entanglement in fishing gear that is designed to entangle a fish by trapping a fish by its gills or spines (e.g., gill nets), only a limited number of fish species that possess certain features such as an irregular shaped or rigid rostrum (snout) (e.g., billfish) are susceptible to entanglement by military expended materials. A survey of marine debris entanglements found no fish entanglements in military expended materials in a 25-year dataset (Ocean Conservancy 2010).

3.9.3.4.3.1 Combined Entanglement Stressors

An individual fish could experience the following consequences of entanglement stressors: displacement, stress, avoidance response, behavioral changes, entanglement causing injury, and entanglement causing mortality. If entanglement results in mortality, it cannot act in combination because mortal injuries occur with the first instance. Therefore, there is no possibility for the occurrence of this consequence to increase if sub-stressors are combined.

Sub-lethal consequences may result in delayed mortality because they cause irrecoverable injury or alter the individual's ability to feed or detect and avoid predation. Sub-lethal effects resulting in mortality could be more likely if the activities occurred in essentially the same location and occurred within the individual's recovery time from the first disturbance. This circumstance is only likely to arise during training and testing activities that cause frequent and recurring entanglement stressors to essentially the same location (e.g., torpedoes expended at the same location as sonobuoys). In these specific circumstances the potential consequences to fishes from combinations of entanglement stressors may be greater than the sum of their individual consequences.

These specific circumstances that could multiply the consequences of entanglement stressors are highly unlikely to occur for two reasons. First, it is highly unlikely that torpedo guidance wires and sonobuoy parachutes would impact essentially the same space because most of these sub-stressors are widely dispersed in time and space. Because the risk of injury or mortality is extremely low for each sub-stressor independently, the combined impact of these sub-stressors does not increase the risk in a meaningful way. Furthermore, while it is conceivable that interaction between sub-stressors could magnify their combined risks, the necessary circumstances are highly unlikely to overlap.

Interaction between entanglement sub-stressors is likely to have neutral consequences for fishes. There is no potential for these entangling objects to combine in a way that would multiply their impact, as is the case with derelict (abandoned or discarded) fishing nets that commonly occur in the Study Area (Macfadyen et al. 2009) and entangle fish by design. Fish entangled in derelict nets attract scavengers and predators that may themselves become entangled in an ongoing cycle (Morgan and Chuenpagdee 2003). Guidance wires and parachutes are used relatively infrequently over a wide area, and are mobile for only a short time. Therefore, unlike discarded fishing gear, it is extremely unlikely that guidance wires and parachutes could interact.

3.9.3.4.3.2 Summary of Entanglement Stressors

The Navy identified and analyzed three military expended materials types that have potential to entangle fishes: fiber-optic cables, guidance wires, and parachutes. Other military expended materials types such as bomb or missile fragments do not have the physical characteristics to entangle fishes in the marine environment and were not analyzed. Even for fishes that might encounter and become entangled in an expended guidance wire, the breaking strength of that wire is low enough that the impact would be only temporary and not likely to impact the individual.

Pursuant to the ESA, entanglement stressors used under the No Action Alternative, Alternative 1, and Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

Entanglement stressors used under the No Action Alternative, Alternative 1, and Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.5 Ingestion Stressors

This section analyzes the potential ingestion impacts of the various types of munitions and military expended materials other than munitions used by the Navy during training and testing activities within the Study Area. Aspects of ingestion stressors that are applicable to marine organisms in general are presented in Section 3.0.5.7.5 (Conceptual Framework for Assessing Effects from Ingestion). Ingestion of expended materials by fishes could occur in coastal and open ocean areas, and can occur at the surface, in the water column, or at the seafloor depending on the size and buoyancy of the expended object and the feeding behavior of the fish. Floating material is more likely to be eaten by fishes that feed at or near the water surface (e.g., ocean sunfishes, basking sharks, manta rays, etc.), while materials that sink to the seafloor present a higher risk to bottom-feeding fishes (e.g., rockfish, hammerhead sharks, skates/rays, flounders).

It is reasonable to assume that any item of a size that can be swallowed by a fish could be eaten at some time; this analysis focuses on ingestion of materials in two locations: (1) at the surface or water column, and (2) at the seafloor. Open-ocean predators and open-ocean planktivores are most likely to ingest materials in the water column. Coastal bottom-dwelling predators and estuarine bottom-dwelling predators could ingest materials from the seafloor. The potential for fish, including the ESA-listed fish species, to encounter and ingest expended materials is evaluated with respect to their feeding group and geographic range, which influence the probability that they would eat military expended materials.

The Navy expends the following types of materials during training and testing in the Study Area that could become ingestion stressors: non-explosive practice munitions (small- and medium-caliber), fragments from high-explosives, fragments from targets, chaff, flare casings (including plastic end caps and pistons), and small parachutes. The activities that expend these items and their general distribution are detailed in Section 3.0.5.3.5 (Ingestion Stressors). Metal items eaten by marine fish are generally small (such as fishhooks, bottle caps, and metal springs), suggesting that small- and medium-caliber projectiles, pistons, or end caps (from chaff canisters or flares) are more likely to be ingested. Both physical and toxicological impacts could occur as a result of consuming metal or plastic materials. Items of concern are those of ingestible size that either drift at or just below the surface (or in the water column) for a time or sink immediately to the seafloor. The likelihood that expended items would cause a potential impact on a given fish species depends on the size and feeding habits of the fish and the rate at which the fish encounters the item and the composition of the item. In this analysis only small- and medium-caliber munitions (or small fragments from larger munitions), chaff, small parachutes, and end caps and pistons from flares and chaff cartridges are considered to be of ingestible size for a fish.

The analysis of ingestion impacts on fish is structured around the following feeding strategies:

Feeding at or Just Below the Surface or Within the Water Column

- **Open-Ocean Predators.** Large, migratory, open-ocean fishes, such as tuna, dorado, sharks, and billfishes, feed on fast-swimming prey in the water column of the Study Area. These fishes range widely in search of unevenly distributed food patches. Smaller military expended materials could be mistaken for prey items and ingested purposefully or incidentally as the fish is swimming. Prey fishes sometimes dive deeper to avoid an approaching predator (Pitcher 1986). A few of these predatory fishes (e.g., tiger sharks) are known to ingest any type of marine debris that fit into its mouth, even items such as tires.
- **Open-Ocean Planktivores.** Plankton eating fish in the open-ocean portion of the Study Area include anchovies, sardines, flying fishes, ocean sunfish, manta rays, whale sharks, and basking sharks. These fishes feed by either filtering plankton from the water column or by selectively ingesting larger zooplankton. These planktivores could encounter, and incidentally feed on smaller types of military expended materials (e.g., chaff, end caps, pistons) at the surface or in the water column. None of the species listed under the ESA in the Study Area are open ocean

planktivores, but some species in this group of fishes (e.g., anchovies) constitute a major prey base for many important predators.

Military expended materials that could potentially impact these types of fish at or just below the surface or in the water column include those items that float or are suspended in the water column for some period of time (e.g., parachutes and end caps and pistons from chaff cartridges or flares).

Fishes Feeding at the Seafloor

- **Coastal Bottom Dwelling Predators/Scavengers.** Large predatory fishes near the seafloor are represented by rockfishes, groupers, and jacks, which are typical seafloor predators in coastal and deeper nearshore waters of the Study Area (See Table 3.9-7). These species feed opportunistically on or near the bottom, taking fish and invertebrates from the water column and from the bottom (e.g., crabs, octopus). Bottom-dwelling fishes in the nearshore coasts (See Table 3.9-7) may feed by seeking prey and by scavenging on dead fishes and invertebrates (e.g., skates, rays, flatfish, rat fish).

Military expended materials that could be ingested by fish at the seafloor include items that sink (e.g., small-caliber projectiles and casings, fragments from high-explosive munitions).

Potential impacts of ingestion to adults are different than for other lifestages (eggs, larvae, juveniles) because early lifestages are too small to ingest any military expended materials except for chaff, which has been shown to have no impact on fishes. Therefore, no ingestion potential impacts on early lifestages would occur with the exception of later stage larvae and juveniles.

Within the context of fish location in the water column and feeding strategies, the analysis is divided into (1) munitions (small- and medium-caliber projectiles, and small fragments from larger munitions); and (2) military expended material other than munitions (chaff, chaff end caps, pistons, parachutes, flares, and target fragments).

Table 3.9-7: Summary of Ingestion Stressors on Fishes Based on Location

Feeding Guild	Representative Species	ESA-Protected Species	Overall Potential for Impact
Open-ocean Predators	Dorado, most shark species, tuna, billfish	None	These fishes may ingest floating or sinking expended materials, but the encounter rate would be extremely low.
Open-ocean plankton eaters	Basking shark	None	These fishes may ingest floating expended materials incidentally as they feed in the water column, but the encounter rate would be extremely low.
Coastal bottom-dwelling predators	Rockfishes, groupers, jacks	None	These fishes may ingest expended materials on the seafloor, but the encounter rate would be extremely low.
Coastal/estuarine bottom-dwelling predators and scavengers	Skates and rays, flounders	None	These fishes could incidentally ingest some expended materials while foraging, especially in muddy waters with limited visibility. However, encounter frequency would be extremely low.

Note: ESA = Endangered Species Act

3.9.3.5.1 Impacts from Munitions and Military Expended Materials other than Munitions

The potential impacts of ingesting foreign objects on a given fish depend on the species and size of the fish. Fish that normally eat spiny, hard-bodied invertebrates could be expected to have tougher mouths and digestive systems than fish that normally feed on softer prey. Materials that are similar to the normal diet of a fish would be more likely to be ingested and more easily handled once ingested—for example, by fish that feed on invertebrates with sharp appendages. These items could include fragments from high-explosives that a fish could encounter on the seafloor. Relatively small or smooth objects, such as small caliber projectiles or their casings, might pass through the digestive tract without causing harm. A small sharp-edged item could cause a fish immediate physical distress by tearing or cutting the mouth, throat, or stomach. If the object is rigid and large (relative to the fish's mouth and throat), it may block the throat or obstruct the flow of waste through the digestive system. An object may be enclosed by a cyst in the gut lining (Danner et al. 2009; Hoss and Settle 1990). Ingestion of large foreign objects could lead to disruption of a fish's normal feeding behavior, which could be sublethal or lethal.

Munitions are heavy and would sink immediately to the seafloor, so exposure would be limited to those fish identified as bottom-dwelling predators and scavengers. It is possible that expended small caliber projectiles on the seafloor could be colonized by seafloor organisms and mistaken for prey or that expended small caliber projectiles could be accidentally or intentionally eaten during foraging. Over time, the metal may corrode or become covered by sediment in some habitats, reducing the likelihood of a fish encountering the small caliber, non-explosive practice munitions.

Fish feeding on the seafloor in the offshore locations where these items are expended (e.g., gunnery boxes) would be more likely to encounter and ingest them than fish in other locations. A particularly large item (relative to the fish ingesting it) could become permanently encapsulated by the stomach lining, with the rare chance that this could impede the fish's ability to feed or take in nutrients. However, in most cases, a fish would pass a round, smooth item through its digestive tract and expel it, with no long-term measurable reduction in the individual's fitness.

If high-explosive ordnance does not explode, it would sink to the bottom. In the unlikely event that explosive material, high-melting-point explosive (known as HMX) or royal demolition explosive (known as RDX), is exposed on the ocean floor it would break down in a few hours (U.S. Department of the Navy 2001b). HMX or RDX would not accumulate in the tissues of fish (Lotufo et al. 2010; Price et al. 1998). Fish may take up trinitrotoluene (TNT) from the water when it is present at high concentrations but not from sediments (Lotufo et al. 2010). The rapid dispersal and dilution of TNT expected in the marine water column reduces the likelihood of a fish encountering high concentrations of TNT to near zero.

3.9.3.5.1.1 No Action Alternative – Training Activities

Projectiles

Table 3.0-65 lists the number and location of small- and medium-caliber projectiles. As indicated in Section 3.0.5.3.5.1 (Non-explosive Practice Munitions) under the No Action Alternative, small- and medium-caliber projectile use would occur in the Hawaii and SOCAL Range Complexes. Species that occur in these areas would have the potential to be exposed to small- and medium-caliber projectiles.

Table 3.0-66 lists the number and location of activities that expend fragments from high-explosive ordnance and munitions (e.g., demolition charges, grenades, bombs, missiles, and rockets). The number and footprint of high-explosive ordnance and munitions are detailed in Table 3.3-5; however, the fragment size cannot be quantified. As indicated in Section 3.0.5.3.5.2 (Fragments from High-explosive

Munitions), under the No Action Alternative, high-explosive ordnance and munitions use would occur in the Hawaii and SOCAL Range Complexes. Species that occur in these areas would have the potential to be exposed to fragments from high explosive ordnance and munitions. These items are heavy and would sink immediately to the seafloor, so exposure to fishes would be limited to those groups identified as bottom-dwelling predators and scavengers. It is possible that expended small-caliber projectiles on the seafloor could be colonized by seafloor organisms and mistaken for prey or that expended small-caliber projectiles could be accidentally or intentionally eaten during foraging. Over time, the metal corrodes slowly or may become covered by sediment in some habitats, reducing the likelihood of a fish encountering the small-caliber non explosive practice munitions. High explosive munitions are typically fused to detonate within 5 ft. (1.5 m) of the water surface, with steel fragments breaking off in all directions and rapidly decelerating in the water and settling to the seafloor. The analysis generally assumes that most explosive expended materials sink to the seafloor and become incorporated into the seafloor, with no substantial accumulations in any particular area (see Section 3.1, Sediments and Water Quality).

Encounter rates in locations with concentrated small-caliber projectiles would be assumed to be greater than in less concentrated areas. Fishes feeding on the seafloor in the offshore locations where these items are expended (e.g., focused in gunnery boxes) would be more likely to encounter these items and at risk for potential ingestion impacts than in other locations. If ingested, and swallowed, these items could potentially disrupt an individual's feeding behavior or digestive processes. If the item is particularly large for the fish ingesting it, the projectile could become permanently encapsulated by the stomach lining, with the rare chance that this could impede the fish's ability to feed or take in nutrients. However, in most cases a fish would pass the round and smooth item through their digestive tract and expel the item with full recovery expected without impacting the individual's growth, survival, annual reproductive success, or lifetime reproductive success. There are no ESA-listed species that occur at the offshore locations where small-caliber projectile use is concentrated.

Unexploded high-explosive munitions would sink to the bottom. The residual explosive material would not be exposed to the marine environment, as it is encased in a non-buoyant cylindrical package. Should the High Melting point Explosive or Royal Demolition Explosive be exposed on the ocean floor, they would break down within a few hours (Department of the Navy 2001b) and would not accumulate in the tissues of fishes (Lotufo, Gibson, et al. 2010; Price et al. 1998). Trinitrotoluene (TNT) would bioaccumulate in fish tissues if present at high concentrations in the water, but not from fish exposure to TNT in sediments since it is rapidly degraded (Lotufo, Blackburn, et al. 2010). Given the rapid dispersal and dilution expected in the marine water column, the likelihood of a fish encountering high concentrations of TNT is very low. Over time, Royal Demolition Explosive residue would be covered by ocean sediments in most habitats or diluted by ocean water.

It is not possible to predict the size or shape of fragments resulting from high explosives. High explosives used in the Study Area range in size from medium-caliber projectiles to large bombs, rockets, and missiles. When these items explode, they partially break apart or remain largely intact with irregular shaped pieces—some of which may be small enough for a fish to ingest. Fishes would not be expected to ingest most fragments from high explosives because most pieces would be too large to ingest. Also, since fragment size cannot be quantified, it is assumed that fragments from larger munitions are similarly sized as larger munitions, but more fragments would result from larger munitions than smaller munitions. Small-caliber projectiles far outnumber the larger-caliber high explosive projectiles/bombs/missiles/rockets expended as fragments in the Study Area. Although it is possible that the number of fragments resulting from a high explosive could exceed this number, this cannot be quantified. Therefore, small-caliber projectiles would be more prevalent throughout the Study Area, and more likely to be encountered by bottom-dwelling fishes, and potentially ingested than fragments from any type of high explosive munitions.

Chaff and Flares

Tables 3.0-85 and 3.0-86 lists the number and location of expended chaff and flares. As indicated in Section 3.0.5.3.5.3 (Military Expended Materials Other Than Munitions) under the No Action Alternative, activities that expend chaff and flares occur in the open ocean areas of the Hawaii and SOCAL Range Complexes. Species that occur in these areas would have the potential to be exposed to chaff and flares. Under all Alternatives, a total of 20,950 chaff cartridges would be expended from aircraft during training activities. No potential impacts would occur from the chaff itself, as discussed in Section 3.0.5.3.5.3, but there is some potential for the end caps or pistons associated with the chaff cartridges to be ingested. Under all Alternatives, a total of 10,050 flares would be expended during training flare exercises. The flare device consists of a cylindrical cartridge approximately 1.4 in (3.6 cm) in diameter and 5.8 in (14.7 cm) in length. Items that could be potentially ingested from flares include plastic end caps and pistons. An extensive literature review and controlled experiments conducted by the U.S. Air Force revealed that self-protection flare use poses little risk to the environment (U.S. Air Force 1997). The light generated by flares in the air (designed to burn out completely prior to entering the water) would have no impact on fish based on short burn time, relatively high altitudes where they are used, and the wide-spread and infrequent use. The potential exists for large, open-ocean predators (e.g., tunas, billfishes, pelagic sharks) to ingest self-protection flare end caps or pistons as they float on the water column for some time. A variety of plastic and other solid materials have been recovered from the stomachs of billfishes, dorado (South Atlantic Fishery Management Council 2011) and tuna (Hoss and Settle 1990).

End caps and pistons sink in saltwater (Spargo 1999), which reduces the likelihood of ingestion by surface-feeding fishes. However, some of the material could remain at or near the surface, and predatory fishes may incidentally ingest these items. The highest density of chaff and flare end caps/pistons would be expended in the SOCAL Range Complex. Assuming that all end-caps and pistons would be evenly dispersed in the SOCAL Range Complex, the annual relative end-cap and piston concentration would be very low (0.07 nm^2).

Based on the low environmental concentration (Table 3.3-5), it is unlikely that a larger number of fish would ingest an end cap or piston, much less a harmful quantity. Furthermore, a fish might expel the item before swallowing it. The number of fish potentially impacted by ingestion of end caps or pistons would be low based on the low environmental concentration and population-level impacts are not expected to occur.

Summary of Training Activities

Overall, the potential impacts of ingesting small-caliber projectiles, high explosive fragments, parachutes, or end caps/pistons would be limited to individual cases where a fish might suffer a negative response, for example, ingesting an item too large to be digested. While ingestion of ordnance-related materials, or the other military expended materials identified here, could result in sublethal or lethal impacts, the likelihood of ingestion is low based on the dispersed nature of the materials and the limited exposure of those items at the surface/water column or seafloor where certain fishes could be at risk of ingesting those items. Furthermore, a fish might taste an item then expel it before swallowing it (Felix et al. 1995), in the same manner that fish would temporarily take a lure into its mouth, then spit it out. Based on these factors, the number of fish potentially impacted by ingestion of ordnance-related materials would be low and population-level impacts are not likely to occur.

Based on the primarily nearshore distribution of steelhead trout and overlap of munitions use, potential ingestion risk would be greatest in the coastal areas of the SOCAL Range Complex and SSTC. While munitions use could overlap with steelhead trout, the likelihood of ingestion would be extremely low given the low abundance of steelhead trout in the Study Area and the dispersed nature of the activity. However, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, munitions use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of munitions or military expended materials of ingestible size for training activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of munitions or military expended materials of ingestible size for training activities under the No Action Alternative would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.5.1.2 No Action Alternative – Testing Activities

Table 3.0-65 lists the number and location of small- and medium-caliber projectiles. As indicated in Section 3.0.5.3.5.1 (Non-explosive Practice Munitions) under the No Action Alternative, only medium caliber projectile use would occur in the SOCAL Range Complex. Species that occur in these areas would have the potential to be exposed to small- and medium-caliber projectiles.

Table 3.0-66 lists the number and location of activities that expend fragments from high-explosive ordnance and munitions (e.g., demolition charges, grenades, bombs, missiles, and rockets). The number and footprint of high-explosive ordnance and munitions are detailed in Table 3.3-5; however, the fragment size cannot be quantified. As indicated in Section 3.0.5.3.5.2 (Fragments from High-explosive Munitions), under the No Action Alternative, high-explosive ordnance and munitions use would occur in the Hawaii and SOCAL Range Complexes. Species that occur in these areas would have the potential to be exposed to fragments from high explosive ordnance and munitions.

Under the No Action Alternative, no testing activities use chaff or flares (Tables 3.0-85 and 3.0-86).

Overall, the potential impacts of ingesting small-caliber projectiles, high-explosive fragments, parachutes, or flare end caps/pistons would be limited to individual cases where a fish might suffer a negative response, for example, ingesting an item too large to be digested. While ingestion of ordnance-related materials, or the other military expended materials identified here, could result in sublethal or lethal impacts, the likelihood of ingestion is low based on the dispersed nature of the materials and the limited exposure of those items at the surface/water column or seafloor where certain fishes could be at risk of ingesting those items. Furthermore, a fish might expel the item before swallowing it. Based on these factors, the number of fish potentially impacted by ingestion of ordnance-related materials would be low and population-level impacts are not likely to occur.

Based on the primarily nearshore distribution of steelhead trout and overlap of munitions use, potential ingestion risk would be greatest in the coastal areas of the SOCAL Range Complex and SSTC. While munitions use could overlap with steelhead trout, the likelihood of ingestion would be extremely low given the low abundance of steelhead trout in the Study Area and the dispersed nature of the activity. However, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, munitions use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of munitions or military expended materials of ingestible size for testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of munitions or military expended materials of ingestible size for testing activities under the No Action Alternative would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.5.1.3 Alternative 1 – Training Activities

Projectiles

Table 3.0-65 lists the number and location of small- and medium- caliber projectiles. As indicated in Section 3.0.5.3.5.1 (Non-explosive Practice Munitions) under Alternative 1, small- and medium-caliber projectile use would occur in the open ocean portions of the Study Area. Species that occur in these areas would have the potential to be exposed to small- and medium-caliber projectiles.

Table 3.0-66 lists the number and location of activities that expend fragments from high-explosive ordnance and munitions (e.g., demolition charges, grenades, bombs, missiles, and rockets). The number and footprint of high-explosive ordnance and munitions are detailed in Table 3.3-6; however, the fragment size cannot be quantified. As indicated in Section 3.0.5.3.5.2 (Fragments from High-explosive Munitions), under Alternative 1, high-explosive ordnance and munitions use would occur in the open ocean portions of the Study Area. Species that occur in these areas would have the potential to be exposed to fragments from high explosive ordnance and munitions.

Chaff and Flares

Tables 3.0-85 and 3.0-86 lists the number and location of expended chaff and flares. As indicated in Section 3.0.5.3.5.3 (Military Expended Materials Other Than Munitions) under Alternative 1, activities that expend chaff and flares occur in the open ocean areas of the Hawaii and SOCAL Range Complexes. Species that occur in these areas would have the potential to be exposed to chaff and flares. Although the number and location of training activities under Alternative 1 are slightly higher than training activities under the No Action Alternative,. the impacts and comparisons to the No Action Alternative would be similar to those as described in Section 3.9.3.5.1.1 (No Action Alternative – Summary of Training Activities).

The increase in expended materials under Alternative 1 would increase the probability of ingestion risk; however, as discussed under the No Action Alternative, the likelihood of ingestion would still be low based on the dispersed nature of the materials and the limited exposure of those items at the surface/water column or seafloor where certain fishes could be at risk of ingesting those items. Therefore, the number of fish potentially impacted by ingestion of expended materials would be low and population-level impacts are not likely to occur.

Based on the primarily nearshore distribution of steelhead trout and overlap of munitions use, potential ingestion risk would be greatest in the coastal areas of the SOCAL Range Complex and SSTC. While munitions use could overlap with steelhead trout, the likelihood of ingestion would be extremely low given the low abundance of steelhead trout in the Study Area and the dispersed nature of the activity. However, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, munitions use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of munitions or military expended materials of ingestible size for training activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of munitions or military expended materials of ingestible size for training activities under Alternative 1 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.5.1.4 Alternative 1 – Testing Activities

Table 3.0-65 lists the number and location of small- and medium-caliber projectiles. As indicated in Section 3.0.5.3.5.1 (Non-explosive Practice Munitions) under Alternative 1, small- and medium-caliber projectile use would occur in the entre Study Area. Species that occur in these areas would have the potential to be exposed to small- and medium-caliber projectiles.

Table 3.0-66 lists the number and location of activities that expend fragments from high-explosive ordnance and munitions (e.g., demolition charges, grenades, bombs, missiles, and rockets). The number and footprint of high-explosive ordnance and munitions are detailed in Table 3.3-6; however, the fragment size cannot be quantified. As indicated in Section 3.0.5.3.5.2 (Fragments from High-explosive Munitions), under Alternative 1, high-explosive ordnance and munitions use would occur in the open ocean portions of the Study Area. Species that occur in these areas would have the potential to be exposed to fragments from high explosive ordnance and munitions.

Tables 3.0-85 and 3.0-86 lists the number and location of expended chaff and flares. As indicated in Section 3.0.5.3.5.3 (Military Expended Materials Other Than Munitions) under Alternative 1, activities that expend chaff and flares occur in the open ocean areas of the Hawaii and SOCAL Range Complexes. Species that occur in these areas would have the potential to be exposed to chaff and flares. Although the number and location of testing activities under Alternative 1 are slightly higher than testing activities under the No Action Alternative, the impacts and comparisons to the No Action Alternative would be similar to those described in Section 3.9.3.5.1.1 (No Action Alternative).

Given the reasons stated under the training activities, the number of fish potentially impacted by ingestion of ordnance-related materials would be low and population-level impacts are not likely to occur.

Based on the primarily nearshore distribution of steelhead trout and overlap of munitions use, potential ingestion risk would be greatest in the coastal areas of the SOCAL Range Complex and SSTC. While munitions use could overlap with steelhead trout, the likelihood of ingestion would be extremely low given the low abundance of steelhead trout in the Study Area and the dispersed nature of the activity. However, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, munitions use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of munitions or military expended materials of ingestible size for testing activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of munitions or military expended materials of ingestible size for testing activities under Alternative 1 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.5.1.5 Alternative 2 – Training Activities

Under Alternative 2, the number of military expended materials would be the same as under Alternative 1 (Tables 3.0-65 and 3.0-66). Therefore, the impact of military expended materials would be the same as under Alternative 1.

Based on the primarily nearshore distribution of steelhead trout and overlap of munitions use, potential ingestion risk would be greatest in the coastal areas of the SOCAL Range Complex and SSTC. While munitions use could overlap with steelhead trout, the likelihood of ingestion would be extremely low given the low abundance of steelhead trout in the Study Area and the dispersed nature of the activity. However, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, munitions use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of munitions or military expended materials of ingestible size for training activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of munitions or military expended materials of ingestible size for training activities under Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.5.1.6 Alternative 2 – Testing Activities

Under Alternative 2, the number of military expended materials would increase slightly compared to the No Action Alternative (Tables 3.0-65 and 3.0-66). Given the reasons stated under the training activities under Alternative 1 and despite the slight increase, the number of fish potentially impacted by ingestion from munitions use would be low and population-level impacts are not likely to occur.

Based on the primarily nearshore distribution of steelhead trout and overlap of munitions use, potential ingestion risk would be greatest in the coastal areas of the SOCAL Range Complex and SSTC. While munitions use could overlap with steelhead trout, the likelihood of ingestion would be extremely low given the low abundance of steelhead trout in the Study Area and the dispersed nature of the activity. However, there would be the potential for effect. The majority of the primary constituent elements required by steelhead trout are applicable to freshwater and estuaries (i.e., spawning sites, rearing sites, and migration corridors), and are outside the Study Area. Therefore, munitions use would not affect steelhead trout critical habitat.

Pursuant to the ESA, the use of munitions or military expended materials of ingestible size for testing activities Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of munitions or military expended materials of ingestible size for testing activities under Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.5.2 Summary and Conclusions of Ingestion Impacts

3.9.3.5.2.1 Combined Ingestion Stressors

An individual fish could experience the following consequences of ingestion stressors: stress, behavioral changes, ingestion causing injury, and ingestion causing mortality. Ingestion causing mortality cannot act in combination because mortal injuries occur with the first instance. Therefore, there is no possibility for the occurrence of this consequence to increase if sub-stressors are combined.

Sub-lethal consequences may result in delayed mortality because they cause irrecoverable injury or alter the individual's ability to feed or detect and avoid predation. Normally, for fish large enough to ingest it, most small-caliber projectiles would pass through a fish's digestive system without injury. However, in this scenario it is possible that a fish's digestive system could already be compromised or blocked in such a manner that the small-caliber projectiles can no longer easily pass through without harm. It is conceivable that a fish could first ingest a small bomb fragment that might damage or block its digestive tract, then ingest a small-caliber projectile, with magnified combined impacts. Sub-lethal effects resulting in mortality could be more likely if the activities occurred in essentially the same location and occurred within the individual's recovery time from the first disturbance. This circumstance is likely to arise only during training and testing activities that cause frequent and recurring ingestion stressors to essentially the same location (e.g., chaff cartridge end caps/flares expended at the same location as small-caliber projectiles). In these specific circumstances the potential consequences to fishes from combinations of ingestion stressors may be greater than the sum of their individual consequences.

These specific circumstances that could magnify the consequences of ingestion stressors are highly unlikely to occur because, with the exception of a sinking exercise, it is highly unlikely that chaff cartridge end caps/flares and small-caliber projectiles would impact essentially the same location because most of these sub-stressors are widely dispersed in time and space.

The combined impact of these sub-stressors does not increase the risk in a meaningful way because the risk of injury or mortality is extremely low for each sub-stressor independently. While it is conceivable that interaction between sub-stressors could magnify their combined risks, the necessary circumstances are highly unlikely to overlap. Interaction between ingestion sub-stressors is likely to have neutral consequences for fishes.

Pursuant to the ESA, the use of munitions or military expended materials of ingestible size for training activities under the No Action Alternative, Alternative 1, or Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of munitions or military expended materials of ingestible size for training activities under the No Action Alternative, Alternative 1, or Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.5.2.2 Summary and Conclusions of Ingestion Impacts

The Navy identified and analyzed three military expended materials types that have ingestion potential for fishes: non-explosive practice munitions, military expended materials from high explosives, and military expended materials from non-ordnance items (e.g., end caps, canisters, chaff, and accessory materials). The probability of fishes ingesting military expended materials depends on factors such as the size, location, composition, and the buoyancy of the expended material. These factors, combined with the location and feeding behavior of fishes were used to analyze the likelihood the expended material would be mistaken for prey and what the potential impacts would be if ingested. Most expended materials, such as large- and medium-caliber ordnance, would be too large to be ingested by a fish, but other materials, such as small-caliber munitions or some fragments of larger items, may be small enough to be swallowed by some fishes. During normal feeding behavior, many fishes ingest nonfood items and often reject (spit out) nonfood items prior to swallowing. Other fishes may ingest and swallow both food and nonfood items indiscriminately. There are concentrated areas where bombing, missile, and gunnery activities that generate materials that could be ingested. However, even within those areas, the overall impact on fishes would be inconsequential.

The potential impacts of military expended material ingestion would be limited to individual cases where a fish might suffer a negative response, for example, ingesting an item too large, sharp, or pointed to pass through the digestive tract without causing damage. Based on available information, it is not possible to accurately estimate actual ingestion rates or responses of individual fishes. Nonetheless, the number of military expended materials ingested by fishes is expected to be very low and only an extremely small percentage of the total would be potentially encountered by fishes. Certain feeding behavior such as “suction feeding” along the seafloor exhibited by sturgeon may increase the probability of ingesting military expended materials relative to other fishes; however, encounter rates would still remain low.

Pursuant to the ESA, the use of munitions or military expended materials of ingestible size under the No Action Alternative, Alternative 1, or Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The use of munitions or military expended materials of ingestible size under the No Action Alternative, Alternative 1, or Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.3.6 Secondary Stressors

This section analyzes potential impacts on fishes exposed to stressors indirectly through impacts on habitat, sediment, or water quality. These are also primary elements of marine fish habitat and firm distinctions between indirect impacts and habitat impacts are difficult to maintain. For the purposes of this analysis, indirect impacts on fishes via sediment or water which do not require trophic transfer (e.g., bioaccumulation) in order to be observed are considered here. It is important to note that the terms "indirect" and "secondary" do not imply reduced severity of environmental consequences, but instead describe how the impact may occur in an organism or its ecosystem.

Stressors from Navy training and testing activities could pose secondary or indirect impacts on fishes via habitat, sediment, and water quality. These include: (1) explosives and by-products; (2) metals; (3) chemicals; (4) other materials such as targets, chaff, and plastics, and (5) impacts on fish habitat. Activities associated with these stressors are detailed in Tables 2.8-1 to 2.8-5 and analyses of their potential impacts are discussed in Section 3.1 (Sediments and Water Quality) and Section 3.3 (Marine Habitats).

3.9.3.6.1 Explosives

In addition to directly impacting fish and fish habitat, underwater explosions could impact other species in the food web including plankton and other prey species that fish feed upon. The impacts of underwater explosions would differ depending upon the type of prey species in the area of the blast. As discussed in Section 3.9.4.1, fish with swim bladders are more susceptible to blast injuries than fish without swim bladders.

In addition to physical impacts of an underwater blast, prey might have behavioral reactions to underwater sound. For instance, prey species might exhibit a strong startle reaction to detonations that might include swimming to the surface or scattering away from the source. This startle and flight response is the most common secondary defense among animals (Hanlon and Messenger 1996). The sound from underwater explosions might induce startle reactions and temporary dispersal of schooling fishes if they are within close proximity. The abundances of fish and invertebrate prey species near the detonation point could be diminished for a short period of time before being repopulated by animals from adjacent waters. Alternatively, any prey species that would be directly injured or killed by the blast could draw in scavengers from the surrounding waters that would feed on those organisms, and in turn could be susceptible to becoming directly injured or killed by subsequent explosions. Any of these scenarios would be temporary, only occurring during activities involving explosives, and no lasting impact on prey availability or the pelagic food web would be expected. Indirect impacts of underwater detonations and high explosive ordnance use under the Proposed Action would not result in a decrease in the quantity or quality of fish populations or fish habitats in the Study Area.

3.9.3.6.2 Explosion By-Products, and Unexploded Ordnance

Deposition of undetonated explosive materials into the marine environment can be reasonably well estimated by the known failure and low-order detonation rates of high explosives. Undetonated explosives associated with mine neutralization activities are collected after training is complete; therefore, potential impacts are assumed to be inconsequential for these training and testing activities, but other activities could result in unexploded ordnance and unconsumed explosives on the seafloor. Fishes may be exposed by contact with the explosive, contact with contaminants in the sediment or water, and ingestion of contaminated sediments.

High-order explosions consume most of the explosive material, creating typical combustion products. In the case of Royal Demolition Explosive, 98 percent of the products are common seawater constituents and the remainder are rapidly diluted below threshold impact level. Explosion by-products associated with high order detonations present no indirect stressors to fishes through sediment or water. However, low order detonations and unexploded ordnance present elevated likelihood of impacts on fishes.

Indirect impacts of explosives and unexploded ordnance to fishes via sediment is possible in the immediate vicinity of the ordnance. Degradation of explosives proceeds via several pathways discussed in Section 3.1. Degradation products of Royal Demolition Explosive are not toxic to marine organisms at realistic exposure levels (Rosen and Lotufo 2010). TNT and its degradation products impact developmental processes in fishes and are acutely toxic to adults at concentrations similar to real-world exposures (Halpern et al. 2008; Rosen and Lotufo 2010). Relatively low solubility of most explosives and their degradation products means that concentrations of these contaminants in the marine environment are relatively low and readily diluted. Furthermore, while explosives and their degradation products were detectable in marine sediment approximately 6 to 12 in (15.2 to 30.5 m) away from degrading ordnance, the concentrations of these compounds were not statistically distinguishable from background beyond 3 to 6 ft. (0.9 to 1.8 m) from the degrading ordnance (Section 3.1). Taken together, it is likely that various lifestages of fishes could be impacted by the indirect impacts of degrading explosives within a very small radius of the explosive 1 to 6 ft. (0.3 to 1.8 m).

3.9.3.6.3 Metals

Certain metals are harmful to fishes at concentrations above background levels (e.g., cadmium, chromium, lead, mercury, zinc, copper, manganese, and many others) (Wang and Rainbow 2008). Metals are introduced into seawater and sediments as a result of Navy training and testing activities involving vessel hulks, targets, ordnance, munitions, and other military expended materials (Section 3.1). Some metals bioaccumulate and physiological impacts begin to occur only after bioaccumulation concentrate the metals (see Section 3.3, Marine Habitats, and Chapter 4, Cumulative Impacts). Indirect impacts of metals to fishes via sediment and water involve concentrations several orders of magnitude lower than concentrations achieved via bioaccumulation. Fishes may be exposed by contact with the metal, contact with contaminants in the sediment or water, and ingestion of contaminated sediments. Concentrations of metals in sea water are orders of magnitude lower than concentrations in marine sediments. It is extremely unlikely that fishes would be indirectly impacted by toxic metals via the water.

3.9.3.6.4 Chemicals

Several Navy training and testing activities introduce potentially harmful chemicals into the marine environment; principally, flares and propellants for rockets, missiles, and torpedoes. Polychlorinated biphenyls (PCBs) are discussed in Section 3.1. Properly functioning flares missiles, rockets, and torpedoes combust most of their propellants; leaving benign or readily diluted soluble combustion by-products (e.g., hydrogen cyanide). Operational failures allow propellants and their degradation products to be released into the marine environment.

The greatest risk to fishes from flares, missile, and rocket propellants is perchlorate which is highly soluble in water, persistent, and impacts metabolic processes in many plants and animals. Fishes may be exposed by contact with contaminated water or ingestion of contaminated sediments. Since perchlorate is highly soluble, it does not readily absorb to sediments. Therefore, missile and rocket fuel poses no risk of indirect impact on fishes via sediment. In contrast, the principal toxic components of torpedo fuel, propylene glycol dinitrate and nitrodiphenylamine, adsorbs to sediments, has relatively low toxicity, and is readily degraded by biological processes (Section 3.1). It is conceivable that various lifestages of fishes could be indirectly impacted by propellants via sediment in the immediate vicinity of the object (e.g., within a few inches), but these potential impacts would diminish rapidly as the propellant degrades.

3.9.3.6.5 Other Materials

Some military expended materials (e.g., parachutes) could become remobilized after their initial contact with the sea floor (e.g., by waves or currents) and could be reintroduced as an entanglement or ingestion hazard for fishes. In some bottom types (without strong currents, hard-packed sediments, and low biological productivity), items such as projectiles might remain intact for some time before becoming degraded or broken down by natural processes. While these items remain intact sitting on the bottom, they could potentially remain ingestion hazards. These potential impacts may cease only (1) when the military expended materials are too massive to be mobilized by typical oceanographic processes, (2) if the military expended materials become encrusted by natural processes and incorporated into the seafloor, or (3) when the military expended materials become permanently buried. In this scenario, a parachute could initially sink to the seafloor, but then be transported laterally through the water column or along the seafloor, increasing the opportunity for entanglement. In the unlikely event that a fish would become entangled, injury or mortality could result. The entanglement stressor would eventually cease to pose an entanglement risk as it becomes encrusted or buried.

3.9.3.6.6 Impacts on Fish Habitat

The Proposed Action could result in localized and temporary changes to the benthic community during activities that impact fish habitat. Fish habitat could become degraded during activities that would strike the seafloor or introduce military expended materials, bombs, projectiles, missiles, rockets, or fragments to the seafloor. During, or following activities that impact benthic habitats, fish species may experience loss of available benthic prey at locations in the Study Area where these items might be expended on essential fish habitat or habitat areas of particular concern. Additionally, plankton and zooplankton that are eaten by fish may also be negatively impacted by these same expended materials. The spatial area of Essential Fish Habitat and habitat areas of particular concern impacted by the Proposed Action would be relatively small compared to the available habitat in the HSTT Study Area. Potentially a maximum area of 0.3 nm^2 of essential fish habitat and habitat areas of particular concern may have decreased habitat value resulting from the Proposed Action, based on the footprint of expended materials. However, there would still be vast expanses of essential fish habitat and habitat areas of particular concern adjacent to the areas of habitat impact that would remain undisturbed by the Proposed Action.

Impacts of physical disturbance and strikes by small, medium, and large projectiles would be concentrated within designated gunnery box areas, resulting in localized disturbances of hard bottom areas, but could occur anywhere in the range complexes or the Study Area. Hard bottom is important habitat for many different species of fish, including those fishes managed by various fishery management plans.

When a projectile hits a biogenic habitat, the substrate immediately below the projectile is not available at that habitat type on a long-term basis, until the material corrodes. The substrate surrounding the projectile would be disturbed, possibly resulting in short-term localized increased turbidity. Given the large spatial area of the range complexes compared to the small percentage covered by biogenic habitat, it is unlikely that most of the small, medium, and large projectiles expended in the Study Area would fall onto this habitat type. Furthermore, these activities are distributed within discrete locations within the Study Area, and the overall footprint of these areas is quite small with respect to the spatial extent of this biogenic habitat within the Study Area.

Sinking exercises could also provide secondary impacts on deep sea populations. These activities occur in open-ocean areas, outside of the coastal range complexes, with potential direct disturbance or strike impacts on deep sea fishes, covered in Sections 3.9.2.4 through 3.9.2.22. Secondary impacts on these fishes could occur after the ship hulks sink to the seafloor. Over time, the ship hulk would be colonized by marine organisms that attach to hard surfaces. For fishes that feed on these types of organisms, or whose abundances are limited by available hard structural habitat, the ships that are sunk during sinking exercises could provide an incidental beneficial impact on the fish community (Love and York 2005).

Designated critical habitat of steelhead trout includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek, and is outside the Study Area. Therefore, would be no impacts associated with secondary stressors.

Pursuant to the ESA, secondary stressors resulting under the No Action Alternative, Alternative 1, or Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

Secondary stressors under the No Action Alternative, Alternative 1, or Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.4 Summary of Potential Impacts (Combined Impacts from All Stressors) on Fish

As described in Section 3.0.5.5 (Resource-Specific Impacts Analysis for Multiple Stressors), this section evaluates the potential for combined impacts of all the stressors from the Proposed Action. The analysis and conclusions for the potential impacts from each individual stressor are discussed in the analyses of each stressor in the sections above and summarized in Sections 3.9.4.2 (Endangered Species Act Determinations).

There are generally two ways that a fish could be exposed to multiple stressors. The first would be if a fish were exposed to multiple sources of stress from a single activity (e.g., a mine warfare activity may include the use of a sound source and a vessel). The potential for a combination of these impacts from a single activity would depend on the range of effects of each stressor and the response or lack of response to that stressor. Most of the activities as described in the Proposed Action involve multiple stressors; therefore, it is likely that if a fish were within the potential impact range of those activities, they may be impacted by multiple stressors simultaneously. This would be even more likely to occur during large-scale exercises or activities that span a period of days or weeks (such as a sinking exercises or composite training unit exercise).

Fish could be exposed to a combination of stressors from multiple activities over the course of its life. This is most likely to occur in areas where training and testing activities are more concentrated (e.g., near naval ports, testing ranges, and routine activity locations outlined in Table 3.0-3 and in areas that individual fish frequent because it is within the animal's home range, migratory corridor, spawning or feeding area. Except for in the few concentration areas mentioned above, combinations are unlikely to occur because training and testing activities are generally separated in space and time in such a way that it would be very unlikely that any individual fish would be exposed to stressors from multiple activities. However, animals with a home range intersecting an area of concentrated Navy activity have elevated exposure risks relative to animals that simply transit the area through a migratory corridor. The majority of the proposed training and testing activities occur over a small spatial scale relative to the entire Study Area, have few participants, and are of a short duration (the order of a few hours or less).

Multiple stressors may also have synergistic effects. For example, fish that experience temporary hearing loss or injury from acoustic stressors could be more susceptible to physical strike and disturbance stressors via a decreased ability to detect and avoid threats. Fish that experience behavioral and physiological consequences of ingestion stressors could be more susceptible to entanglement and physical strike stressors via malnourishment and disorientation. These interactions are speculative, and without data on the combination of multiple Navy stressors, the synergistic impacts from the combination of Navy stressors are difficult to predict in any meaningful way. Navy research and monitoring efforts include data collection through conducting long-term studies in areas of Navy activity, occurrence surveys over large geographic areas, biopsy of animals occurring in areas of Navy activity, and tagging studies where animals are exposed to Navy stressors. These efforts are intended to contribute to the overall understanding of what impacts may be occurring overall to animals in these areas.

Although potential impacts to certain fish species from the Proposed Action may include injury or mortality, impacts are not expected to decrease the overall fitness of any given population. Mitigation measures designed to reduce the potential impacts are discussed in Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring. The potential impacts anticipated from the Proposed Action are summarized in Sections 3.9.4.2, Endangered Species Act Determinations, with respect to each regulation applicable to fish.

Pursuant to the ESA, the combined impacts of all the stressors under the No Action Alternative, Alternative 1, or Alternative 2 may affect, but is not likely to adversely affect, ESA-listed steelhead trout.

The combined impacts of all the stressors under the No Action Alternative, Alternative 1, or Alternative 2 would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

3.9.5 Endangered Species Act Determinations

Table 3.9-8 summarizes the ESA determinations for each substressor analyzed. For all substressors, training and testing activities would have no effect on steelhead trout critical habitat, which includes the estuarine and freshwater habitat of San Juan Creek, Trabuco Creek, and San Mateo Creek.

Table 3.9-8: Summary of Endangered Species Act Determinations for Training and Testing Activities for the Preferred Alternative

Stressor		Steelhead Trout
Acoustic Stressors		
Non-Impulsive Sources	Training Activities	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect
Explosives and other non-impulsive sources	Training Activities	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect
Energy Stressors		
Electromagnetic devices	Training Activities	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect
Physical Disturbance and Strike Stressors		
Vessels and in-water devices	Training Activities	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect
Military expended materials	Training Activities	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect
Seafloor devices	Training Activities	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect
Entanglement Stressors		
Cables and wires	Training Activities	No effect
	Testing Activities	No effect
Parachutes	Training Activities	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect
Ingestion Stressors		
Munitions	Training Activities	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect
Military expended materials other than munitions	Training Activities	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect
Secondary Stressors		
Secondary Stressors	Training Activities	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect

This Page Intentionally Left Blank

REFERENCES

Abbott, R., Bing-Sawyer, E. & Blizard, R. (2002). Assessment of pile driving impacts on the Sacramento blackfish (*Orthodon microlepidotus*). (pp. 17 pp.). Oakland, California: Caltrans District 4.

Abbott, R. & Reyff, J. (2004). Fisheries and Hydroacoustic Monitoring Program Compliance Report I. Edmonds-Hess and M. Melandry (Eds.), *San Francisco-Oakland Bay Bridge East Span Seismic Safety Project*. (pp. 148).

Abbott, R., Reyff, J. & Marty, G. (2005). Monitoring the effects of conventional pile driving on three species of fish. (pp. 131 pp). Richmond, California: Strategic Environmental Consulting, Inc. for Manson Construction Company.

Able, K. W. & Fahay, M. P. (1998). The first year in the life of estuarine fishes in the Middle Atlantic Bight: Rutgers University Press.

Adams, P. B., Grimes, C. B., Hightower, J. E., Lindley, S. T. & Moser, M. L. (2002). *Status Review for North American Green Sturgeon,* Acipenser medirostris. (pp. 49) National Marine Fisheries Service, North Carolina Cooperative Fish and Wildlife Research Unit.

Allen, L. G., Pondella, D. J., II & Horn, M. H. (Eds.). (2006). *The Ecology of Marine Fishes: California and Adjacent Waters* (pp. 660). Berkeley, CA: University of California Press.

Amoser, S. & Ladich, F. (2003). Diversity in noise-induced temporary hearing loss in otophysine fishes. *Journal of the Acoustical Society of America, 113*(4), 2170-2179.

Amoser, S. & Ladich, F. (2005). Are hearing sensitivities of freshwater fish adapted to the ambient noise in their habitats? *Journal of Experimental Biology, 208*, 3533-3542.

Astrup, J. (1999). Ultrasound detection in fish - a parallel to the sonar-mediated detection of bats by ultrasound-sensitive insects? *Comparative Biochemistry and Physiology, Part A, 124*, 19-27.

Astrup, J. & MØHL, B. (1993). Detection of intense ultrasound by the cod *Gadus morhua*. *Journal of Experimental Biology, 182*, 71-80.

Atema, J., Kingsford, M. J. & Gerlach, G. (2002). Larval reef fish could use odour for detection, retention and orientation to reefs. *Marine Ecology Progress Series, 241*, 151-160.

Bakun, A., Babcock, E. A., Lluch-Cota, S. E., Santora, C. & Salvadeo, C. J. (2010). Issues of ecosystem-based management of forage fisheries in ‘‘open’’ non-stationary ecosystems: The example of the sardine fishery in the Gulf of California. *Reviews in Fish Biology and Fisheries, 20*, 9-29. doi:10.1007/s11160-009-9118-1

Baum, E. (1997). *Maine Atlantic Salmon: A National Treasure* (pp. 224). Hermon, ME: Atlantic Salmon Unlimited.

Beamish, R.J., G.A. McFarlane, & J.R. King. (2005). Migratory patterns of pelagic fishes and possible linkages between open ocean and coastal ecosystems off the Pacific coast of North America. Deep Sea Research II. 52(2005) 739-755Beauchamp, D. A., Shepard, M. F. & Pauley, G. B. (1983). Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Pacific Northwest). Chinook Salmon. (pp. 15) U.S. Fish and Wildlife Service Division of Biological Services

Bester, C. (1999, last updated 17 December 2003). Biological profiles: Scalloped hammerhead shark. [Internet] Florida Museum of Natural History. Retrieved from http://www.flmnh.ufl.edu/fish/Gallery/Descript/ScHammer/ScallopedHammerhead.html as accessed

Bethea, D. M., Carlson, J. K., Hollensead, L. D., Papastamatiou, Y. P. & Graham, B. S. (2011). A Comparison of the Foraging Ecology and Bioenergetics of the Early Life-Stages of Two Sympatric Hammerhead Sharks. *Bulletin of Marine Science*, 87(4), 873-889. 10.5343/bms.2010.1047

Bleckmann, H. & Zelick, R. (2009). Lateral line system of fish. *Integrative Zoology, 4*(1), 13-25. doi: 10.1111/j.1749-4877.2008.00131.x

Boehlert, G. W. & Gill, A. B. (2010). Environmental and Ecological Effects of Ocean Renewable Energy Development; A Current Synthesis. *Oceanography, 23*(2), 68-81.

Booman, C., Dalen, H., Heivestad, H., Levsen, A., van der Meeren, T. & Toklum, K. (1996). (Seismic-fish) Effekter av luftkanonskyting pa egg, larver og ynell. *Havforskningsinstituttet*.

Botsford, L. W., Brumbaugh, D. R., Grimes, C., Kellner, J. B., Largier, J., O'Farrell, M. R., Wespestad, V. (2009). Connectivity, Sustainability, and Yield: Bridging the Gap Between Conventional Fisheries Management and Marine Protected Areas. [Review]. *Reviews in Fish Biology and Fisheries, 19*(1), 69-95. 10.1007/s11160-008-9092-z

Brander, K. (2010). Impact of climate change on fisheries. *Journal of Marine Systems, 79*, 389-402. 10.1016/j.jmarsys.2008.12.015

Brander, K. M. (2007). Global fish production and climate change. *Proceedings of the National Academy of Sciences of the United States of America, 104*(50), 19709-19714. 10.1073/pnas.0702059104

Buerkle, U. (1968). Relation of pure tone thresholds to background noise level in the Atlantic cod (*Gadus morhua*). *Journal of the Fisheries Research Board of Canada, 25*, 1155 1160.

Buerkle, U. (1969). Auditory masking and the critical band in Atlantic cod (*Gadus morhua*). *Journal of the Fisheries Research Board of Canada, 26*, 1113-1119.

Bullock, T. H., Bodznick, D. A. & Northcutt, R. G. (1983). The Phylogenetic Distribution of Electroreception - Evidence for Convergent Evolution of a Primitive Vertebrate Sense Modality. *Brain Research Reviews, 6*(1), 25-46. 10.1016/0165-0173(83)90003-6

Buran, B. N., Deng, X. & Popper, A. N. (2005). Structural variation in the inner ears of four deep-sea elopomorph fishes. *Journal of Morphology, 265*(215-225), 215-225.

California Department of Transportation. (2001). Pile Installation Demonstration Project Marine Mammal Impact Assessment *San Francisco - Oakland Bay Bridge East Span Seismic Safety Project*.

Caltrans. (2001). Pile installation demonstration project: Fisheries impact assessment. (pp. 59) San Francisco - Oakland Bay Bridge East Span Seismic Safety Project.

Carlson, T., Hastings, M. & Popper, A. N. (2007). Memorandum: Update on Recommendations for Revised Interim Sound Exposure Criteria for Fish during Pile Driving Activities. (pp. 8). Prepared for California Department of Transportation.

Casper, B., Lobel, P. & Yan, H. (2003a). The hearing sensitivity of the little skate, *Raja erinacea*: A comparison of two methods. *Environmental Biology of Fishes, 68*, 371-379.

Casper, B. & Mann, D. (2006a). Evoked potential audiograms of the nurse shark (*Ginglymostoma cirratum*) and the yellow stingray (*Urabatis jamaicensis*). *Environmental Biology of Fishes, 76*, 101-108. 10.1007/s10641-006-9012-9

Casper, B. M., Lobel, P. S. & Yan, H. Y. (2003b). The hearing sensitivity of the little skate, *Raja erinacea*: A comparison of two methods. *Environmental Biology of Fishes, 68*, 371-379.

Casper, B. M. & Mann, D. A. (2006b). Evoked potential audiograms of the nurse shark (*Ginglymostoma cirratum*) and the yellow stingray (*Urobatis jamaicensis*). *Environmental Biology of Fishes, 76*, 101-108.

Casper, B. M. & Mann, D. A. (2009). Field hearing measurements of the Atlantic sharpnose shark *Rhizoprionodon terraenovae*. *Journal of Fish Biology, 75*, 2768-2776. doi:10.1111/j.1095-8649.2009.02477.x

Castro, J. I. (1983). The sharks of North American waters (pp. 179). College Station, Texas: Texas A&M University Press.

Cato, D. H. (1978). Marine biological choruses observed in tropical waters near Australia. *Journal of the Acoustical Society of America, 64*(3), 736-743.

Chapman, C. J. & Hawkins, A. D. (1973a). Field study of hearing in cod, gadus-morhua-l. *Journal of Comparative Physiology, 85*(2), 147-167. 10.1007/bf00696473

Chapman, C. J. & Hawkins, A. D. (1973b). A field study of hearing in the cod, *Gadus morhua*. *Journal of Comparative Physiology, 85*, 147-167.

Cheung, W. W. L., Watson, R., Morato, T., Pitcher, T. J. & Pauly, D. (2007). Intrinsic vulnerability in the global fish catch. *Marine Ecology-Progress Series, 333*, 1-12.

Codarin, A., Wysocki, L. E., Ladich, F. & Picciulin, M. (2009). Effects of ambient and boat noise on hearing and communication in three fish species living in a marine protected area (Miramare, Italy). *Marine Pollution Bulletin, 58*(12), 1880-1887. doi:10.1016/j.marpolbul.2009.07.011

Collin, S. P. & Whitehead, D. (2004). The functional roles of passive electroreception in non-electric fishes. *Animal Biology, 54*(1), 1-25.

Compagno, L. J. V. (1984). FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of sharks species known to date. Part 2: Carcharhiniformes. (pp. 406). Available from ftp://ftp.fao.org/docrep/fao/009/ad123e/ad123e00.pdf

Continental Shelf Associates (CSA) Inc. (2004). Explosive removal of offshore structures - information synthesis report U.S. Department of the Interior (Ed.). New Orleans, LA: Minerals Management Service, Gulf of Mexico OCS Region.

Coombs, S. & Popper, A. (1979a). Hearing Differences Among Hawaiian Squirrelfish (Family *Holocentridae*) Related to Differences in the Peripheral Auditory System. *Journal of Comparative Physiology, 132*, 203-307.

Coombs, S. & Popper, A. N. (1979b). Hearing differences among Hawaiian squirrelfish (family Holicentridae) related to differences in the peripheral auditory system. *Journal of Comparative Physiology A, 132*, 203-207.

Crain, C. M., Halpern, B. S., Beck, M. W. & Kappel, C. V. (2009). Understanding and Managing Human Threats to the Coastal Marine Environment. In R. S. Ostfeld and W. H. Schlesinger (Eds.), *The Year in Ecology and Conservation Biology, 2009* (pp. 39-62). Oxford, UK: Blackwell Publishing. doi: 10.1111/j.1749-6632.2009.04496.x

Cross, J. N. & Allen, L. G. (1993). Fishes. In M. D. Dailey, D. J. Reish and J. W. Anderson (Eds.), *Ecology of the Southern California Bight: A Synthesis and Interpretation* (pp. 459-540). Berkeley, California: University of California Press.

Culik, B. M., Koschinski, S., Tregenza, N. & Ellis, G. M. (2001). Reactions of harbor porpoises *Phocoena phocoena* and herring Clupea harengus to acoustic alarms. *Marine Ecology Progress Series, 211*, 255-260.

Daly-Engel, T. S., Seraphin, K. D., Holland, K. N., Coffey, J. P., Nance, H. A., Toonen, R. J. & Bowen, B. W. (2012). Global phylogeography with mixed-marker analysis reveals male-mediated dispersal in the endangered scalloped hammerhead shark (*Sphyrna lewini*). PLoS One, 7(1), 279-289. DOI:10.1371/journal.pone.0029986

Danner, G. R., Chacko, J. & Brautigam, F. (2009). Voluntary ingestion of soft plastic fishing lures affects brook trout growth in the laboratory. *North American Journal of Fisheries Management, 29*(2), 352-360. doi: 10.1577/M08-085.1

Dempster, T. & Taquet, M. (2004). Fish aggregation device (FAD) research: gaps in current knowledge and future directions for ecological studies. *Reviews in Fish Biology and Fisheries, 14*(1), 21-42.

Deng, X., Wagner, H.-J. & Popper, A. N. (2011). The inner ear and its coupling to the swim bladder in the deep-sea fish *Antimora rostrata* (Teleostei: Moridae). *Deep-Sea Research I, 58*, 27-37. doi:10.1016/j.dsr.2010.11.001

Derraik, J. G. B. (2002). The pollution of the marine environment by plastic debris: A review. *Marine Pollution Bulletin, 44*(9), 842-852. doi: 10.1016/S0025-326X(02)00220-5

Doksaeter, L., Godo, O. R., Handegard, N. O., Kvadsheim, P. H., Lam, F.-P. A., Donovan, C. & Miller, P. J. O. (2009). Behavioral responses of herring (*Clupea harengus*) to 1-2 and 6-7 kHz sonar signals and killer whale feeding sounds. *The Journal of the Acoustical Society of America, 125*(1), 554-564. Retrieved from http://link.aip.org/link/?JAS/125/554/1

Drazen, J. C. and B. A. Seibel. (2007). "Depth-related trends in metabolism of benthic and benthopelagic deep-sea fishes." Limnology and Oceanography 52(5): 2306-2316.

Dufour, F., Arrizabalaga, H., Irigoien, X. & Santiago, J. (2010). Climate impacts on albacore and bluefin tunas migrations phenology and spatial distribution. *Progress In Oceanography, 86*(1-2), 283-290. 10.1016/j.pocean.2010.04.007

Dulvy, N. K., Sadovy, Y. & Reynolds, J. D. (2003). Extinction vulnerability in marine populations. *Fish and Fisheries, 4*(1), 25-64.

Duncan, K. M. & Holland, K. N. (2006). Habitat use, growth rates and dispersal patterns of juvenile scalloped hammerhead sharks *Sphyrna lewini* in a nursery habitat. *Marine Ecology-Progress Series*, 312, 211-221. 10.3354/meps312211

Dunning, D., Ross, Q., Geoghegan, P., Reichle, J., Menezes, J. & Watson, J. (1992). Alewives Avoid High-Frequency Sound. *North American Journal of Fisheries Management, 12*(3), 407-416.

Dzwilewski, P. T. & Fenton, G. (2002). Shock wave / sound propagation modeling results for calculating marine protected species impact zones during explosive removal of offshore structures. (ARA PROJECT 5604, pp. 1-37). New Orleans, LA: Applied Research Associates Inc., for Minerals Management Service.

Edds-Walton, P. L. & Finneran, J. J. (2006). Evaluation of Evidence for Altered Behavior and Auditory Deficits in Fishes Due to Human-Generated Noise Sources. (Vol. TR 1939, pp. 47). San Diego, CA: SSC San Diego.

Egner, S. & Mann, D. (2005a, January 19). Auditory sensitivity of sergeant major damselfish *Abudefduf saxatilis* from post-settlement juvenile to adult. *Marine Ecology Progess Series, 285*, 213-222. Retrieved from www.int-res.com

Egner, S. A. & Mann, D. A. (2005b). Auditory sensitivity of sergeant major damselfish *Abudefduf saxatilis* from post-settlement juvenile to adult. *Marine Ecology Progress Series, 285*, 213-222.

Emmett, R. L., Hinton, S. A., Stone, S. L. & Monaco, M. E. (1991). *Distribution and Abundance of Fishes and Invertebrates in West Coast Estuaries*. (Vol. II: Species Life History Summaries, ELMR Report Number 8, pp. 329). Rockville, MD: NOAA/NOS Strategic Environmental Assessments Division.

Engås, A., S. Løkkeborg, et al. (1996). "Effects of seismic shooting on local abundance and catch rates of cod (Gadus morhua) and haddock (Melanogrammus aeglefinus)." Canadian Journal of Fisheries and Aquatic Sciences 53: 2238-2249

Engås, A. and S. Løkkeborg. (2002). "Effects of seismic shooting and vessel-generated noise on fish behaviour and catch rates." Bioacoustics 12: 313-315.

Enger, P. S. (1981). Frequency discrimination in teleosts-central or peripheral? W. N. Tavolga, A. N. Popper and R. R. Fay (Eds.), *Hearing and Sound Communication in Fishes* (pp. 243-255). New York: Springer-Verlag.

Environmental Sciences Group. (2005). *CFMETR Environmental Assessment Update 2005*. (RMC-CCE-ES-05-21, pp. 652). Kingston, Ontario: Environmental Sciences Group, Royal Military College.

Estrada, J. A., A. N. Rice, et al. (2003). "Predicting trophic position in sharks of the north-west Atlantic Ocean using stable isotope analysis." Journal of the Marine Biological Association of the United Kingdom 83: 1347-1350.

Fay, R. R. (1988). Hearing in vertebrates: A psychophysics handbook (pp. 621). Winnetka, Illinois: Hill-Fay Associates.

Fay, R. R. & Megela-Simmons, A. (1999). The sense of hearing in fishes and amphibians R. R. Fay and A. N. Popper (Eds.), *Comparative Hearing: Fish and Amphibians* (pp. 269-318). New York: Springer-Verlag.

Feist, B.E. (1991). Potential impacts of pile driving on juvenile pink (Oncorhynchus gorbuscha) and chum (O. keta) salmon behavior and distribution. Masters of Science thesis, University of Washington, Seattle, Washington.

Feist, B. E., Anderson, J. J. & Miyamoto, R. (1992). *Potential Impacts of Pile Driving on Juvenile Pink (*Oncorhynchus gorbuscha*) and Chum (*O. keta*) Salmon Behavior and Distribution*. (pp. 66) University of Washington.

Felix, A., Stevens, M. E. & Wallace, R. L. (1995). Unpalatability of a Colonial Rotifer, Sinantherina socialis to Small Zooplanktivorous Fishes. Invertebrate Biology, 114(2), 139-144. 10.2307/3226885

Fisheries Hydroacoustic Working Group. (2008). Memorandum of agreement in principle for interim criteria for injury to fish from pile driving. California Department of Transportation in coordination with the Federal Highway Administration.

Fitch, J. E. and P. H. Young. (1948). Use and effect of explosives in California coastal waters. California Division Fish and Game.

Food and Agriculture Organization of the United Nations. (2005). Review of the state of world marine fishery resources. (FAO Fisheries Technical Paper No. 457, pp. 235). Rome, Italy: FAO. Available from http://www.fao.org/docrep/009/y5852e/y5852e00.htm

Food and Agriculture Organization of the United Nations. (2012). Species Fact Sheets, *Sphyrna lewini* FAO. Retrieved from http://www.fao.org/fishery/species/2028/en as accessed

Formicki, K., Tanski, A., Sadowski, M. & Winnicki, A. (2004). Effects of magnetic fields on fyke net performance. *Journal of Applied Ichthyology, 20*(5), 402-406. 10.1111/j.1439-0426.2004.00568.x

Froese, R. and D. Pauly. (2010). FishBase. 2010: World Wide Web electronic publication.

Gannon, D. P., Barros, N. B., Nowacek, D. P., Read, A. J., Waples, D. M. & Wells, R. S. (2005). Prey detection by bottlenose dolphins (*Tursiops truncatus*): an experimental test of the passive listening hypothesis. *Animal Behaviour, 69*, 709-720.

Gearin, P. J., Gosho, M. E., Laake, J. L., Cooke, L., DeLong, R. L. & Hughes, K. M. (2000). Experimental testing of acoustic alarms (pingers) to reduce bycatch of harbour porpoise, *Phoceona phocoena*, in the state of Washington. *2*(1), 1-9.

Gill, A. B. (2005). Offshore renewable energy: ecological implications of generating electricity in the coastal zone. *Journal of Applied Ecology, 42*(4), 605-615. 10.1111/j.1365-2664.2005.01060.x

Gitschlag, G. R., Schirripa, M. J. & Powers, J. E. (2001). Estimation of fisheries impacts due to underwater explosives used to sever and salvage oil and gas platforms in the U.S. Gulf of Mexico Final Report. Prepared by U.S. Department of the Interior.

Glover, A. G. & Smith, C. R. (2003). The deep-sea floor ecosystem: current status and prospects of anthropogenic change by the year 2025. *Environmental Conservation, 30*(3), 219-241. doi: 10.1017/S0376892903000225

Goatley, C. H. R. and D. R. Bellwood. (2009). "Morphological structure in a reef fish assemblage." Coral Reefs 28: 449-457.

Goertner, J.F. (1982). Prediction of Underwater Explosion Safe Ranges for Sea Mammals. Research and Technology Department. NSWC TR 82-188.

Goertner, J. F., Wiley, M. L., Young, G. A. & McDonald, W. W. (1994). Effects of underwater explosions on fish without swimbladders. (NSWC TR 88-114). Silver Spring, MD: Naval Surface Warfare Center.

Goncalves, R., Scholze, M., Ferreira, A. M., Martins, M. & Correia, A. D. (2008). The joint effect of polycyclic aromatic hydrocarbons on fish behavior. *Environmental Research, 108*(2), 204-213. 10.1016/j.envres.2008.07.008

Good, T. P., Waples, R. S. & Adams, P. (2005). *Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead*. (NOAA Technical Memorandum NMFS-NWFSC-66, pp. 598) U.S. Department of Commerce.

Govoni, J. J., L. R. L.R. Settle, et al. (2003). "Trauma to juvenile pinfish and spot inflicted by submarine detonations." Journal of Aquatic Animal Health 15: 111-119.

Gregory, J. & Clabburn, P. (2003). Avoidance behaviour of *Alosa fallax fallax* to pulsed ultrasound and its potential as a technique for monitoring clupeid spawning migration in a shallow river. *Aquatic Living Resources, 16*, 313-316. 10.1016/S0990-7440(03)00024-X. Retrieved from www.sciencedirect.com

Haedrich, R. L. (1996). "Deep-water fishes: Evolution and adaptation in the earth's largest living spaces." Journal of Fish Biology 49: 40-53.

Halpern, B. S., McLeod, K. L., Rosenberg, A. A. & Crowder, L. B. (2008). Managing for cumulative impacts in ecosystem-based management through ocean zoning. *Ocean & Coastal Management, 51*(3), 203-211. doi: 10.1016/j.ocecoaman.2007.08.002

Halvorsen, M. B., Casper, B. M., Woodley, C. M., Carlson, T. J. & Popper, A. N. (2011). Predicting and mitigating hydroacoustic impacts on fish from pile installations *Research Results Digest*. (Vol. 363, pp. Project 25-28). Washington, D.C.: National Cooperative Highway Research Program, Transportation Research Board, National Academy of Sciences.

Halvorsen, M. B., Zeddies, D. A., Ellison, W. T., Chicoine, D. R. & Popper, A. N. (2012). Effects of mid-frequency active sonar on hearing in fish. *Journal of the Acoustical Society of America, 131*(1), 599-607.

Hansen, L. P. & Windsor, M. L. (2006). Interactions between aquaculture and wild stocks of Atlantic salmon and other diadromous fish species: Science and management, challenges and solutions. *ICES Journal of Marine Science, 63*(7), 1159-1161. 10.1016/J.ICEJMS.2006.05.003

Hartwell, S. I., Hocutt, C. H. & van Heukelem, W. F. (1991). Swimming response of menhaden (*Brevoortia tyrannus*) to electromagnetic pulses. *Journal of Applied Ichthyology, 7*(2), 90-94.

Hastings, M. C. (1990). Effects of Underwater Sound on Fish. Document No. 46254-900206-01IM, Project No. 401775-1600, AT&T Bell Laboratories.

Hastings, M. C. (1995). Physical effects of noise on fishes. Presented at the Proceedings of INTER-NOISE 95, The 1995 International Congress on Noise Control Engineering.

Hastings, M. C. & Popper, A. N. (2005a). Effects of Sound on Fish. (Contract No. 43A0139, Task Order 1). 2600 V Street Sacramento, CA 9581: California Department of Transportation. Prepared by P. C. Jones & Stokes.

Hastings, M. C. & Popper, A. N. (15701). (2005b). Effects of sound on fish. (Vol. Report to Cal Trans, pp. 1-82).

Hastings, M. C., Popper, A. N., Finneran, J. J. & Lanford, P. J. (1996, Mar). Effects of low-frequency underwater sound on hair cells of the inner ear and lateral line of the teleost fish *Astronotus ocellatus*. *Journal of the Acoustical Society of America, 99*(3), 1759-1766.

Hastings, M. C., Reid, C. A., Grebe, C. C., Hearn, R. L. & Colman, J. G. (2008). The effects of seismic airgun noise on the hearing sensitivity of tropical reef fishes at Scott Reef, Western Australia. *Proceedings of the Institute of Acoustics, 30*(5), 8 pp.

Hawkins, A. D. & Johnstone, A. D. F. (1978a). The hearing of the Atlantic salmon, *Salmo salar*. *Journal of Fish Biology, 13*, 655-673.

Hawkins, A. D. & Johnstone, A. D. F. (1978b). The hearing of the Atlantic salmon, *Salmo solar*. *Journal of Fish Biology, 13*, 655-673.

Helfman, G. S., Collette, B. B. & Facey, D. E. (1997). *The Diversity of Fishes* (pp. 528). Malden, MA: Blackwell Science.

Helfman, G. S., Collette, B. B., Facey, D. E. & Bowen, B. W. (2009a). The Diversity of Fishes. In Wiley-Blackwell (Ed.) (Second ed.).

Helfman, G. S., Collette, B. B., Facey, D. E. & Bowen, B. W. (2009b). *The Diversity of Fishes: Biology, Evolution, and Ecology* (2nd ed., pp. 528). Malden, MA: Wiley-Blackwell.

Higgs, D., Plachta, D., Rollo, A., Singheiser, M., Hastings, M. & Popper, A. (2004). Development of ultrasound detection in American shad (*Alosa sapidissima*). *The Journal of Experimental Biology, 207*, 155-163. 10.1242/jeb.00735

Higgs, D. M. (2005). Auditory cues as ecological signals for marine fishes. *Marine Ecology Progress Series, 287*, 278-281.

Holland, K. N., Wetherbee, B. M., Peterson, J. D. & Lowe, C. G. (1993). Movements and Distribution of Hammerhead Shark Pups on their Natal Grounds. *Copeia*(2), 495-502. 10.2307/1447150

Horn, M. H. & Allen, L. G. (1978). A distributional analysis of California coastal marine fishes. *Journal of Biogeography, 5*(1), 23-42. Retrieved from http://www.jstor.org/stable/3038105

Horst, T. J. (1977). Use of Leslie Matrix for assessing environmental-impact with an example for a fish population. *Transactions of the American Fisheries Society, 106*(3), 253-257.

Hoss, D. E. & Settle, L. R. (1990). Ingestion of plastics by teleost fishes. In S. Shomura and M. L. Godfrey (Eds.), *Proceedings of the Second International Conference on Marine Debris* [Technical Memorandum]. (NFMS-SWFSC-154, pp. 693-709). Honolulu, HI: US Department of Commerce, National Oceanic and Atmospheric Administration.

International Union for Conservation of Nature and Natural Resources. (2009). Indo-Pacific bottlenose dolphin assessment workshop report: Solomon Islands case study of *Tursiops aduncus*. R. R. Reeves and R. L. Brownell (Eds.), *Occasional Paper of the Species Survival Commission*. Gland, Switzerland: International Union for Conservation of Nature and Natural Resources.

International Union for Conservation of Nature. (2010). Red List of Threatened Species. Version 2009.2. Barcelona, International Union for Conservation of Nature and Natural Resources. 2010.

Iversen, R. T. B. (1967). Response of the yellowfin tuna (Thunnus albacares) to underwater sound. In W. N. Tavolga (Ed.), *Marine Bio-Acoustics II*. New York: Pergamon Press.

Iversen, R. T. B. (1969). Auditory thresholds of the scombrid fish *Euthynnus affinis*, with comments on the use of sound in tuna fishing, *FAO Conference on Fish Behaviour in Relation to Fishing Techniques and Tactics*.

Jonsson, B., Waples, R. S. & Friedland, K. D. (1999). Extinction considerations for diadromous fishes. *ICES Journal of Marine Science, 56*(4), 405-409.

Jørgensen, R., Handegard, N. O., Gjøsæter, H. & Slotte, A. (2004). Possible vessel avoidance behaviour of capelin in a feeding area and on a spawning ground. *Fisheries Research, 69*(2), 251-261. doi: 10.1016/j.fishres.2004.04.012

Jorgensen, R., Olsen, K., Petersen, I. & Kanapthipplai, P. (2005). Investigations of potential effects of low frequency sonar signals on survival, development and behaviour of fish larvae and juveniles. (pp. 51) The Norwegian College of Fishery Science, University of Tromso, Norway.

Kajiura, S. M. & Holland, K. N. (2002). Electroreception in Juvenile Scalloped Hammerhead and Sandbar Sharks. *The Journal of Experimental Biology, 205*, 3609-3621.

Kalmijn, A. J. (2000). Detection and processing of electromagnetic and near-field acoustic signals in elasmobranch fishes. *Philosophical Transactions of the Royal Society of London Series B-Biological Sciences, 355*(1401), 1135-1141. doi: 10.1098/rstb.2000.0654

Kane, A. S., Song, J., Halvorsen, M. B., Miller, D. L., Salierno, J. D., Wysocki, L. E., Popper, A. N. (2010). Exposure of fish to high intensity sonar does not induce acute pathology. [Uncorrected Proof]. *Journal of Fish Biology*.

Kappel, C. V. (2005). Losing pieces of the puzzle; threats to marine, estuarine, and diadromous species. *Frontiers in Ecology and the Environment, 3*(5), 275-282.

Kauparinen, A. & Merila, J. (2007). Detecting and managing fisheries-induced evolution. *Trends in Ecology & Evolution, 22*(12), 652-659. 10.1016/j.tree.2007.08.11

Keevin, T. M. & Hempen, G. (1997). The environmental effects of underwater explosions with methods to mitigate impacts (pp. 1-102). U.S. Army Corps of Engineers St. Louis, Missouri.

Keller, A. A., Fruh, E. L., Johnson, M. M., Simon, V. & McGourty, C. (2010, May). Distribution and abundance of anthropogenic marine debris along the shelf and slope of the US West Coast. [Research Support, U.S. Gov't, Non-P.H.S.]. *Marine Pollution Bulletin, 60*(5), 692-700. 10.1016/j.marpolbul.2009.12.006 Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/20092858

Kenyon, T. (1996a). Ontogenetic changes in the auditory sensitivity of damselfishes (pomacentridae). *Journal of Comparative Physiology, 179*, 553-561.

Kenyon, T. N. (1996b). Ontogenetic changes in the auditory sensitivity of damselfishes (pomacentridae). *Journal of Comparative Physiology A, 179*, 553-561.

Ketten, D. R. (1998, September). Marine Mammal Auditory Systems: A Summary of Audiometric and Anatomical Data and Its Implications for Underwater Acoustic Impacts. Dolphin-Safe Research Program, Southwest Fisheries Science Center, LA Jolla, CA.

Klimley, A. P. & Nelson, D. R. (1984). Diel Movement Patterns of the Scalloped Hammerhead Shark (*Sphyrna-Lewini*) in Relation to El-Bajo-Espiritu-Santo - A Refuging Central-Position Social System. Behavioral Ecology and Sociobiology, 15(1), 45-54. 10.1007/bf00310214

Koslow, J. A. (1996). "Energetic and life-history patterns of deep-sea benthic, benthopelagic and seamount-associated fish." Journal of Fish Biology 49: 54-74.

Kvadsheim, P. H. and E. M. Sevaldsen. (2005). The potential impact of 1-8 kHz active sonar on stocks of juvenile fish during sonar exercises, Forsvarets Forskningsinstitutt

Ladich, F. (2008). Sound communication in fishes and the influence of ambient and anthropogenic noise. [Journal Article]. *Bioacoustics, 17*, 35-37.

Ladich, F. and A. N. Popper. (2004). Parallel Evolution in Fish Hearing Organs. Evolution of the Vertebrate Auditory System, Springer Handbook of Auditory Research. G. A. Manley, A. N. Popper and R. R. Fay. New York, Springer-Verlag.

Laist, D. W. (1987). Overview of the biological effects of lost and discarded plastic debris in the marine environment. *Marine Pollution Bulletin, 18*(6B), 319-326.

Leet, W. S., Dewees, C. M., Klingbeil, R. & Larson, E. J. (Eds.). (2001). *California's Living Marine Resources: A Status Report*. (SG 01-11, pp. 593) California Department of Fish and Game. Available from www.dfg.ca.gov/mrd

Limburg, K. E. & Waldman, J. R. (2009). Dramatic declines in North Atlantic diadromous fishes. *BioScience, 59*(11), 955-965. 10.1525/bio.2009.59.11.7

Lombarte, A. and A. N. Popper. (1994). "Quantitative analyses of postembryonic hair cell addition in the otolithic endorgans of the inner ear of the European hake, Merluccius merluccius (Gadiformes, Teleostei)." Journal of Comparative Neurology 345: 419-428.

Lombarte, A., Yan, H. Y., Popper, A. N., Chang, J. C., and Platt, C. (1993). "Damage and regeneration of hair cell ciliary bundles in a fish ear following treatment with gentamicin." Hear. Res. 66, 166-174.

Lotufo, G. R., Blackburn, W., Marlborough, S. J. & Fleeger, J. W. (2010). Toxicity and bioaccumulation of TNT in marine fish in sediment exposures. *Ecotoxicology and Environmental Safety, 73*(7), 1720-1727. doi: 10.1016/j.ecoenv.2010.02.009

Love, M. S. & York, A. (2005). A comparison of the fish assemblages associated with an oil/gas pipeline and adjacent seafloor in the Santa Barbara Channel, southern California bight. Bulletin of Marine Science, 77(1), 101-117.

Lovell, J., Findlay, M., Moate, R. & Yan, H. (2005). The hearing abilities of the prawn *Palaemon serratus*. *Comparative Biochemistry and Physiology, Part A, 140*, 89-100. Retrieved from www.elsevier.com/locate/cbpa

Luczkovich, J. J., Daniel III, H. J., Hutchinson, M., Jenkins, T., Johnson, S. E., Pullinger, R. C. & Sprague, M. W. (2000). Sounds of sex and death in the sea: bottlenose dolphin whistles suppress mating choruses of silver perch. *Bioacoustics, 10*(4), 323-334.

Lundquist, C. J., Thrush, S. F., Coco, G. & Hewitt, J. E. (2010). Interactions between disturbance and dispersal reduce persistence thresholds in a benthic community. *Marine Ecology-Progress Series, 413*, 217-228. doi: 10.3354/meps08578

Macfadyen, G., Huntington, T. & Cappell, R. (2009). *Abandoned, Lost or Otherwise Discarded Fishing Gear*. (UNEP Regional Seas Report and Studies 185, or FAO Fisheries and Aquaculture Technical Paper 523, pp. 115). Rome, Italy: United Nations Environment Programme, Food and Agriculture Organization of the United Nations. Available from http://www.fao.org/docrep/011/i0620e/i0620e00.HTM

Madsen, P., Johnson, M., Miller, P., Soto, N., Lynch, J. & Tyack, P. (2006, October). Quantitative measures of air-gun pulses recorded on sperm whales (*Physeter macrocephalus*) using acoustic tags during controlled exposure experiments. *Journal of the Acoustical Society of America, 120*(4), 2366-2379.

Mahon, R., S. K. Brown, et al. (1998). "Assemblages and biogeography of demersal fishes of the east coast of North America." Canadian Journal of Fisheries and Aquatic Sciences 55: 1704-1738.

Mann, D. A., Higgs, D., Tavolga, W., Souza, M. & Popper, A. (2001a). Ultrasound detection by clupeiform fishes. *Journal of the Acoustical Society of America*, 3048-3054.

Mann, D. A., Higgs, D. M., Tavolga, W. N., Souza, M. J. & Popper, A. N. (2001b). Ultrasound detection by clupeiform fishes. *Journal of the Acoustical Society of America, 109*(6), 3048-3054.

Mann, D. A. & Lobel, P. S. (1997, June). Propagation of damselfish (*Pomacentridae*) courtship sounds. *Journal of Acoustical Society of America, 101*(6), 3783-3791.

Mann, D. A., Lu, Z., Hastings, M. C. & Popper, A. N. (1998). Detection of ultrasonic tones and simulated dolphin echolocation clicks by a teleost fish, the American shad (*Alosa sapidissima*). *Journal of the Acoustical Society of America, 104*(1), 562-568.

Mann, D. A., Lu, Z. & Popper, A. N. (1997). A clupeid fish can detect ultrasound. *Nature, 389*, 341.

Mann, D., Popper, A. & Wilson, B. (2005a, May 20). Pacific herring hearing does not include ultrasound. *Biology Letters, 1*, 158-161. 10.1098/rsbl.2004.0241

Mann, D. A., Popper, A. N. & Wilson, B. (2005b). Pacific herring hearing does not include ultrasound. *Biology Letters, 1*, 158-161.

Marcotte, M. M. & Lowe, C. G. (2008). Behavioral responses of two species of sharks to pulsed, direct current electrical fields: Testing a potential shark deterrent. *Marine Technology Society Journal, 42*(2), 53-61.

Marshall, N. J. (1996). "Vision and sensory physiology - The lateral line systems of three deep-sea fish." Journal of Fish Biology 49: 239-258.

McCauley, R. D. & Cato, D. H. (2000). Patterns of fish calling in a nearshore environment in the Great Barrier Reef. *Philosophical Transactions: Biological Sciences, 355*, 1289-1293.

McCauley, R. D., Fewtrell, J., Duncan, A. J., Jenner, C., Jenner, M.-N., Penrose, J. D., McCabe, K. (2000). Marine seismic surveys: analysis and propagation of air-gun signals; and effects of air-gun exposure on humpback whales, sea turtles, fishes and squid. (REPORT R99-15) Centre for Marine Science and Technology, Curtin University.

McCauley, R. D., J. Fewtrell, et al. (2003). "High intensity anthropogenic sound damages fish ears." Journal of the Acoustical Society of America 113(1): 638-642.

McEwan, D. & Jackson, T. A. (1996). *Steelhead Restoration and Management Plan for California*. (pp. 234). Sacramento, CA: California Department of Fish and Game.

McLennan, M. W. (1997). A simple model for water impact peak pressure and pulse width: a technical memorandum. Goleta, CA: Greeneridge Sciences Inc.

Meyer, M., Fay, R. R. & Popper, A. N. (2010). Frequency tuning and intensity coding of sound in the auditory periphery of the lake sturgeon, Acipenser fulvescens. Journal of Experimental Biology, 213, 1567-1578. doi:10.1242/jeb.031757Miller, J. D. (1974, April, 1974). Effects of noise on people. *Journal of the Acoustical Society of America, 56*(3), 729-764.

Miller, M.H., Carlson, J., Cooper, P., Kobayashi, D., Nammack, M., and J. Wilson. (2013). Status review report: scalloped hammerhead shark (*Sphyrna lewini*). Report to National Marine Fisheries Service, Office of Protected Resources. March 2013.131 pp.

Misund, O. A. (1997a). Underwater acoustics in marine fisheries and fisheries research. *Reviews in Fish Biology and Fisheries, 7*, 1-34.

Misund, O. A. (1997b). Underwater acoustics in marine fisheries and fisheries research. *Reviews in Fish Biology and Fisheries, 7*(1), 1-34.

Moore, C. J. (2008). Synthetic polymers in the marine environment: A rapidly increasing, long-term threat. *Environmental Research, 108*(2), 131-139. 10.1016/j.envres.1008.07.025

Morgan, L. & Chuenpagdee, R. (2003) Shifting Gears addressing the collateral impacts of fishing methods in U.S. waters. Island Press, Washington, D.C

Mueller-Blenkle, C., McGregor, P. K., Gill, A. B., Andersson, M. H., Metcalfe, J., Bendall, V., Thomsen, F. (2010a). *Effects of Pile-Driving Noise on the Behaviour of Marine Fish*. (COWRIE Ref: Fish 06-08 / CEFAS Ref: C3371, Technical Report, pp. 57) COWRIE Ltd.

Mueller-Blenkle, C., McGregor, P. K., Gill, A. B., Andersson, M. H., Metcalfe, J., Bendall, V., Thomsen, F. (2010b). *Effects of Pile-Driving Noise on the Behaviour of Marine Fish*. (COWRIE Ref: Fish 06-08 / CEFAS Ref: C3371, Technical Report, pp. 62) COWRIE Ltd.

Musick, J. A., Harbin, M. M., Berkeley, S. A., Burgess, G. H., Eklund, A. M., Findley, L. & Wright, S. G. (2000). Marine, estuarine, and diadromous fish stocks at risk of extinction in North America (exclusive of Pacific salmonids). *25*(11), 6-30.

Myrberg, A. A. (2001). The acoustical biology of elasmobranchs. *Environmental Biology of Fishes, 60*, 31-45.

Myrberg, A. A., Banner, A. & Richard, J. D. (1969). Shark attraction using a video-acoustic system. *Marine Biology, 2*(3), 264-276.

Myrberg, A. A., Gordon, C. R. & Klimley, A. P. (1976). Attraction of free ranging sharks by low frequency sound, with comments on its biological significance A. Schuijf and A. D. Hawkins (Eds.), *Sound Reception in Fish*. Amsterdam: Elsevier.

Myrberg, A. A., Ha, S. J., Walewski, S. & Banbury, J. C. (1972). Effectiveness of acoustic signals in attracting epipelagic sharks to an underwater sound source. *Bulletin of Marine Science, 22*, 926-949.

Myrberg, J., A.A. (1980). Ocean noise and the behavior of marine animals: relationships and implications F. P. Diemer, F. J. Vernberg and D. Z. Mirkes (Eds.), *Advanced concepts in ocean measurements for marine biology* (pp. 461-491). Univ.SouthCar.Press, 572pp.

National Marine Fisheries Service. (1997). Endangered and threatened species: Listing of several evolutionary significant units (ESUs) of west coast steelhead. [Final rule]. *Federal Register, 62*(159), 43937-43954.

National Marine Fisheries Service. (2001). *Final Environmental Impact Statement: Fishery Management Plan, Pelagic Fisheries of the Western Pacific Region*. (Vol. 1). Prepared by URS Corporation. Available from http://www.fpir.noaa.gov/Library/PUBDOCs/environmental_impact_statements/FEIS_Wstrn_Pcf_Plgc_Fshrs/feis_wstrn_pcf_plgc_fshrs.html

National Marine Fisheries Service. (2002). Magnuson-Stevens Act provisions; Essential Fish Habitat (EFH). [Final rule]. Federal Register, 67(12), 2343-2383.

National Marine Fisheries Service. (2005). Appendix G: Non-fishing impacts to essential fish habitat and recommended conservation measures. In Final Environmental Impact Statement for Essential Fish Habitat Identification and Conservation in Alaska. (pp. 94). Juneau, AK: NOAA, NMFS Alaska Regional Office.

National Marine Fisheries Service. (2009). Annual Report to Congress on the status of U.S. fisheries - 2008. Silver Spring, Maryland: National Oceanic and Atmospheric Administration Available from http://www.nmfs.noaa.gov/sfa/statusoffisheries/booklet_status_of_us_fisheries08.pdf

National Marine Fisheries Service. (2010). Steelhead Trout (*Oncorhynchus mykiss*): NOAA Fisheries Office of Protected Resources.

National Marine Fisheries Service. (2011). Endangered and Threatened Wildlife and Plants; 90-Day Finding on a Petition To List the Scalloped Hammerhead Shark as Threatened or Endangered Under the Endangered Species Act National Marine Fisheries Service. Retrieved from http://www.nmfs.noaa.gov/pr/pdfs/fr/fr76-72891.pdf as accessed

National Oceanic and Atmospheric Administration. (1996). Magnuson Act provisions; Consolidation and update of regulations. [Proposed rule; request for comments]. Federal Register, 61(85), 19390-19429.

National Oceanic and Atmospheric Administration. (2011). Draft Aquaculture Policy. Available from http://www.nmfs.noaa.gov/aquaculture/docs/noaadraftaqpolicy.pdf

National Research Council (NRC). (1994). Low-frequency sound and marine mammals: Current knowledge and research needs. Washington, DC, National Academy Press.

National Research Council (NRC). (2003). Ocean Noise and Marine Mammals. Washington, DC, National Academies Press.

Nedwell, J., Turnpenny, A., Langworthy, J. & Edwards, B. (2003a). *Measurements of Underwater Noise during Piling at the Red Funnel Terminal, Southampton, and Observations of its Effect on Caged Fish*. (Report Reference 558 R 0207, pp. 33) Subacoustech Ltd. Prepared for Red Funnel.

Nedwell, J., Turnpenny, A., Langworthy, J. & Edwards, B. (2003b). Measurements of underwater noise during piling at the Red Funnel Terminal, Southampton, and observations of its effect on caged fish. (Report 558 R 0207, pp. 33 pp.). Hants, UK: Subacoustech Ltd.

Nelson, D. R. & Johnson, R. H. (1972). Acoustic attraction of Pacific reef sharks: effect of pulse intermittency and variability. *Comparative Biochemistry and Physiology Part A, 42*, 85-95.

Nemeth, D. J. & Hocutt, C. H. (1990). Acute effects of electromagnetic pulses (EMP) on fish. *Journal of Applied Ichthyology, 6*(1), 59-64.

Nelson, J. S. (2006). Fishes of the World. Hoboken, NJ, John Wiley & Sons: 601.

Nestler, J. M., Goodwin, R. A., Cole, T. M., Degan, D. & Dennerline, D. (2002). Simulating Movement Patterns of Bluback Herring in a Stratified Southern Impoundment. *Transations of the American Fisheries Society, 131*, 55-69.

Newman, M. C. (1998). Uptake, biotransformation, detoxification, elimination, and accumulation. *Fundamentals of ecotoxicology*, 25.

Nix, P. and P. Chapman. (1985). Monitoring of underwater blasting operations in False Creek, British Columbia Proceedings of the workshop on effects of explosive use in the marine environment, Ottawa, Ontario, Environmental Protection Branch Technical Report No. 5, Canada Oil and Gas Lands Administration.

Normandeau, Exponent, T., T. & Gill, A. (2011). Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species. Camarillo, CA: U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific OCS Region. Available from http://www.gomr.boemre.gov/PI/PDFImages/ESPIS/4/5115.pdf

O'Connell, C. P., Abel, D. C., Rice, P. H., Stroud, E. M. & Simuro, N. C. (2010). Responses of the southern stingray (*Dasyatis americana*) and the nurse shark (*Ginglymostoma cirratum*) to permanent magnets. *Marine and Freshwater Behaviour and Physiology, 43*(1), 63-73. doi: 10.1080/10236241003672230

O'Keefe, D. J. & Young, G. A. (1984). Handbook on the environmental effects of underwater explosions. (pp. 203). Prepared by Naval Surface Weapons Center.

O'Keeffe, D. J. (1984). Guidelines for predicting the effects of underwater explosions on swimbladder fish (pp. 1-28). Dahlgren,Virginia: Naval Surface Weapons Center.

O'Keeffe, D. J. & Young, G. A. (1984). Handbook on the Environmental Effects of Underwater Explosions (pp. 1-207). Silver Spring, Maryland: Naval Surface Weapons Center.

Ocean Conservancy. (2010). Trash travels: from our hands to the sea, around the globe, and through time C. C. Fox (Ed.), *International Coastal Cleanup report*. (pp. 60) The Ocean conservancy.

Ohman, M. C., Sigray, P. & Westerberg, H. (2007). Offshore windmills and the effects electromagnetic fields on fish. *Ambio, 36*(8), 630-633. doi: 10.1579/0044-7447(2007)36[630:OWATEO]2.0.CO;2

Ormerod, S. J. (2003). Current issues with fish and fisheries: Editor's overview and introduction. *Journal of Applied Ecology, 40*(2), 204-213.

Pacific Fishery Management Council. (2000). *Amendment 14 to the Pacific Coast Salmon Plan (1997) Incorporating the Regulatory Impact Review/Initial Regulatory Flexibility Analysis and Final Supplemental Environmental Impact Statement*. Portland, OR.

Pacific Fishery Management Council. (2008). Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery. July 2008.

Pauly, D. and M. L. Palomares. (2005). "Fishing down marine food web: It is far more pervasive than we thought." Bulletin of Marine Science 76(2): 197-211.Paxton, J. R. and W. N. Eschmeyer (1994). Encyclodpedia of Fishes. San Diego, California, Academic Press.

Pearson, W. H., Skalski, J. R. & Malme, C. I. (1987). Effects of sounds from a geophysical survey device on fishing success. Battelle/Marine Research Laboratory for the Marine Minerals Service, United States Department of the Interior.

Pearson, W. H., Skalski, J. R. & Malme, C. I. (1992). Effects of sounds from a geophysical survey device on behavior of captive Rockfish (*Sebastes spp.*). *Canadian Journal of Fisheries and Aquatic Sciences, 49*, 1343-1356.

Pepper, C. B., Nascarella, M. A. & Kendall, R. J. (2003). A review of the effects of aircraft noise on wildlife and humans, current control mechanisms, and the need for further study. *Environmental Management, 32*(4), 418-432.

Pews Oceans Commission. (2003). *America's Living Oceans: Charting a Course for Sea Change*. (pp. 166). Arlington, VA: Pew Oceans Commission.

Pickering, A. D. (1981). Stress and Fish: Academic Press, New York.

Pitcher, T. J. (1986). Functions of shoaling behaviour in teleosts. In. The Behavior of Teleost Fishes. T. J. Pitcher. Baltimore, MD, The Johns Hopkins University Press: 294-337.

Pitcher, T. J. (1995). "The impact of pelagic fish behaviour on fisheries." Scientia Marina 59(3-4): 295-306.

Popper, A. N. (1977). A scanning electron microscopic study of the sacculus and lagena in the ears of fifteen species of teleost fishes. *Journal of Morphology, 153*, 397-418.

Popper, A. N. (1980). Scanning electron microscopic studies of the sacculus and lagena in several deep sea fishes. *American Journal of Anatatomy, 157*, 115 136.

Popper, A. N. (2003a, October). Effects of Anthropogenic Sounds on Fishes. *Fisheries, 28*(10), 24-31. Retrieved from www.fisheries.org

Popper, A. N. (2003b). Effects of anthropogenic sounds on fishes. *Fisheries, 28*(10), 24-31.

Popper, A. N. (2008). Effects of mid- and High-Frequency Sonars on Fish. (pp. 52). Newport, Rhode Island: Naval Undersea Warfare Center Division. Prepared by L. Environmental BioAcoustics.

Popper, A. N. & Carlson, T. J. (1998, September). Application of Sound and Other Stimuli to Control Fish Behavior. *Transactions of the American Fisheries Society, 127*(5), 673-707.

Popper, A. N., Carlson, T. J., Hawkins, A. D., Southall, B. L. & Gentry, R. L. (2006). *Interim Criteria for Injury of Fish Exposed to Pile Driving Operations: A White Paper*. (pp. 15).

Popper, A. N. & Fay, R. R. (2010). Rethinking sound detection by fishes. *Hearing Research*. doi: DOI: 10.1016/j.heares.2009.12.023 Retrieved from http://www.sciencedirect.com/science/article/B6T73-4Y0KWGD-1/2/7a2c622709c6199f8a4051cbbbffbd8c

Popper, A. N., Fay, R. R., Platt, C. & Sand, O. (2003). Sound detection mechanisms and capabilities of teleost fishes S. P. Collin and N. J. Marshall (Eds.), *Sensory Processing in Aquatic Environments*. New York: Springer-Verlag.

Popper, A. N., Halvorsen, M. B., Kane, A., Miller, D. L., Smith, M. E., Song, J., Wysocki, L. E. (2007). The effects of high-intensity, low-frequency active sonar on rainbow trout. *Journal of the Acoustical Society of America, 122*(1), 623–635.

Popper, A. N. and M. C. Hastings (2009). "The effects of anthropogenic sources of sound on fishes." Journal of Fish Biology 75(3): 455-489.

Popper, A. N. & Hastings, M. C. (2009a). The effects of anthropogenic sources of sound on fishes. *Journal of Fish Biology, 75*(3), 455-489. 10.1111/j.1095-8649.2009.02319.x

Popper, A. N. & Hastings, M. C. (2009b). The effects of human-generated sound on fish. *Integrative Zoology, 4*, 43-52.

Popper, A. N. & Hastings, M. C. (2009c). Review Paper: The effects of anthropogenic sources of sound on fishes. [Review Paper]. *Journal of Fish Biology, 75*, 455-489. 10.1111/j.1095-8649.2009.02319.x

Popper, A. N. and B. Hoxter (1984). "Growth of a fish ear: 1. Quantitative analysis of sensory hair cell and ganglion cell proliferation." Hearing Research 15: 133-142.

Popper, A. N. & Hoxter, B. (1987). Sensory and nonsensory ciliated cells in the ear of the sea lamprey, *Petromyzon marinus*. *Brain, Behavior and Evolution, 30*, 43-61.

Popper, A. N., Smith, M. E., Cott, P. A., Hanna, B. W., MacGillivray, A. O., Austin, M. E. & Mann, D. A. (2005). Effects of exposure to seismic airgun use on hearing of three fish species. *Journal of the Acoustical Society of America, 117*(6), 3958-3971. Retrieved from http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=16018498

Popper, A. N., D. T. T. Plachta, et al. (2004). "Response of clupeid fish to ultrasound: a review." ICES Journal of Marine Science 61: 1057-1061.

Popper, A. N. & Tavolga, W. N. (1981). Structure and Function of the Ear in the Marine Catfish, *Arius felis*. *Journal of Comparative Physiology, 144*, 27-34.

Price, C. B., Brannon, J. M. & Yost, S. L. (1998). *Transformation of RDX and HMX Under Controlled Eh/pH Conditions* [Final Report]. (Technical Report IRRP-98-2, pp. 34). Washington, DC: U.S. Army Corps of Engineers, Waterways Experiment Station.

Quinn, T.P. & K.W. Meyers. (2004). Anadromy and the marine migrations of Pacific salmon and trout: Rounsefell revisited. Reviews in Fish Biology and Fisheries (2004) 14:421-442.

Ramcharitar, J., Higgs, D. M. & Popper, A. N. (2001). Sciaenid inner ears: a study in diversity. *Brain, Behavior and Evolution, 58*, 152-162.

Ramcharitar, J. & Popper, A. N. (2004a, September). Masked auditory thresholds in sciaenid fishes: A comparative study. *Journal of the Acoustical Society of America, 116*(3), 1687-1691.

Ramcharitar, J. & Popper, A. N. (2004b, September). Masked auditory thresholds in sciaenid fishes: A comparative study. *Journal of Acoustical Society of America, 116*(3), 1687-1691.

Ramcharitar, J. & Popper, A. N. (2004c). Masked auditory thresholds in sciaenid fishes: a comparative study. *Journal of the Acoustical Society of America, 116*(3), 1687-1691.

Ramcharitar, J. U., Deng, X., Ketten, D. & Popper, A. N. (2004). Form and function in the unique inner ear of a teleost: The silver perch (*Bairdiella chrysoura*). *Journal of Comparative Neurology, 475*(4), 531-539.

Ramcharitar, J., Higgs, D. & Popper, A. N. (2006a, January). Audition in sciaenid fishes with different swim bladder-inner ear configurations. *Journal of the Acoustical Society of America, 119*(1), 439-443.

Ramcharitar, J. U., Higgs, D. M. & Popper, A. N. (2006b). Audition in sciaenid fishes with different swim bladder-inner ear configurations. *Journal of the Acoustical Society of America, 119*(1), 439-443.

Randall, J. E. (1998). Zoogeography of shore fishes of the Indo-Pacific region. *Zoological Studies, 37*(4), 227-268.

Remage-Healey, L., Nowacek, D. P. & Bass, A. H. (2006a). Dolphin foraging sounds suppress calling and elevate stress hormone levels in a prey species, the Gulf toadfish. *Journal of Experimental Biology, 209*, 4444-4451.

Remage-Healey, L., Nowacek, D. P. & Bass, A. H. (2006b). Dolphin foraging sounds suppress calling and elevate stress hormone levels in a prey species, the Gulf toadfish. *The Journal of Experimental Biology, 209*, 4444-4451. 10.1242/jeb.02525

Rex, M. A. and R. J. Etter. (1998). "Bathymetric patterns of body size: implications for deep-sea biodiversity." Deep-Sea Research II 45(1-3): 103-127.

Reynolds, J. D., Dulvy, N. K., Goodwin, N. B. & Hutchings, J. A. (2005). Biology of extinction risk in marine fishes. *Proceedings of the Roayal Society B-Biological Sciences, 272*(1579), 2337-2344. 10.1098/rspb.2005.3281

Rigg, D. P., Peverell, S. C., Hearndon, M. & Seymour, J. E. (2009). Do elasmobranch reactions to magnetic fields in water show promise for bycatch mitigation? *Marine and Freshwater Research, 60*(9), 942-948. doi: 10.1071/mf08180

Rickel, S. and A. Genin. (2005). "Twilight transitions in coral reef fish: The input of light-induced changes in foraging behaviour." Animal Behaviour 70(1): 133-144.

Rosen, G. & Lotufo, G. R. (2010). Fate and effects of composition B in multispecies marine exposures. Environmental Toxicology and Chemistry, 9999(12), 1-8. doi: 10.1002/etc.153

Ross, Q. E., D. J. Dunning, et al. (1996). "Reducing impingement of alewives with high-frequency sound at a power plant intake on Lake Ontario." North American Journal of Fisheries Management 16: 548-559.Rostad, A., Kaartvedt, S., Klevjer, T. A. & Melle, W. (2006). Fish are attracted to vessels. *ICES Journal of Marine Science, 63*(8), 1431-1437. 10.1016/j.icejms.2006.03.026

Rowat, D., Meekan, M., Engelhardt, U., Pardigon, B. & Vely, M. (2007a). Aggregations of juvenile whale sharks (*Rhincodon typus*) in the Gulf of Tadjoura, Djibouti. *Environmental Biology of Fishes, 80*(4), 465-472. doi: 10.1007/s10641-006-9148-7

Rowat, D., Meekan, M. G., Engelhardt, U., Pardigon, B. & Vely, M. (2007b). Aggregations of juvenile whale sharks (Rhincodon typus) in the Gulf of Tadjoura, Djibouti. *Environmental Biology of Fishes, 80*(4), 465-472. 10.1007/s10641-006-9148-7

Ruggerone, G.T., S.E. Goodman, and R. Miner. (2008). Behavioral response and survival of juvenile coho salmon to pile driving sounds. Natural Resources Consultants, Inc., and Robert Miner Dynamic Testing, Inc.

Sabarros, P. S., Menard, F., Levenez, J. J., Tew-Kai, E. & Ternon, J. F. (2009). Mesoscale eddies influence distribution and aggregation patterns of micronekton in the Mozambique Channel. *Marine Ecology Progess Series, 395*, 101-107. doi:10.3354/meps08087

Sabates, A., Olivar, M. P., Salat, J., Palomera, I. & Alemany, F. (2007). Physical and Biological Processes Controlling the Distribution of Fish Larvae in the NW Mediterranean. *Progress in Oceanography, 74*(2-3), 355-376. 10.1016/j.pocean.2007.04.017

Saele, O., J. S. Solbakken, et al. (2004). "Staging of Atlantic halibut (Hippoglossus hippoglossus L.) from first feeding through metamorphosis, including cranial ossification independent of eye migration." Aquaculture 239: 445-465.

Sancho, G. (2000). "Predatory behaviors of Caranx melampygus (Carangidae) feeding on spawning reef fishes: A novel ambushing strategy." Bulletin of Marine Science 66(2): 487-496.

Scholik, A. R. & Yan, H. Y. (2001, Feb). Effects of underwater noise on auditory sensitivity of a cyprinid fish. *Hearing Research, 152*(1-2), 17-24. Retrieved from http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=11223278

Scholik, A. R. & Yan, H. Y. (2002). Effects of boat engine noise on the auditory sensitivity of the fathead minnow, *Pimephales promelas*. *Environmental Biology of Fishes, 63*, 203-209.

Schwartz, A. L. (1985). The behavior of fishes in their acoustsic environment. *Environmental Biology of Fishes, 13*(1), 3-15.

Schwarz, A. L. (1985). The behavior of fishes in their acoustic environment. *Environmental Biology of Fishes, 13*(1), 3-15.

Scripps Institution of Oceanography & Foundation., N. S. (2008). Environmental Assessment of a marine geophysical survey by the R/V Melville in the Santa Barbara Channel. Scripps Institution of Oceanography, La Jolla, CA and National Science Foundation, Arlington, VA.

Scripps Institution of Oceanography & Foundation., N. S. (2005). Environmental Assessment of a Planned Low-Energy Marine Seismic Survey by the Scripps Institution of Oceanography on the Louisville Ridge in the Southwest Pacific Ocean, January–February 2006. Scripps Institution of Oceanography, La Jolla, CA and National Science Foundation, Arlington, VA.

Settle, L. R., J. J. Govoni, et al. (2002). Investigation of impacts of underwater explosions on larval and early juvenile fishes.

Sibert, J., J. Hampton, et al. (2006). "Biomass, size, and trophic status of top predators in the Pacific Ocean." Science 314: 1773-1776.

Sisneros, J. A. & Bass, A. H. (2003a). Seasonal plasticity of peripheral auditory frequency sensitivity. *The Journal of Neuroscience, 23*, 1049-1058.

Sisneros, J. A. & Bass, A. H. (2003b, February 1). Seasonal Plasticity of Peripheral Auditory Frequency Sensitivity. *The Journal of Neuroscience, 23*(3), 1049-1058.

Skalski, J. R., Pearson, W. H. & Malme, C. I. (1992). Effects of sounds from a geophysical survey device on catch-per unit-effort in a hook-and-line fishery for rockfish (*Sebastes* spp.). *Canadian Journal of Fisheries and Aquatic Sciences, 49*, 1357-1365.

Slabbekoorn, H., Bouton, N., van Opzeeland, I., Coers, A., ten Cate, C. & Popper, A. N. (2010a). A noisy spring: the impact of globally rising underwater sound levels on fish. [Review]. *Trends in Ecology and Evolution, 25*(7).

Slabbekoorn, H., Bouton, N., van Opzeeland, I., Coers, A., ten Cate, C. & Popper, A. N. (2010b). A noisy spring: The impact of globally rising underwater sound levels on fish. *Trends in Ecology and Evolution, 25*(7), 419-427. doi:10.1016/j.tree.2010.04.005

Slotte, A., K. Kansen, et al. (2004). "Acoustic mapping of pelagic fish distribution and abundance in relation to a seismic shooting area off the Norwegian west coast." Fisheries Research 67: 143-150.

Smith, M. E., Coffin, A. B., Miller, D. L. & Popper, A. N. (2006). Anatomical and functional recovery of the goldfish (*Carassius auratus*) ear following noise exposure. *Journal of Experimental Biology, 209*, 4193-4202. doi:10.1242/jeb.02490

Smith, M. E., Kane, A. S. & Popper, A. N. (2004a, Sep). Acoustical stress and hearing sensitivity in fishes: does the linear threshold shift hypothesis hold water? *Journal of Experimental Biology, 207*(Pt 20), 3591-3602. Retrieved from http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15339955

Smith, M. E., Kane, A. S. & Popper, A. N. (2004b, Jan). Noise-induced stress response and hearing loss in goldfish (Carassius auratus). *Journal of Experimental Biology, 207*(Pt 3), 427-435. Retrieved from http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=14691090

Song, J., Mann, D. A., Cott, P. A., Hanna, B. W. & Popper, A. N. (2008). The inner ears of northern Canadian freshwater fishes following exposure to seismic air gun sounds. *Journal of the Acoustical Society of America, 124*(2), 1360-1366. Retrieved from http://link.aip.org/link/?JAS/124/1360/1

Song, J., Mathieu, A., Soper, R. F. & Popper, A. N. (2006). Structure of the inner ear of bluefin tuna Thunnus thynnus. *Journal of Fish Biology, 68*, 1767-1781. 10.1111/j.1095-8649.2006.01057.x Retrieved from http://www.blackwell-synergy.com

South Atlantic Fishery Management Council. (2011). Dolphin Fish. [Web page] South Atlantic Fishery Management Council. Retrieved from http://www.safmc.net/FishIDandRegs/FishGallery/DolphinFish/tabid/284/Default.aspx

Spargo, B. J. (1999). Environmental Effects of RF Chaff: A Select Panel Report to the Undersecretary of Defense for Environmental Security. Washington, DC, U.S. Department of the Navy, Naval Research Laboratory: 85.

Speed, C. W., Meekan, M. G., Rowat, D., Pierce, S. J., Marshall, A. D. & Bradshaw, C. J. A. (2008). Scarring patterns and relative mortality rates of Indian Ocean whale sharks. *Journal of Fish Biology, 72*(6), 1488-1503. doi: 10.1111/j.1095-8649.2008.01810.x

Sprague, M. W. & Luczkovich, J. J. (2004, November). Measurement of an individual silver perch *Bairdiella chrysoura* sound pressure level in a field recording. *Journal of the Acoustical Society of America, 116*(5), 3186-3191.

Stadler, J. H. & Woodbury, D. P. (2009). Assessing the effects to fishes from pile driving: Application of new hydroacoustic criteria, *Inter-Noise 2009: Innovations in Practical Noise Control*. Ottawa, Canada.

Stenseth, N. C., Mysterud, A., Ottersen, G., Hurrell, J. W., Chan, K. S. & Lima, M. (2002). Ecological effects of climate fluctuations. *Science, 297*, 1292-1296.

Stevens, J. D. (2007). Whale shark (*Rhincodon typus*) biology and ecology: A review of the primary literature. *Fisheries Research, 84*(1), 4-9. doi: 10.1016/j.fishres.2006.11.008

Stuhmiller, J. H., Phillips, Y. Y. & Richmong, D. R. (1990). The Physics and Mechanisms of Primary Blast Injury R. Zatchuck, D. P. Jenkins, R. F. Bellamy and C. M. Quick (Eds.), *Textbook of Military Medicine. Part I. Warfare, Weapons, and the Casualty* (Vol. 5, pp. 241-270). Washington. D.C.: TMMM Publications.

Swisdak Jr., M. M. & Montaro, P. E. (1992). Airblast and fragmentation hazards produced by underwater explosions. (pp. 35). Silver Springs, Maryland. Prepared by Naval Surface Warfare Center.

Tavolga, W. N. (1974a). Sensory parameters in communication among coral reef fishes. *The Mount Sinai Journal of Medicine, 41*(2), 324-340.

Tavolga, W. N. (1974b). Signal/noise ratio and the critical band in fishes. *Journal of the Acoustical Society of America, 55*, 1323-1333.

The Hawaii Association for Marine Education and Research Inc. (2005). Manta Rays. Retrieved from http://www.hamerhawaii.com/Main%20Web%20Pages/Education/Marine$10Life/Rays/manta_rays.htm, November 18, 2010.

Torres-Rojas, Y. E., Hernandez-Herrera, A., Galvan-Magana, F. & Alatorre-Ramirez, V. G. (2010). Stomach content analysis of juvenile, scalloped hammerhead shark *Sphyrna lewini* captured off the coast of Mazatlan, Mexico. *Aquatic Ecology*, 44(1), 301-308. 10.1007/s10452-009-9245-8

U.S. Department of the Navy. (1996). *Environmental Assessment of the Use of Selected Navy Test Sites for Development Tests and Fleet Training Exercises of the MK-46 and MK 50 Torpedoes* [Draft report]. Program Executive Office Undersea Warfare, Program Manager for Undersea Weapons.

U.S. Department of the Navy. (1998). Shock Testing the Seawolf Submarine Final Environmental Impact Statement.

U.S. Department of the Navy. (2001a). *Airborne Mine Neutralization System (AMNS) Inert Target Tests: Environmental Assessment and Overseas Environmental Assessment*. (pp. 83). Panama City, FL: Coastal Systems Station. Prepared by Science Applications International Corporation.

U.S. Department of the Navy. (2001b). *Overseas Environmental Assessment (OEA) for Cape Cod TORPEDO EXERCISE (TORPEX) in Fall 2001*. (pp. 62). Arlington, VA: Undersea Weapons Program Office. Prepared by Naval Undersea Warfare Center Division Newport.

U.S. Department of the Navy. (2006). Archival Search Report for Certain Northeast Range Complex Training/Testing Ranges: Small Point Mining Range, Ex-Salmon Site and the Tomahawk Missile Recovery Site at Ralph Odom Survival Training Facility [Final Report]. (Contract No. N62470-02-D-3054, D0 0009, Mod 3, pp. 87). Norfolk, VA: U.S. Department of the Navy.

U.S. Navy Office of Naval Research. (2001). *Final Environmental Impact Statement for the North Pacific Acoustic Laboratory*. (Vol. I and II). Arlington, VA.

U.S. Air Force, Headquarters Air Combat Command. (1997). Environmental Effects of Self-Protection Chaff and Flares. Langley Air Force Base, VA, U.S. Air Force: 241.

U.S. Army Corps of Engineers, Waterways Experiment Station, Environmental Laboratory. (1998). Toxicity of Military Unique Compounds in Aquatic Organisms: An Annotated Bibliography (Studies Published Through 1996) [Final Report]. (Technical Report IRRP-98-4, pp. 93). Vicksburg, MS: U.S. Army Corps of Engineers.

U.S. Environmental Protection Agency. (2004). Regional Analysis Document for Cooling Water Intake Structures-CWA 316(b), Phase II-Large existing electric generating plants. In Cooling Water Intake Structures-CWA 316(b). [Electronic Data] EPA. Retrieved from http://www.epa.gov/waterscience/316b/phase2/casestudy/final.htm, 13 April 2010.

van der Oost, R., Beyer, J. & Vermeulen, N. P. E. (2003). Fish bioaccumulation and biomarkers in environmental risk assessment: a review. *Environmental Toxicology and Pharmacology, 13*(2), 57-149.

Vaske, T., Vooren, C. M. & Lessa, R. P. (2009). Feeding Strategy of the Night Shark (*Carcharhinus signatus*) and Scalloped Hammerhead Shark (*Sphyrna lewini*) Near Seamounts off Northeastern Brazil. *Brazilian Journal of Oceanography*, 57(2), 97-104.

Wang, W. X. & Rainbow, P. S. (2008). Comparative approaches to understand metal bioaccumulation in aquatic animals. Comparative Biochemistry and Physiology C-Toxicology & Pharmacology, 148(4), 315-323. doi: 10.1016/j.cbpc.2008.04.003

Wainwright, P. C. and B. A. Richard. (1995). "Predicting patterns of prey use from morphology of fishes." Environmental Biology of Fishes 44: 97-113.

Wardle, C. S. (1986). Fish behaviour and fishing gear. In T. J. Pitcher (Ed.), *The Behavior of Teleost Fishes* (pp. 463-495). Baltimore, MD: The Johns Hopkins University Press.

Wardle, C. S., T. J. Carter, et al. (2001). "Effects of seismic air guns on marine fish." Continental Shelf Research 21: 1005-1027.

Warrant, E. J. and N. A. Locket. (2004). "Vision in the deep sea." Biological Reviews 79(3): 671-712.

Wedemeyer, G. A., Barton, B. A. & McLeay, D. J. (1990). Stress and acclimation. In C. B. Schreck and P. B. Moyle (Eds.), *Methods for Fish Biology* (pp. 451-489). Bethesda, MD: American Fisheries Society.

Wegner, N. C., C. A. Sepulveda, et al. (2006). "Gill specializations in high-performance pelagic teleosts, with reference to striped marlin (Tetrapturus audax) and wahoo (Acanthocybium solandri)." Bulletin of Marine Science 79(3): 747-759.

West Coast Salmon Biological Review Team, Northwest Fisheries Science Center & Southwest Fisheries Science Center. (2003). *Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead*. Available from http://www.nwfsc.noaa.gov/trt/brtrpt.htm

Wiley, M. L., Gaspin, J. B. & Goertner, J. F. (1981). Effects of underwater explosions on fish with a dynamical model to predict fishkill. *Ocean Science and Engineering, 6*, 223-284.

Wilson, S. K., Adjeroud, M., Bellwood, D. R., Berumen, M. L., Booth, D., Bozec, Y. M., Syms, C. (2010, Mar). Crucial knowledge gaps in current understanding of climate change impacts on coral reef fishes. [Article]. *Journal of Experimental Biology, 213*(6), 894-900. 10.1242/jeb.037895 Retrieved from <Go to ISI>://WOS:000275002600011

Wright, A., Soto, N., Baldwin, A., Bateson, M., Beale, C., Clark, C., Martin, V. (2007). Anthropogenic Noise as a Stressor in Animals: A Multidisciplinary Perspective. *International Journal of Comparative Psychology*. Retrieved from http://escholarship.org/uc/item/46m4q10x

Wright, D. G. (1982). A Discussion Paper on the Effects of Explosives on Fish and Marine Mammals in the Waters of the Northwest Territories *Canadian Technical Report of Fisheries and Aquatic Sciences*. (pp. 1-16). Winnipeg, Manitoba: Western Region Department of Fisheries and Oceans.

Wright, D. G. & Hopky, G. E. (1998). Guidelines for the use of explosives in or near Canadian fisheries waters *Canadian Technical Report of Fisheries and Aquatic Sciences 2107*.

Wright, K., Higgs, D., Belanger, A. & Leis, J. (2005a, June). Auditory and olfactory abilities of pre-settlement larvae and post-settlement juveniles of a coral reef damselfish (Pisces: Pomacentridae). *Marine Biology, 147*, 1425-1434.

Wright, K. J., Higgs, D. M., Belanger, A. J. & Leis, J. M. (2005b). Auditory and olfactory abilities of pre-settlement larvae and post-settlement juveniles of a coral reef damselfish (Pisces: Pomacentridae). *Marine Biology, 147*, 1425-1434.

Wright, K. J., Higgs, D. M., Belanger, A. J. & Leis, J. M. (2007). Auditory and olfactory abilities of pre-settlement larvae and post-settlement juveniles of a coral reef damselfish (Pisces: Pomacentridae). [Erratum to Mar Biol 147:1425–1434 DOI 10.1007/s00227-005-0028-z]. *Marine Biology, 150*, 1049-1050.

Wright, K. J., Higgs, D. M., Cato, D. H. & Leis, J. M. (2010). Auditory sensitivity in settlement-stage larvae of coral reef fishes. *Coral Reefs, 29*, 235-243. doi:10.1007/s00338-009-0572-y

Wysocki, L. E., Davidson, J. W., Smith, M. E., Frankel, A. S., Ellison, W. T., Mazik, P. M., Bebak, J. (2007). Effects of aquaculture production noise on hearing, growth, and disease resistance of rainbow trout *Oncorhynchus mykiss*. *Aquaculture, 272*, 687-697.

Wysocki, L. E., Dittami, J. P. & Ladich, F. (2006). Ship noise and cortisol secretion in European freshwater fishes. *Biological Conservation, 128*, 501-508.

Wysocki, L. E. & Ladich, F. (2005, Mar). Hearing in fishes under noise conditions. *Journal of the Association for Research in Otolaryngology, 6*(1), 28-36. 10.1007/s10162-004-2427-0 Retrieved from http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15735936

Yelverton, J. T., Richmond, D. R., Hicks, W., Saunders, K. & Fletcher, E. R. (1975). The relationship between fish size and their response to underwater blast. (Defense Nuclear Agency Topical Report DNA 3677T, pp. 39 pp.). Washington, DC: Lovelace Foundation for Medical Education and Research, Defense Nuclear Agency.

Young, G. A. (1991). Concise Methods for Predicting the Effects of Underwater Explosions on Marine Life. (NAVSWC MP 91-220, pp. 19). Dahlgren, VA: U.S. Department of the Navy, Naval Surface Warfare Center.

Zelick, R., Mann, D. & Popper, A. N. (1999). Acoustic communication in fishes and frogs R. R. Fay and A. N. Popper (Eds.), *Comparative Hearing: Fish and Amphibians* (pp. 363-411). New York: Springer-Verlag.This Page Intentionally Left Blank.

This Page Intentionally Left Blank

3.10 Cultural Resources

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

This Page Intentionally Left Blank

3.10 CULTURAL RESOURCES

CULTURAL RESOURCES SYNOPSIS

The United States Department of the Navy considered all potential stressors, and the following have been analyzed for submerged cultural resources:

- Acoustic (underwater explosives and pile-driving)
- Physical disturbance (in-water devices, military expended materials, sea floor devices)

Preferred Alternative

- Acoustics and Physical Disturbance: Acoustic and physical stressors, as indicated above, would not affect submerged cultural resources within United States (U.S.) territorial waters in accordance with Section 106 of the National Historic Preservation Act because measures were previously implemented to protect these resources. A Finding of No Effects on historic properties within the Area of Potential Effect has been determined by the U.S. Department of the Navy, and the California State Historic Preservation Officer (California State Historic Preservation Office 2012) concurs with this finding.

3.10.1 INTRODUCTION AND METHODS

3.10.1.1 Introduction

Cultural resources are found throughout the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area). The approach to assessing cultural resources includes defining the resource; presenting the regulatory requirements for identifying, evaluating, and treating the resource within established jurisdictional parameters; establishing the specific resource subtypes in the Study Area; identifying the data used to define the current conditions; and describing the method of impact analysis.

Cultural resources are defined as districts, landscapes, sites, structures, objects, and ethnographic resources, as well as other physical evidence of human activity, that are considered to be important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Cultural resources include archaeological resources, historic architectural resources, and traditional cultural properties related to prehistoric/pre-contact (prior to European contact) and historic/post-contact periods.

Archaeological resources include prehistoric and historic sites and artifacts. Archaeological resources can have a surface component, a subsurface component, or both. Prehistoric resources are physical properties resulting from human activities that predate written records, and include village sites, temporary camps, lithic scatters, roasting pits, hearths, milling features, petroglyphs, rock features, and burials. Historic resources postdate the advent of written records in a region, and include building foundations, refuse scatters, wells, cisterns, and privies. Submerged cultural resources include historic shipwrecks and other submerged historic materials, such as sunken airplanes and prehistoric cultural remains. Architectural resources are elements of the built environment consisting of standing buildings or structures from the historic period. These resources include existing buildings, dams, bridges, lighthouses, and forts. Traditional cultural resources are resources associated with beliefs or cultural practices of a living culture, subculture, or community. These beliefs and practices must be rooted in the group's history and must be important in maintaining the cultural identity of the group. Prehistoric archaeological sites and artifacts, historic and contemporary locations of traditional events, sacred places, landscapes, and resource collection areas, including fishing, hunting and gathering areas, may be traditional cultural resources.

3.10.1.2 Identification, Evaluation, and Treatment of Cultural Resources

Procedures for identifying, evaluating, and treating cultural resources within state territorial waters (within 3 nautical miles [nm] of the coast) and United States (U.S.) territorial waters (within 12 nm of the coast) are contained in a series of federal and state laws and regulations, and agency guidelines. Archaeological, historical architectural, and cultural (including Native American and Native Hawaiian) resources are protected by a variety of laws and their implementing regulations: the National Historic Preservation Act of 1966 as amended in 2006, the Archeological and Historic Preservation Act of 1974, the Archaeological Resources Protection Act of 1979, the American Indian Religious Freedom Act of 1978, the Native American Graves Protection and Repatriation Act of 1990, the Submerged Lands Act of 1953, the Abandoned Shipwreck Act of 1987, and the Sunken Military Craft Act of 2004. The Advisory Council on Historic Preservation (Advisory Council) further guides treatment of archaeological and architectural resources through the regulations, *Protection of Historic Properties* (36 Code of Federal Regulations [C.F.R.] Part 800). The category of "historic properties" is a subset of cultural resources that is defined in the National Historic Preservation Act (16 United States Code [U.S.C.] § 470w(5)) as any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (National Register), including artifacts, records, and material remains related to such a property or resource.

Section 106 of the National Historic Preservation Act requires federal agencies to consider the effects of their actions on cultural resources listed in or eligible for inclusion in the National Register. The regulations implementing Section 106 (36 C.F.R. Part 800) specify a consultation process to assist in satisfying this requirement. Consultation with the appropriate State Historic Preservation Offices, the Advisory Council, Native American tribes and Native Hawaiian organizations, the public, and state and federal agencies is required by Section 106 of the National Historic Preservation Act. Government-to-government consultation required by Executive Order (EO) 13007 will be accomplished concurrently with the preparation of this Environmental Impact Statement (EIS)/Overseas EIS (OEIS) for the portion of the Proposed Action within state territorial waters (within 3 nm). Section 106 consultation letters for the undertaking described under this EIS/OEIS were delivered to California and Hawaii State Historic Preservation Officers and to the appropriate federally recognized Native American tribes or Native Hawaiian organizations. In a letter dated 5 June 2012, the California State Historic Preservation Office concurred that the Area of Potential Effect for the portion of the undertaking under its jurisdiction had been adequately determined, and further concurred with the U.S. Department of the Navy's (Navy's) finding of No Historic Properties Affected (California State Historic Preservation Office 2012). A finding of No Effect on Historic Properties was submitted to the Hawaii State Historic Preservation Office, and no formal response or objection was received within the 30 days required by law. In accordance with 36 C.F.R. 800.4(d)(1)(i), concurrence by the Hawaii State Historic Preservation Office with the finding is assumed. Consultation with State Historic Preservation Offices, tribes, or Native Hawaiian organizations will continue if required, as stipulated by Section 106.

Additional regulations and guidelines for submerged historic resources include 10 U.S.C. 113, note for the Sunken Military Craft Act; the *Abandoned Shipwreck Guidelines* prepared by the National Park Service (National Park Service 2007) and, for the purposes of conducting research or recovering Navy ship and aircraft wrecks, the *Guidelines for Archaeological Research Permit Applications on Ship and Aircraft Wreck*s *under the Jurisdiction of the Department of the Navy* (36 C.F.R. Part 767) overseen by the Naval History and Heritage Command. The Sunken Military Craft Act does not apply to actions taken by, or at the direction of, the United States. In accordance with the Abandoned Shipwreck Act of 1987, abandoned shipwrecks in state waters are considered the property of the U.S. Government if the shipwreck meets the criteria for inclusion in the National Register of Historic Places. However, the federal government may transfer the title of an abandoned shipwreck to the state if the shipwreck falls within the jurisdiction of the state (Barnette 2010). Warships or other vessels used for military purposes at the time of their sinking retain sovereign immunity (e.g., Japanese freighters). According to the principle of sovereign immunity, foreign warships sunk in U.S. territorial waters are protected by the U.S. Government, which acts as custodian of the sites in the best interest of the sovereign nation (Neyland 2001). In addition, the federal archaeological program developed by the National Park Service pursuant to a Presidential Order, includes a collection of historical and archaeological resource protection laws to which federal managers adhere.

The addendum to the National Historic Preservation Act (16 U.S.C. 470a-2: International Federal activities affecting historic properties) requires an assessment by federal agencies of project effects on resources located outside U.S. territorial waters that are identified on the World Heritage List. Papahanaumokuakea is located within the Study Area.

No specific procedures for identifying and protecting cultural resources in the open ocean have been defined by the international community (Zander and Varmer 1996). No treaty offering comprehensive protection of submerged cultural resources has been developed and implemented. However a few international conventions prepared by the United Nations Educational, Scientific, and Cultural Organization apply to submerged cultural resources, including the 1970 Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property, the 1972 Convention Concerning the Protection of the World Cultural and Natural Heritage, the 1982 Convention on the Law of the Sea, and the 2001 Convention on the Protection of the Underwater Cultural Heritage. Only the 1970 and 1972 conventions have been fully ratified by the United States.

3.10.1.3 Methods

3.10.1.3.1 Approach

The approach for establishing current conditions is based on different regulatory parameters defined by geographical location. Within U.S. territorial waters (12 nm), the National Environmental Policy Act (NEPA) is the guiding mandate. Areas beyond 12 nm in the open ocean will not be analyzed, as those areas are beyond the jurisdiction of the National Historic Preservation Act and NEPA.

The implementing regulations of Section 106 of the National Historic Preservation Act require federal agencies to take into account the effects that a proposed action would have on cultural resources included in or eligible for inclusion in the National Register of Historic Places. “Historic properties” is synonymous with National Register-eligible or -listed archaeological, architectural, or traditional resources. Cultural resources that have not been formally evaluated (i.e., a Consensus Determination in consultation with the State Historic Preservation Office) may be considered potentially eligible, and thus are afforded the same regulatory consideration as resources listed in the National Register. Evaluations and determinations of historic properties within the Study Area are the responsibility of the federal agency, in consultation with either the State Historic Preservation Office (California) or the State Historic Preservation Division (Hawaii).

Properties are evaluated for nomination to the National Register and for National Register eligibility using the following criteria (36 C.F.R. § 60.4(a)-(d)):

- Criterion A: Be associated with events that have made a significant contribution to the broad patterns of American history
- Criterion B: Be associated with the lives of persons significant in the American past
- Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction
- Criterion D: Yield, or may be likely to yield, information important in prehistory or history

A historic property also must possess the following aspects of integrity: location, design, setting, materials, workmanship, feeling, and association to convey its significance and to qualify for the National Register. These seven aspects, in various combinations, define integrity. To retain integrity, a property will always possess several, and usually most, of these aspects.

Cultural resources in U.S. territorial waters (within 12 nm of the coastline) are as follows:

- Resources listed on or eligible for listing on the National Register (Section 106 of the National Historic Preservation Act)
- Resources entitled to sovereign immunity (e.g., Japanese midget submarine)

3.10.1.3.2 Data Sources

Cultural resources information relevant to this EIS/OEIS was derived from a variety of sources, including previous environmental documents, national and international shipwreck databases, the National Register Information System (managed by the National Park Service), information repositories associated with State Historic Preservation Offices, on-line maps and data, and published sources, as cited. Previous environmental documents used for general information include the *Hawaii Range Complex EIS/OEIS* (U.S. Department of the Navy 2008a), *Southern California Range Complex EIS/OEIS* (U.S. Department of the Navy 2008b), and *Silver Strand Training Complex EIS* (U.S. Department of the Navy 2011).

The national and international shipwreck databases researched included the National Oceanic and Atmospheric Administration’s Office of Coast Survey Advanced Wreck and Obstruction Information System, National Oceanic and Atmospheric Administration Aids to Navigation, California State Lands Commission Shipwrecks database, and the General Dynamics Global Maritime Wrecks Database, as well as secondary sources of shipwreck information. Many of the shipwreck databases and secondary sources overlap, generating repetitiveness in data. Many federal agencies “share” data as well as secondary sources. The intent of this analysis is not to provide a definitive number of shipwrecks, obstructions, or hazards within a defined area, however, but rather to provide an overview of the potential resources in an area.

The online National Register Information System was reviewed to identify National Register-listed properties, historic districts, and National Historic Landmarks. Appropriate information repositories associated with the State Historic Preservation Offices were contacted or their online databases were reviewed for information on shipwreck locations, types, and eligibility for listing on the state registers and National Register of Historic Places.

3.10.1.3.3 Cultural Context

Several types of cultural properties may be present in the Study Area, including: submerged prehistoric occupation sites along the continental shelf; wrecks of ships, submarines, aircraft, and barges; sunken navigational equipment, such as buoys; man-made obstructions; and Indian tribe and Native Hawaiian marine resource gathering areas (e.g., Traditional Cultural Properties such as traditional fishing, seaweed, mussel, abalone, clam-gathering grounds, and whaling areas). Research suggests that the sea level rose steadily from about 18,000 years ago to about 7,500 years ago, whereupon it reached present-day levels. In California, PaleoIndian and Archaic period sites were submerged by the rising ocean. Many of these sites would not have been preserved as the encroaching ocean inundated, reworked, and redeposited sediments. In California, locations where PaleoIndian and Archaic period sites may have been preserved include: back barrier deposits or mainland shore deposits located behind large, nearshore islands, estuaries, and portions of coastal floodplains.

3.10.1.3.3.1 Hawaii

Human colonization of the Hawaiian Islands occurred after sea levels stabilized, so no sites are known to exist beyond the current coast lines. Traditional Hawaiian cultural resources, such as stone artifacts, sinkers, and octopus lures, may be located below the water surface; however, because of environmental factors, such as weathering, the location of these resources are not known, and therefore they are not eligible for listing on the National Register of Historic Places (Minerals Management Service 1990, National Oceanic and Atmospheric Adminstration 2012).

Archaeological evidence suggests that the first permanent settlements appeared in the Hawaiian Islands around approximately Anno Domini (A.D.) 300. Because the sea level had already stabilized by the time the Hawaiian Islands were first settled, no pre-contact submerged archaeological sites are found in Hawaii. Any submerged cultural resources are the result of natural erosion or modern/historical development.

European contact with the Hawaiian Islands occurred when Captain James Cook landed in Waimea Harbor in 1778. Kamehameha I united the Hawaiian Islands in 1818. Hawaii assumed importance in the east-west fur trade during this period, and later became the focal point for the Pacific whaling industry. Honolulu and Lahaina became the principal ports for the whaling fleet in Hawaii. By the 1840s, approximately 600 whaling vessels were arriving in Hawaii each year (Kelley 2006). Sunken vessels from this period may be located near the coasts of the Hawaiian Islands. Pearl Harbor became an import harbor in the late 19th century and, in 1887, the U.S. Senate allowed the Navy to lease Pearl Harbor. The harbor was dredged in the early 20th century to accommodate large vessels and, in 1908, Pearl Harbor Naval Shipyard was established.

3.10.1.3.3.2 Southern California

The Late Prehistoric Period along the coast of Southern California was characterized by elaborate artifact inventories and distinctive local cultural complexes that lasted until contact with Europeans (Sutton 2010). Artifacts from this period include circular fishhooks, whalebone markers, asphalt skirt weights, steatite ollas, shell beads, bone gorges, composite fishhooks, Cottonwood series projectile points, and spear points (Noah 1998, Sutton 2010). Evidence from numerous archaeological sites along the coast suggests an exploitation of bay and estuary kelp beds, rocky areas, and offshore environments. Bones from numerous species of fish and marine mammals have been recovered from middens. Coastal Late Prehistoric settlements were located near estuaries, along mouths of sloughs and rivers, and around bays, such as Mission Bay in San Diego. Prehistoric habitation sites are not commonly found outside of the inner continental shelf. During the Late Prehistoric Period, cultural traits associated with Kumeyaay, Luiseño, Cupeño, and Cahuilla peoples of the ethnographic period are found.

The maritime history along the west coast of the United States is a history of exploration, imperial competition, and commercial adventurism. The period of exploration began at least as early as the first Spanish voyages northward from Mexico in the 1530s, and by 1578 the British were encroaching on the Spanish monopoly along the coast of California. Undiscovered sunken vessels from early Spanish and British exploration, colonization, and trade may be present in coastal Southern California.

Prior to World War I, the Navy did not have strong presence in San Diego. By 1921, the Navy acquired a site for the U.S. Destroyer Base, San Diego facility. During the 1930s, San Diego harbor was dredged as a result of Public Works Administration projects, and San Clemente Island was purchased by the Navy as a firing range. The Navy base expanded considerably during World War II, with over 5,100 ships being serviced as a result of the war in the Pacific. Because of the importance of Naval Base San Diego and San Clemente Island Naval Auxiliary Landing Field, the region could contain sunken vessels that were associated with these facilities (Naval Base San Diego 2012).

3.10.2 Affected Environment

The Study Area is divided into three distinct regions for cultural resources evaluation: Southern California, Hawaii, and the open ocean Transit Corridor between them (see Figure 2.1-1). The Study Area covers 335,000 square nautical miles (nm^2); however, only the regions that are located in the offshore waters of Hawaii and Southern California are being evaluated. In the Hawaii Operating Area (OPAREA) (235,000 nm^2), a component of the Hawaii Range Complex (HRC), there are a number of known wrecks, obstructions, and occurrences; however, these sites have not been evaluated as properties eligible for listing in the National Register of Historic Places. In the Southern California (SOCAL) Range Complex within the SOCAL OPAREA (120,000 nm^2), a few hundred such sites have been recorded. The Study Area could contain submerged prehistoric sites on the continental shelf.

3.10.2.1 Hawaii

3.10.2.1.1 Submerged Prehistoric Resources

A few submerged prehistoric resources are located in the waters surrounding the Hawaiian Islands. These resources primarily consist of old shoreline features, such as fishponds. Four extant fishponds lie within the boundaries of the Area of Potential Effects in Pearl Harbor. One fishpond, Pamoku/Puuloa, is filled in with boulders but is intact. The remaining three fish ponds, Paaiau, Okiokilepe, and Laulaunui, become submerged during tidal changes. These fishponds are filled with mangroves and are in waters too shallow for ships to safely navigate, so there would be no effect on these properties. In addition, these fishponds are not located in the loch where sonar testing would occur.

3.10.2.1.2 Known Wrecks, Obstructions, Occurrences, or "Unknowns"

A number of submerged cultural resources lie in the open, deep waters surrounding the Hawaiian Islands. Typical among these resources are wrecks of World War II submarines and ships, commercial fishing vessels and tankers, and aircraft. The most likely types of shipwrecks to occur around the Hawaiian Islands are 19th century cargo ships, submarines, old whaling and merchant ships, fishing boats, 20th century U.S. Warships, and recreational craft. The *Automated Wreck and Obstruction Information System*, Region 16 (2010) records the approximate locations of some deep-water submerged shipwrecks. The majority of these cultural resources, if not all, are likely in poor condition and lack the integrity to qualify as historic properties eligible for listing to the National Register of Historic Places.

A variety of submerged resources are located in the waters surrounding the Hawaiian Islands (U.S. Department of the Navy 2008a). The most common of these submerged resources are shipwrecks. However, junked motor vehicles, harbor features, and old shoreline features are also present. Figure 3.10-1 through Figure 3.10-3 illustrate offshore shipwrecks near the Hawaiian Islands.

Shipwrecks located near the Island of Hawaii are concentrated along the northwestern coastline and within Hilo Bay. The numerous known wrecks in the waters surrounding Oahu include: the largely intact Sea Tiger, a World War II-era Japanese midget submarine; the *Mahi* a Navy minesweeper/cable layer intentionally sunk off the Waianae Coast to create an artificial reef; and the YO-257, a Navy yard oiler built in the 1940s, intentionally sunk off Waikiki to create an artificial reef. The *Mahi* and the YO-257 are both artificial reefs, so they are not eligible for listing in the National Register of Historic Places. Within the Ewa Training Minefield, off of the southern coast of Oahu, there is one known shipwreck (Figure 3.10-3). The wreck is likely the *USS Chittenden County* that was sunk as a target in 1958 by the *Sargo SS-583*; this shipwreck is not eligible for listing in the National Register. Because offshore shipwrecks are in relatively deep water and their locations are not precisely known, a figure illustrating offshore Hawaii shipwrecks is not presented in this document. Submerged resources in Pearl Harbor are discussed in Section 3.10.2.1.3.

3.10.2.1.3 Cultural Resources Eligible for Listing or Listed in the National Register

The data indicate that no shipwrecks in the State of Hawaii are listed in the National Register, excluding those at Naval Station Pearl Harbor. At Pearl Harbor, which is listed in the National Register as a National Historic Landmark, an abundance of submerged cultural resources are associated with World War II. Major shipwrecks include the *USS Arizona* and the *USS Utah*, both of which are listed in the National Register. Training and testing activities would not affect historic properties within Pearl Harbor.

3.10.2.1.4 Cultural Resources Eligible for or Listed on the State Inventory of Historic Places

Outside of Pearl Harbor, the Study Area contains no Hawaii State Register-listed or -eligible sites.

3.10.2.1.5 World Heritage Sites

The Hawaii region of the Study Area contains one World Heritage Site, the Papahanaumokuakea Marine National Monument. This area is protected and encompasses 140,000 square miles of ocean and 10 islands and atolls northwest of Kauai. The Monument contains historic shipwrecks; however, these shipwrecks are not listed as historic properties in the National Register. The Navy would continue its testing and training in existing designated areas, so no activities related to the HSTT would occur within the Papahanaumokuakea Marine National Monument.

3.10.2.1.6 Resources with Sovereign Immunity

The Study Area contains at least one resource with sovereign immunity: a World War II-era Japanese Midget "A" submarine that was sunk by the *USS Ward* (New South Wales 2012). As the midget submarine is a known obstruction, which the Navy avoids, training and testing activities associated with the HSTT would not affect this resource.

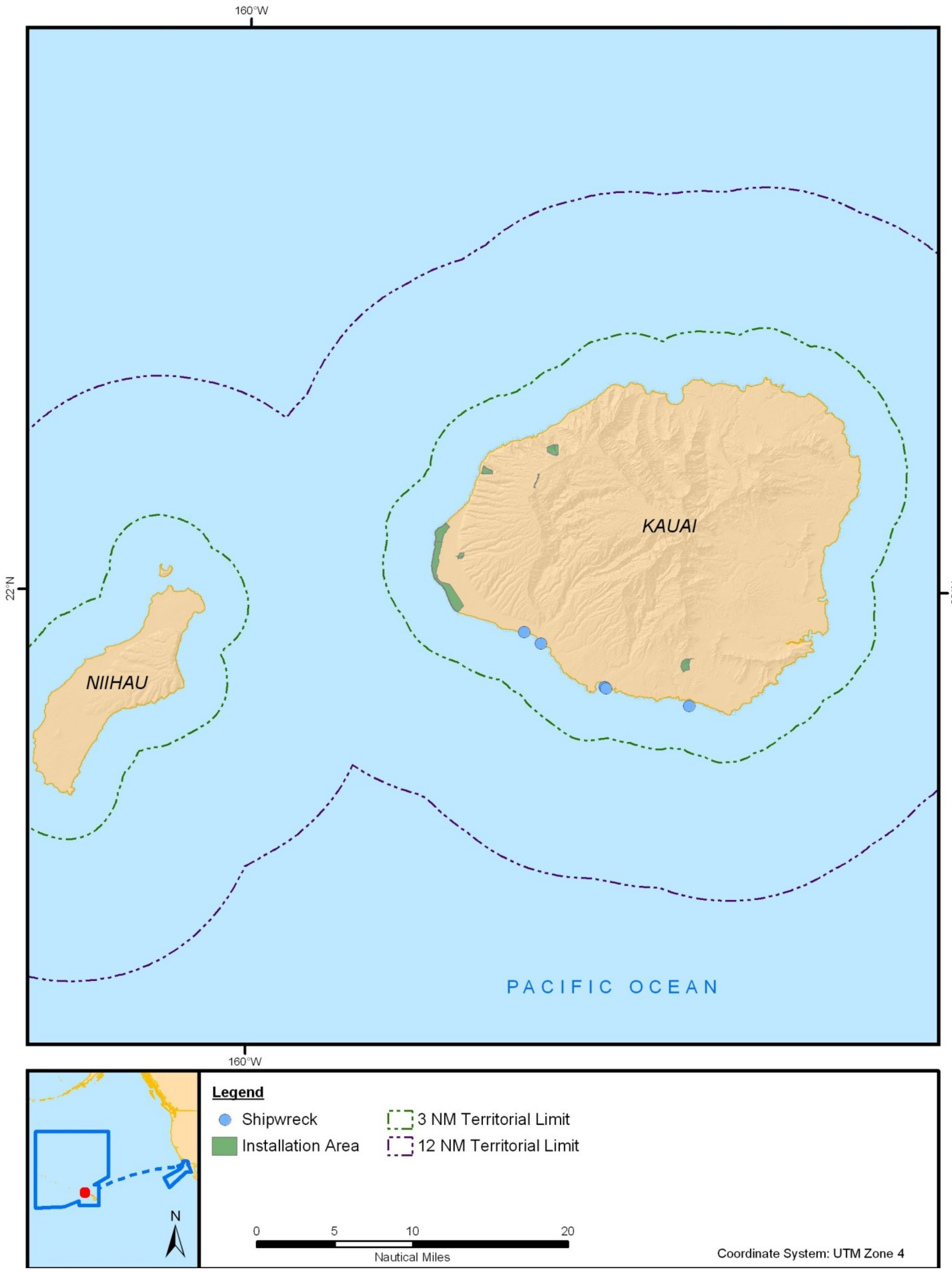


Figure 3.10-1: Kauai Known Shipwrecks

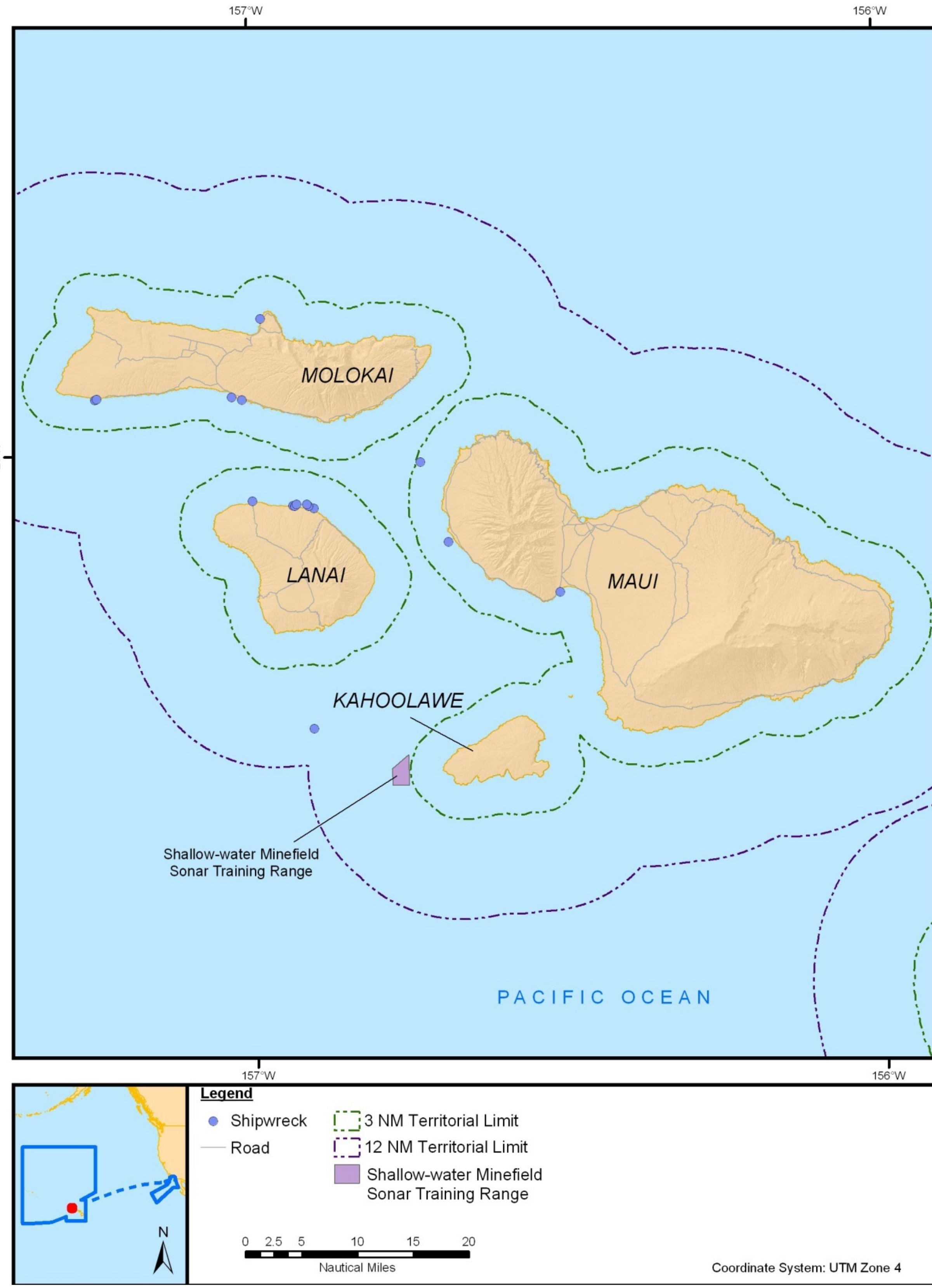


Figure 3.10-2: Molokai, Lanai, Maui, and Kahoolawe Known Shipwrecks

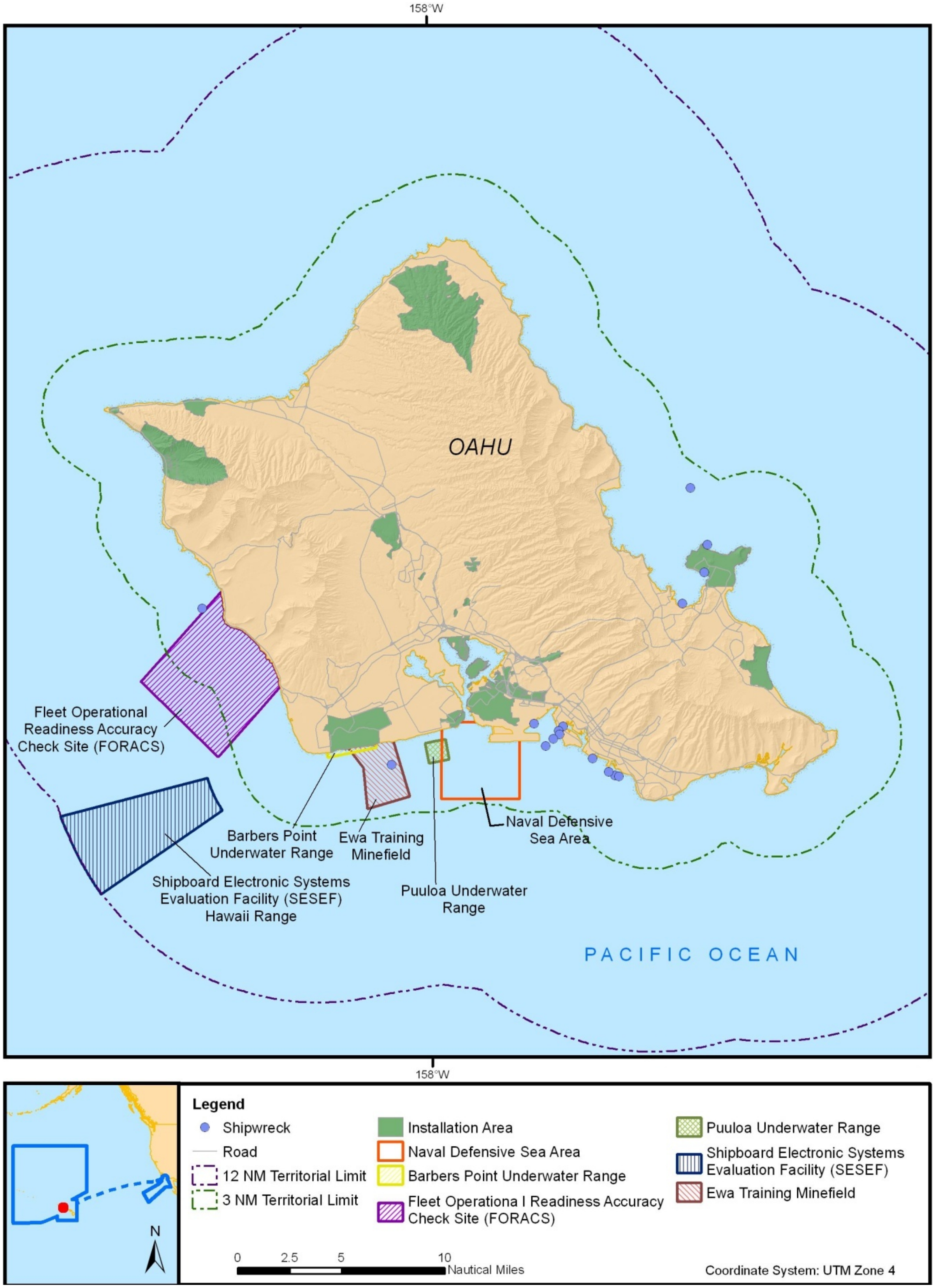


Figure 3.10-3: Oahu Known Shipwrecks

3.10.2.2 Southern California

3.10.2.2.1 Submerged Prehistoric Resources

PaleoIndian and Archaic period sites occur on the continental shelf off the coast of California. Approximately 110 submerged artifacts and sites from the Archaic period have been identified in Southern California (Masters 2003). However, they are located outside of Navy training and testing areas. Prehistoric cultural materials, such as stone bowls and mortars, are also common off the coast of San Diego County (Masters and Schneider 2000, Masters 2003). A concentration of this cultural material is located off La Jolla and Point Loma (Masters 2003).

3.10.2.2.2 Known Wrecks, Obstructions, Occurrences, or "Unknowns"

3.10.2.2.2.1 Offshore

From the early period of Spanish exploration to the intense commercialization of the 19th and 20th centuries, there has been a great variety of shipwrecks in the Pacific Ocean. The earliest known shipwreck was the Manila galleon *San Agustin* that sank off the northern coast of California in 1595. Since that time, thousands of vessels of varying types and descriptions have sunk off the coast of California. Various databases of these shipwrecks have been compiled, including the *Automated Wreck and Obstruction Information System* database (Automated Wreck and Obstruction Information System Database 2010). As part of a Minerals Management Service study (Minerals Management Service 1990), a database was compiled that documents 4,676 shipwrecks off the coast of California, with 876 wrecks in Southern California. The *Automated Wreck and Obstruction Information System* database (Automated Wreck and Obstruction Information System Database 2010) documents 292 wrecks just in San Diego, Orange, Los Angeles, and Ventura Counties.

Submerged cultural resources in the waters around San Clemente Island include pleasure craft, sport and commercial fishers, and cargo and military vessels (Department of the Navy 2008b). Of these 68 submerged cultural resources, 22 are within 12 nm of San Clemente Island and seven are beyond the territorial limit. Submerged aircraft are also reported off San Clemente Island. Figure 3.10-4 illustrates known submerged cultural resources near San Clemente Island.

The potential for long-term preservation of historic properties in the waters surrounding San Clemente Island is considered low, because the intertidal waters in the area create a high-energy environment that accelerates the decay of archaeological resources. Submerged cultural resources identified include 35 shipwrecks, 17 aircraft, an anchor, and the abandoned Sea Lab.

3.10.2.2.2.2 Silver Strand Training Complex

On the bay side of Silver Strand peninsula, three shipwrecks are in or near the training beaches. Unnamed wrecks are recorded in shallow water at the northern end of Delta South beach, in the middle of San Diego Bay, and at the mouth of Fiddler's Cove. The ages and cultural value of these wrecks are not known (U.S. Department of the Navy 2008b).

On the ocean side of the peninsula, three shipwrecks are located near Silver Strand Training Complex (SSTC) training areas: the bark Narwhale (sank in 1934); the submarine S-142: and the Subchaser YC689 (sank in 1943). The destroyer *USS Hogan* (DD178), a military aircraft (S2F Tracker), and a sunken sailboat are located offshore, south of SSTC and west of the City of Imperial Beach (Figure 3.10-5) (U.S. Department of the Navy 2008b).

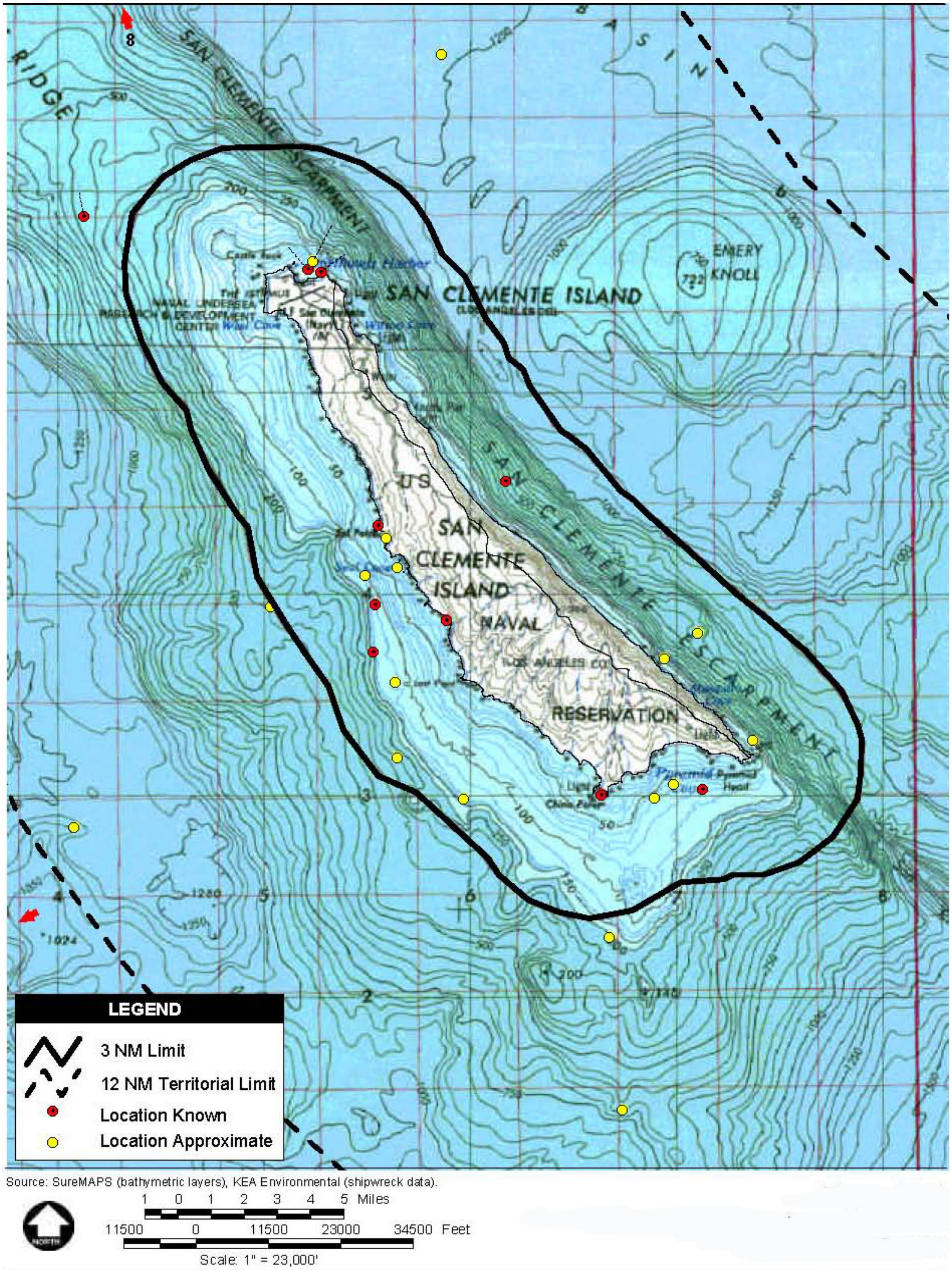


Figure 3.10-4: San Clemente Island Submerged Shipwrecks and Obstructions

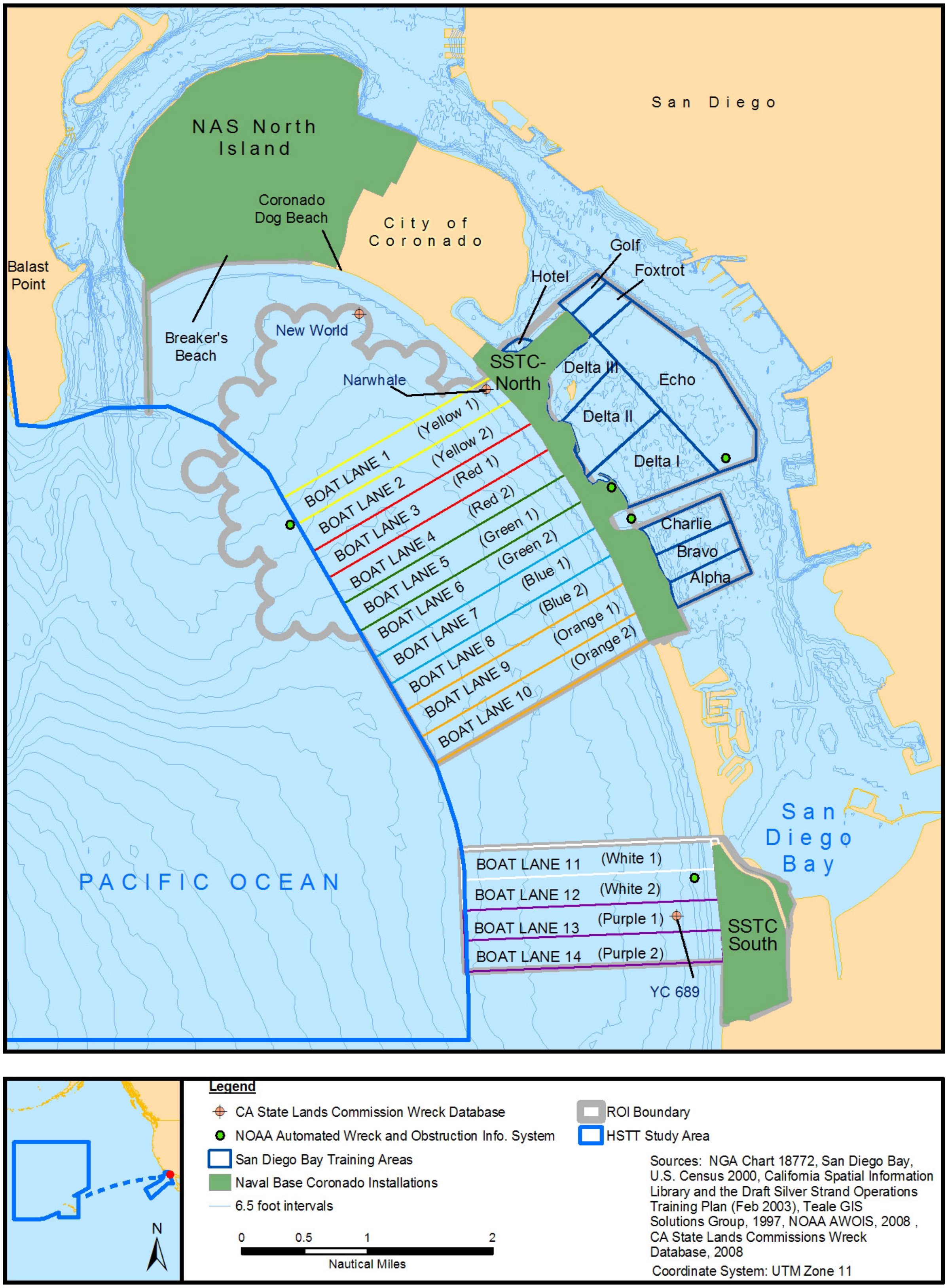


Figure 3.10-5: San Diego Bay and Silver Strand Training Complex Submerged Cultural Resources

3.10.2.2.2.3 San Diego Bay

Known cultural resources in San Diego Bay have not been inventoried. However, cultural resources were reviewed for the San Diego Deepening at Tenth Avenue Marine Terminal project (EDAW 2005). This review identified three known submerged cultural features: a shipwreck (the *Della*), an 1887 marine utility cable, and a sunken Ford Model T. The EDAW study identified 24 cultural resources with unknown location, but known to be lost in the San Diego area, including schooners, barges, a submarine, clippers, gas and oil screws, a yacht, a bark, a ferry, a ship, and a steamer. Figure 3.10-5 illustrates known submerged cultural resources in San Diego Bay.

3.10.2.2.3 Cultural Resources Eligible for or Listed on the National Register

The Study Area contains no National Register-listed or -eligible sites.

3.10.2.2.4 Cultural Resources Eligible for or Listed on the California Register

The Study Area contains no California Register-listed or -eligible sites.

3.10.2.2.5 World Heritage Sites

The Study Area contains no World Heritage Sites.

3.10.2.2.6 Resources with Sovereign Immunity

The Study Area contains no resources with sovereign immunity.

3.10.2.3 Hawaii-Southern California Training and Testing Transit Corridor

The length and variable width of the HSTT transit corridor creates such a vast area that it precludes a systematic survey for submerged historic resources. Waters along the HSTT transit corridor are deep, sometimes over 18,000 feet (ft.) (5,486.4 meters [m]); thus, identifying cultural resources on the ocean floor in the corridor is difficult. However, in accordance with the addendum to the National Historic Preservation Act (16 U.S.C. 470a-2) regarding international federal activities affecting historic properties, the World Heritage List was reviewed and no resources on the list were identified within the HSTT transit corridor.

3.10.2.4 Current Practices

The Navy routinely avoids locations of known obstructions, which include submerged cultural resources such as historic shipwrecks. Known obstructions are avoided to prevent damage to sensitive Navy equipment and vessels, allowing uninterrupted training and testing exercises.

3.10.2.5 Programmatic Agreement on Navy Undertakings in Hawaii

A programmatic agreement was executed for Navy undertakings in Hawaii, including Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility; outlying Oahu installations; and Pacific Missile Range Facility at Barking Sands, Kauai (Hawaii State Historic Preservation Division 2003). The Programmatic Agreement includes stipulations for development of an integrated cultural resources management plan, determinations of areas of potential effects, identification of historic properties, access to historic sites and interpretative activities, review of project effects, monitoring of ground disturbing activities, annual reporting requirements, and consultation with Native Hawaiians and other consulting parties. Submerged resources are specifically identified under Stipulation X.D (Ground Disturbing Activities: Any undertakings in areas known to have a potential for submerged cultural resources will be planned in consultation with the National Park Service, State Historic Preservation Office, and Office of Hawaiian

Affairs as appropriate to develop a work plan and monitoring plan that will ensure avoidance of effects on the resource) and Stipulation XI.A (Discoveries and Emergencies: If during the performance of an undertaking, historic properties, including submerged archaeological sites and traditional cultural properties, are discovered or unanticipated effects are found, or a previously unidentified property which may be eligible for listing on the National Register is discovered, Commander, Navy Region Hawaii would take all reasonable measures to avoid or minimize harm to the property until it concludes consultation with the State Historic Preservation Office and any Native Hawaiian organization, including Oahu Council of Hawaiian Civic Clubs, which has made known to Commander, Navy Region Hawaii that it attaches religious and cultural significance to the historic property).

3.10.2.5.1.1 Programmatic Agreement on Operational and Developmental Undertakings at San Clemente Island, California

Within the SOCAL Range Complex, a programmatic agreement was established to address impacts on cultural resources around San Clemente Island, off-island ranges, and operational training areas within the respective territorial and administrative jurisdictions of the United States and the State of California (California State Historic Preservation Office 2012). The programmatic agreement includes stipulations for the review of both range sustainability and operational training and support activities; determinations of areas of potential effects; identification of historic properties through survey; National Register evaluations through pro-active testing of selected resources; findings of effect; preparation of an integrated cultural resources management plan; treatment of archaeological historic properties including avoidance measures, monitoring, and protective signage; preparation of annual reports; and consultation with Native American Tribes and other consulting parties.

3.10.3 Environmental Consequences

This section evaluates how and to what degree the activities described in Chapter 2 (Description of Proposed Action and Alternatives) could impact cultural resources within U.S. territorial waters and World Heritage sites located in the Study Area. Tables 2.8-1 through 2.8-5 present the baseline and proposed training and testing activity locations for each alternative (including numbers of events and ordnance expended). Appendix F (Training and Testing Activities Matrices) describes the warfare areas and associated stressors that were considered for analysis of cultural resources. The stressors vary in intensity, frequency, duration, and location within the Study Area. The stressors applicable to cultural resources in the Study Area that are analyzed include:

- Acoustic
    - Impacts from explosives- shock (pressure) waves from underwater explosions
    - Impacts from explosives-cratering
    - Impacts from pile-driving
- Physical
    - Impacts from in-water devices
    - Impacts from deposition of military expended materials
    - Impacts from seafloor devices

Sonar and other non impulsive sources do not affect the structural elements of historic shipwrecks and, therefore, an in-depth analysis of sonar impacts will not be included in this section. Archaeologists regularly use multi-beam sonar and side-scan sonar to explore shipwrecks without disturbing them. Based on the physics of underwater sound, the shipwreck would need to be very close (less than 22 ft. [6.7 m]) to the sonar sound source for the shipwreck to experience any slight oscillations from the induced pressure waves. Any oscillations experienced at a depth of less than 22 ft. (6.7 m) would be negligible up to within a few yards from the sonar source. This distance is smaller than the typical safe navigation and operating depth for most sonar sources, and therefore is not expected to impact historic shipwrecks.

3.10.3.1 Acoustic Stressors

Acoustic stressors that could impact cultural resources are vibration and shock waves from underwater explosions. A shock wave and oscillating bubble pulses resulting from any kind of underwater explosion, such as explosive torpedoes, missiles, bombs, projectiles, mines, and certain sonobuoys and explosive sonobuoys, could impact the exposed portions of submerged historic resources if such resources were located nearby. Shock waves (pressure) generated by underwater explosions would be periodic rather than continuous, and could create overall structural instability and eventual collapse of architectural features of submerged historic resources. The amount of damage would depend on factors such as the size of the charge, the distance from the historic shipwreck, the water depth, and the topography of the ocean floor.

3.10.3.1.1 Impacts of Explosive Shock Waves from Underwater Explosions

Anti-surface missiles and projectiles explode at or immediately below the ocean surface (within one meter). Shock waves (pressure) from these types of explosions within the water column would not reach historic resources on the ocean floor. Underwater detonations of improved extended echo ranging sonobuoys and high explosives would occur well below the surface and on or near the ocean bottom. Shock waves from nearby underwater detonations may affect the exposed portions of historic shipwrecks if such resources were located in the area. Underwater explosions generating vibration and shock waves within the Study Area would not impact any cultural resources because (1) known historic shipwrecks, obstructions, and archaeological sites are routinely avoided during training and testing; and (2) most shipwrecks are located at substantial depths and they are distributed over large areas of the sea floor.

3.10.3.1.1.1 No Action Alternative

Training

Under the No Action Alternative, training activities would continue at current levels within existing designated areas within the OPAREAs in the offshore waters of Hawaii and Southern California. Current training activities would continue to be conducted in accordance with programmatic agreements that are already in place for existing training areas. Consequently, no impacts on cultural resources are expected by underwater detonations at depth.

Testing

Under the No Action Alternative, testing activities would continue within existing designated areas within the OPAREA along the offshore waters of Hawaii and Southern California. Current testing activities would continue to be conducted in accordance with programmatic agreements that are already in place for existing testing areas. Consequently, no impacts on cultural resources are expected by underwater detonations at depth.

3.10.3.1.1.2 Alternative 1

Training

Under Alternative 1, the number of explosive round detonations (high explosions) would remain the same as the No Action Alternative. Training would continue in the same localities specified in current HRC, SSTC, and SOCAL EIS documents. Because the Navy routinely avoids locations of known obstructions, which include submerged historic resources, and because of the Navy's compliance with a programmatic agreement that includes the protection of cultural resources, no impacts on cultural resources by underwater detonations at depth are expected within U.S. territorial waters, and no World Heritage sites would be affected.

Testing

Under Alternative 1, the number of high-explosive rounds detonated during testing activities would increase within the OPAREAs in the offshore waters of Hawaii and Southern California. Testing would continue in the same localities specified in current HRC, SSTC, and SOCAL EIS documents. Because the Navy routinely avoids locations of known obstructions, which include submerged historic resources, and because of the Navy's compliance with a programmatic agreement that includes the protection of cultural resources, no impacts on cultural resources by underwater detonations at depth are expected within U.S. territorial waters, and no World Heritage sites would be affected.

3.10.3.1.1.3 Alternative 2

Training

Under Alternative 2, the number of high-explosive rounds detonated would remain the same as under the No Action Alternative. Training would continue in the same localities specified in current HRC, SSTC, and SOCAL EIS documents. Because the Navy routinely avoids locations of known obstructions, which include submerged historic resources, and because of the Navy's compliance with a programmatic agreement that includes the protection of cultural resources, no impacts on cultural resources by underwater detonations at depth are expected within U.S. territorial waters, and no World Heritage sites would be affected.

Testing

Under Alternative 2, the numbers of high-explosive rounds detonated during testing activities would increase within the OPAREA along the offshore waters of Hawaii and Southern California. Testing would continue in the same localities specified in current HRC, SSTC, and SOCAL EIS documents. Because the Navy routinely avoids locations of known obstructions, which include submerged historic resources, and because of the Navy's compliance with the programmatic agreement for Hawaii that includes the protection of cultural resources, no impacts on cultural resources by underwater detonations at depth are expected within U.S. territorial waters, and no World Heritage sites would be affected.

3.10.3.1.2 Impacts from Explosives – Cratering

Underwater explosions at depth or on or near the ocean bottom could displace sediment and leave a crater. Cratering could affect submerged prehistoric sites and previously unidentified historic resources (e.g., shipwrecks) located at or near the point of detonation. Cratering of unconsolidated, soft-bottom habitats would result from Mine Neutralization charges set on or near the bottom. These charges are set on the sea floor by Navy divers in shallow waters. Cratering could potentially disrupt stratigraphic sedimentation and/or affect cultural resources. However, it is unlikely that these resources could be disturbed or destroyed by cratering created by underwater explosions during mine warfare activities because the Navy routinely avoids locations of known obstructions, which include submerged historic resources.

3.10.3.1.2.1 No Action Alternative

Training

Under the No Action Alternative, training activities would continue at current levels within existing designated areas. In Southern California, cratering would be associated with underwater detonations at

San Clemente Island (Northwest Harbor, Horse Beach Cove, Kingfisher), Southern California Anti-Submarine Warfare Range, Shallow Water Training Range, Shallow Water Minefield, Camp Pendleton Amphibious Assault Area, and at SSTC (Boat Lanes 1-14, Breakers Beach, and Delta and Echo training areas). In Hawaii, cratering would be associated with underwater detonations at Puuloa Underwater Range, Marine Corps Base Hawaii, Marine Corps Training Area Bellows, Barbers Point Underwater Range, Naval Inactive Ship Maintenance Facility, Lima Landing, Kingfisher, Shallow Water Minefield, Sonar Training Area, and Ewa Training Minefield. Because the Navy routinely avoids locations of known obstructions, which include submerged cultural resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, effects on underwater cultural resources are not anticipated within U.S. territorial waters.

Testing

Under the No Action Alternative, testing activities would continue at current levels within existing designated areas within the OPAREAs in the offshore waters of Hawaii and Southern California. Because the Navy routinely avoids locations of known obstructions, which include submerged cultural resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, effects on underwater cultural resources are not anticipated within U.S. territorial waters.

3.10.3.1.2.2 Alternative 1

Training

Under Alternative 1, the number of high explosive rounds associated with mine warfare training activities would increase within the OPAREA in the offshore waters of Hawaii and Southern California. Cratering created by deep underwater explosions could disturb or damage previously unidentified artifacts on the sea floor and archaeological deposits buried in the ocean sediments if such resources were located nearby. Because the Navy routinely avoids locations of known obstructions, which include submerged cultural resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, effects on underwater cultural resources are not anticipated.

Testing

Under Alternative 1, the number of high explosive rounds associated with mine warfare activities would increase within the OPAREAs in the offshore waters of Hawaii and Southern California. Cratering created by deep underwater explosions could disturb or damage previously unidentified artifacts on the sea floor and archaeological deposits buried in the ocean sediments if such resources were located nearby. Because the Navy routinely avoids locations of known obstructions, which include submerged cultural resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, effects on underwater cultural resources are not anticipated.

3.10.3.1.2.3 Alternative 2 (Preferred Alternative)

Training

Under Alternative 2, the number of high explosive rounds associated with mine warfare activities would increase within the OPAREA along the offshore waters of Hawaii and Southern California. Cratering created by deep underwater explosions could disturb or damage previously unidentified artifacts on the sea floor and archaeological deposits buried in the ocean sediments if such resources were located nearby. Because the Navy routinely avoids locations of known obstructions, which include submerged cultural resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, effects on underwater cultural resources are not anticipated.

Testing

Under Alternative 2, the number of high explosive rounds associated with mine warfare activities would increase within the OPAREA in the offshore waters of Hawaii and Southern California. Cratering created by deep underwater explosions could disturb or damage previously unidentified artifacts on the sea floor and archaeological deposits buried in the ocean sediments if such resources were located nearby. Because the Navy routinely avoids locations of known obstructions, which include submerged cultural resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, effects on underwater cultural resources are not anticipated.

3.10.3.1.3 Impacts of Pile-Driving

3.10.3.1.3.1 No Action Alternative

Training

Under the No Action Alternative, training activities would continue at current levels within existing designated areas. In Southern California pile-driving for Elevated Causeway training at SSTC, would subject nearshore sediments to vibration, disruption, and compaction. Pile-driving would not occur in Hawaii. Elevated Causeway training at SSTC would occur only in the Oceanside Boat Lanes 110 and in the bayside Bravo training area. A bark (a three- or four-masted sailing vessel) built in 1883, the Narwhal, lies in Boat Lane 1, but the Navy would routinely avoid training near known submerged cultural resources. On the bayside of SSTC, sediments have been periodically dredged and the potential for encountering submerged historic resources that retain their integrity is low.

Testing

Pile-driving is not associated with any testing activities under the No Action Alternative.

3.10.3.1.3.2 Alternative 1

Training

Under Alternative 1, the number of Elevated Causeway training events would not increase relative to the No Action Alternative. Therefore, the potential for affecting submerged historic resources would be the same as described under the No Action Alternative.

Testing

Pile-driving is not associated with any testing activities under Alternative 1.

3.10.3.1.3.3 Alternative 2 (Preferred Alternative)

Training

Under Alternative 2, the number of Elevated Causeway training events would not increase relative to the No Action Alternative. Therefore, the potential for affecting submerged historic resources would be the same as described under the No Action Alternative.

Testing

Pile-driving is not associated with any testing activities under Alternative 2.

3.10.3.1.4 Regulatory Conclusions for Acoustic Stressors

In accordance with Section 106 of the National Historic Preservation Act, acoustic stressors resulting from underwater explosions at depth during training and testing activities would not affect submerged historic resources in U.S. territorial waters, and no World Heritage sites would be affected under the No Action Alternative, Alternative 1, and Alternative 2 because the Navy routinely avoids known submerged obstructions and protective measures are in place as stipulated by a programmatic agreement. Pile-driving for Elevated Causeway training at SSTC is not expected to affect submerged cultural resources.

3.10.3.2 Physical Disturbance and Strike Stressors

Any physical disturbance on the continental shelf and seafloor, such as ship anchoring, targets or mines resting on the seafloor, moored mines, bottom-mounted tripods, unmanned underwater vehicles, or bottom crawlers, could inadvertently damage or destroy submerged prehistoric sites and historic resources. A towed system and attachment cable or vessel strike could inadvertently encounter, snag, damage, or destroy submerged historic resources in shallow water. Expended materials such as chaff, flares, projectiles, casings, target or missile fragments, non-explosive practice munitions, rocket fragments, ballast weights, sonobuoys, torpedo launcher accessories, or mine shapes could be deposited on the ocean bottom on or near submerged prehistoric sites or historic resources. Heavier expended materials could damage intact fragile shipwreck features if they landed with velocity on a resource. However, it is unlikely that these resources could be disturbed or destroyed because the Navy routinely avoids locations of known obstructions, which include submerged cultural resources.

3.10.3.2.1 Impacts from Vessels and In-Water Devices

Use of a towed system and attachment cable could inadvertently encounter, snag, damage, or destroy historic shipwrecks, particularly those situated in relatively shallow water, and especially during low tide. Prior to deploying a towed device, the standard operating procedure is to search the intended path of the device for any floating debris (e.g., driftwood) or other potential surface obstructions, since they could damage the device. Therefore, submerged objects, including cultural resources, if present, would be avoided.

3.10.3.2.1.1 No Action Alternative

<u>**Training**</u>

Under the No Action Alternative, training operations and major range events would continue at current levels within designated areas of the OPAREAs in the offshore waters of Hawaii and Southern California. Because the Navy routinely avoids locations of known obstructions, which include submerged cultural resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, no significant impacts on known cultural resources are expected from towed-in-water devices snagging and damaging historic shipwrecks within U.S. territorial waters in the Study Area.

<u>**Testing**</u>

Under the No Action Alternative, testing activities using towed-in-water devices would continue within existing designated areas of the OPAREAs in the offshore waters of Hawaii and Southern California. Because the Navy routinely avoids locations of known obstructions, which include submerged cultural resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, effects on underwater cultural resources are not anticipated within U.S. territorial waters.

3.10.3.2.1.2 Alternative 1

Training

Under Alternative 1, the number of training activities using towed-in-water devices would increase in the OPAREAs in offshore waters of Hawaii and Southern California. Because the Navy routinely avoids locations of known obstructions, which include submerged cultural resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, no impacts on cultural resources are expected within U.S. territorial waters, and no World Heritage sites would be affected.

Testing

Under Alternative 1, the number of testing activities using towed-in-water devices would increase in the OPAREAs in the offshore waters of Hawaii and Southern California. Because the Navy routinely avoids locations of known obstructions, which include submerged cultural resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, no impacts on cultural resources are expected within U.S. territorial waters, and no World Heritage sites would be affected.

3.10.3.2.1.3 Alternative 2 (Preferred Alternative)

Training

Under Alternative 2, the number of training activities using towed-in-water devices would increase in the OPAREAs in the offshore waters of Hawaii and Southern California. Because the Navy routinely avoids locations of known obstructions, which include submerged historic resources, and because of the Navy's compliance with a programmatic agreement that includes the protection of cultural resources, no impacts on cultural resources are expected within U.S. territorial waters, and no World Heritage sites would be affected.

Testing

Under Alternative 2, the number of testing activities using towed-in-water devices would increase in the OPAREAs in the offshore waters of Hawaii and Southern California. Because the Navy routinely avoids locations of known obstructions, which include submerged historic resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, no impacts on cultural resources are expected within U.S. territorial waters, and no World Heritage sites would be affected.

3.10.3.2.2 Impacts from Military Expended Materials

The deposition of non-explosive practice munitions, sonobuoys, and military expended materials other than ordnance could impact submerged cultural resources if such resources are located nearby. Most of the anticipated expended munitions (e.g., large-caliber, non-explosive practice munitions) would be small objects and fragments that would slowly drift to the sea floor after striking the ocean surface. Larger and heavier objects (e.g., ship hulks) could displace sediments and artifacts upon impacting the ocean floor despite a reduction in their descent velocity. Additionally, post deposition and impacts on sites could occur should expended material fall on or near them. However, the likelihood of these materials either impacting or landing on submerged cultural resources is very low because of the sizes of the regions and because the Navy routinely avoids submerged obstructions.

3.10.3.2.2.1 No Action Alternative

Training

Under the No Action Alternative, training activities would continue at current levels within existing designated areas within the OPAREA along the offshore waters of Hawaii and Southern California. Expended materials may be deposited on the ocean bottom on or near submerged prehistoric sites and historic resources. If they sink near either type of cultural resource, the expended materials would not affect the archaeological or historic characteristics of the submerged prehistoric site or the historic resource. Because the Navy routinely avoids known submerged obstructions, these materials likely would not contact a submerged prehistoric site or a historic resource.

Testing

Under the No Action Alternative, testing activities would continue at current levels within existing designated areas within the OPAREA along offshore waters of Hawaii and Southern California. Expended materials may be deposited on the ocean bottom on or near submerged prehistoric sites and historic resources. Because the Navy routinely avoids known submerged obstructions, these materials likely would not contact a submerged prehistoric site or a historic resource.

3.10.3.2.2.2 Alternative 1

Training

Under Alternative 1, the number of expended items from training activities would increase within designated areas of the OPAREA along the offshore waters of Hawaii and Southern California (most of the expended items are small- to medium-sized caliber that are no larger than a roll of quarters). Expended materials could be deposited on the ocean bottom on or near submerged. Because the Navy routinely avoids known submerged obstructions, these materials likely would not contact a submerged prehistoric site or a historic resource.

Testing

Under Alternative 1, the number of expended items from testing activities would increase within designated areas of the OPAREA along the offshore waters of Hawaii and Southern California (most of the expended items are small- to medium-sized caliber that are no larger than a roll of quarters). Expended materials could be deposited on the ocean bottom on or near submerged prehistoric sites and historic resources. Because the Navy routinely avoids known submerged obstructions, these materials likely would not contact a submerged prehistoric site or a historic resource.

3.10.3.2.2.3 Alternative 2 (Preferred Alternative)

Training

Under Alternative 2, the number of expended items from training activities would increase within designated areas of the OPAREA along the offshore waters of Hawaii and Southern California (most of the expended items are small- to medium-sized caliber that are no larger than a roll of quarters). Expended materials could be deposited on the ocean bottom on or near submerged prehistoric sites and historic resources. Because the Navy routinely avoids known submerged obstructions, these materials likely would not contact a submerged prehistoric site or a historic resource.

Testing

Under Alternative 2, the number of expended items from testing activities would increase within designated areas of the OPAREA along the offshore waters of Hawaii and Southern California (most of the expended items are small- to medium-sized caliber that are no larger than a roll of quarters). Expended materials could be deposited on the ocean bottom on or near submerged prehistoric sites and historic resources. Because the Navy routinely avoids known submerged obstructions, these materials likely would not contact a submerged prehistoric site or a historic resource.

3.10.3.2.3 Impacts from Seafloor Devices

Physical disturbances on the continental shelf and seafloor, such as precision anchoring, targets or mines resting on the ocean floor, moored mines, bottom-mounted tripods, bottom crawlers (unmanned underwater vehicles) could damage or destroy submerged prehistoric sites or historic resources if such resources are located nearby. Precision anchoring could crush or snag structural elements of historic resources and damage intact sediments of submerged prehistoric sites; however, this is highly unlikely because divers are used to set bottom and moored mine anchors (blocks of concrete weighing several hundred pounds) in waters less than 150 ft. (45.7 m) deep and routinely avoid known obstructions, which include cultural resources and any unrecorded obstructions they might encounter.

3.10.3.2.3.1 No Action Alternative

Training

Under the No Action Alternative, training activities using seafloor deployed devices would continue at current levels in existing designated areas within the offshore waters of the Hawaii and Southern California OPAREAs. Because the Navy routinely avoids locations of known obstructions, which include submerged cultural resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, effects on underwater cultural resources are not anticipated within U.S. territorial waters.

Testing

Under the No Action Alternative, testing activities using seafloor deployed devices would continue at current levels in existing designated areas in the offshore waters of the Hawaii and Southern California OPAREAs. Because the Navy routinely avoids locations of known obstructions, which include submerged cultural resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, effects on underwater cultural resources are not anticipated within U.S. territorial waters.

3.10.3.2.3.2 Alternative 1

Training

Under Alternative 1, the number of training activities using seafloor deployed devices would not increase in the offshore waters of the Hawaii and Southern California OPAREAs. Because the Navy routinely avoids locations of known obstructions, which include submerged cultural resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, no impacts on cultural resources are expected within U.S. territorial waters, and no World Heritage sites would be affected.

Testing

Under Alternative 1, testing activities would increase in the offshore waters of the Hawaii and Southern California OPAREAs. Because the Navy routinely avoids locations of known obstructions, which include submerged cultural resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, no impacts on cultural resources are expected within U.S. territorial waters, and no World Heritage sites would be affected.

3.10.3.2.3.3 Alternative 2 (Preferred Alternative)

Training

Under Alternative 2, the number of annual training activities using seafloor deployed devices would not increase within the offshore waters of the Hawaii and Southern California OPAREAs. Because the Navy routinely avoids locations of known obstructions, which include submerged cultural resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, no impacts on cultural resources are expected within U.S. territorial waters, and no World Heritage sites would be affected.

Testing

Under Alternative 2, testing activities would increase in the offshore waters of the Hawaii and Southern California OPAREAs. Because the Navy routinely avoids locations of known obstructions, which include submerged historic resources, and because the Navy complies with a programmatic agreement that includes the protection of cultural resources, no impacts on cultural resources are expected within U.S. territorial waters, and no World Heritage sites would be affected.

3.10.3.2.4 Regulatory Conclusions for Physical Stressors

In accordance with Section 106 of the National Historic Preservation Act, physical stressors resulting from use of marine and seafloor devices during training and testing activities under the No Action Alternative, Alternative 1, and Alternative 2 would not adversely affect submerged cultural resources in U.S. territorial waters, and no World Heritage sites would be affected. Both Alternative 1 and Alternative 2 would increase the number of training and testing activities. However, because the Navy routinely avoids known submerged obstructions and protective measures are in place as stipulated by programmatic agreement, no submerged cultural resources would be affected.

3.10.3.3.1 No Action Alternative

Acoustic and physical stressors associated with training and testing activities would not impact submerged cultural resources. Training and testing activities would continue in existing locations, as specified in the HRC, SSTC, and SOCAL EISs, however, so no impacts on cultural resources are expected within U.S. territorial waters because measures have been previously implemented to protect these resources.

3.10.3.3.2 Alternative 1

An increase in training and testing activities would occur in existing locations, as specified in the HRC, SSTC, and SOCAL EISs, under Alternative 1. Acoustic and physical stressors associated with training and testing activities would not impact cultural resources because measures have been previously implemented to protect them.

3.10.3.3.3 Alternative 2 (Preferred Alternative)

Under Alternative 2, an increase in training and testing activities would occur only in the existing locations, as specified in the HRC, SSTC, and SOCAL EISs. Acoustic and physical stressors associated with training and testing activities would not impact cultural resources because measures have been previously implemented to protect them.

3.10.3.4 Regulatory Determinations

Table 3.10-1 summarizes the potential effects of the Proposed Action on submerged resources under the No Action Alternative, Alternative 1, and Alternative 2. The Proposed Action is not anticipated to affect known cultural resources within the Study Area, and programmatic agreements between the Navy and State Historic Preservation Offices exist to address the protection and management of cultural resources. Accordingly, per Section 106, the Navy will continue, as appropriate, to consult with the California and Hawaii State Historic Preservation Offices.

Table 3.10-1: Summary of Section 106 Effects of Training and Testing Activities on Cultural Resources

Alternative and Stressor	Section 106 Effects of Training and Testing Activities
No Action Alternative	
Acoustic Stressors	Acoustic stressors resulting from underwater explosions creating shock (pressure) waves and cratering of the sea floor would not affect submerged cultural resources. Training and testing would continue only in areas currently utilized for these activities. As a result, effects on cultural resources are not anticipated within United States (U.S.) territorial waters because measures have been previously implemented to protect these resources.
Physical Stressors	Physical stressors resulting from use of towed-in water devices, and use of seafloor devices would not adversely affect submerged cultural resources. Testing and training would continue only in areas currently utilized for these activities. As a result, effects on cultural resources are not anticipated within U.S. territorial waters because measures have been previously implemented to protect these resources. Military expended materials are not expected to affect submerged cultural resources.
Alternative 1	
Acoustic Stressors	Acoustic stressors resulting from underwater explosions creating shock (pressure) waves and cratering of the seafloor would not affect submerged cultural resources. Testing and training would continue only in areas currently utilized for these activities. As a result, effects on cultural resources are not anticipated within U.S. territorial waters because measures have been previously implemented to protect these resources.
Physical Stressors	Physical stressors resulting from use of seafloor devices during training and testing activities could affect submerged cultural resources. Testing and training would continue only in areas currently utilized for these activities. As a result, effects on cultural resources are not anticipated within U.S. territorial waters because measures have been previously implemented to protect these resources. Military expended materials are not expected to affect submerged cultural resources.
Regulatory Determination	Alternative 1 contains increases in the number of training and testing activities compared to the No Action Alternative. No effects on submerged cultural resources would occur because measures were previously implemented to protect these resources. A Finding of No Effects on historic properties within the Area of Potential Effect has been determined by the California State Historic Preservation Officer (Saunders 2012). A Finding of No Effects on historic properties within the Area of Potential Effect has been determined by the Hawaii State Historic Preservation Office, as assumed by their no response or objections under 36 Code of Federal Regulations 800.4(d)(1)(i).

Table 3.10-1: Summary of Section 106 Effects of Training and Testing Activities on Cultural Resources (continued)

Alternative and Stressor	Section 106 Effects of Training and Testing Activities
Alternative 2 (Preferred Alternative)	
Acoustic Stressors	Acoustic stressors resulting from underwater explosions creating shock (pressure) waves and cratering of the seafloor would not affect submerged cultural resources. Testing and training would continue only in areas currently utilized for these activities. As a result, effects on cultural resources are not anticipated within U.S. territorial waters because measures have been previously implemented to protect these resources.
Physical Stressors	Physical stressors resulting from use of towed-in water devices, and use of seafloor devices during training and testing activities would not affect submerged cultural resources. Testing and training would continue only in areas currently identified for these activities. As a result, effects on cultural resources are not anticipated within U.S. territorial waters because measures have been previously implemented to protect these resources. Military expended materials are not expected to affect submerged cultural resources.
Regulatory Determination	Alternative 2 contains increases in the number of training and testing activities compared to the No Action Alternative. Depending on the location, an increase in the number of activities could increase the probability of disturbing submerged cultural resources. Submerged cultural resources would not be affected, however, because testing and training would only occur within areas now used for these activities. As a result, effects on cultural resources are not anticipated within U.S. territorial waters because measures have been previously implemented to protect these resources.

REFERENCES

Automated Wreck and Obstruction Information System Database. (2010). Shipwreck Database. Retrieved from http://shipwrecks.slc.ca.gov/ShipwrecksDatabase/Shipwrecks_Database.asp, January 5, 2011.

Barnette, M. C. (2010). Lost at sea: A treatise on the management and ownership of shipwrecks and shipwreck artifacts. Retrieved from http://uwex.us/lostatsea.htm, 2010, October 22.

California State Historic Preservation Office. (2012). Hawaii-Southern California Training and Testing Activities, Various Ocean Areas, Southern California.

EDAW, I. (2005). Final Environmental Impact Report (EIR) Disposition of Offshore Cooling Water Conduits. (pp. 14). Prepared for California State Lands Commission.

Hawaii State Historic Preservation Division. (2003). Programmatic Agreement among the Commander Navy Region Hawaii, the Advisory Council on Historic Preservation, and the Hawaii State Historic Preservation Officer Regarding Navy Undertakings in Hawaii. (Including Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility; outlying Oahu installations; and the Pacifica Missile Range Facility at Barking Sands, Kauai.)

Kelley, D. (2006). Historical Collections of Hawaii – Keepers of the Culture – Influence of Foreigners on Hawaii – Part 16 Whaling – Whalers Influence – Lord Byron and New Laws http://www.usgwarchives.org/copyright.htm

Masters, P. & Schneider, J. (2000). Cobble Mortars/Bowls: Evidence of Prehistoric Fisheries in the Southern California Bight.

Masters, P. M. (2003). Prehistoric Underwater Archaeological Sites of San Diego County: WAN Conservancy.

Minerals Management Service. (1990). California, Oregon, and Washington Archaeological Resource Study. (Vol. III: Prehistory, pp. 141). Prepared by P. Snethkamp, G. Wessen, A. York, J. Cleland, S. Hoyt and R. Gearhart. Prepared for Minerals Management Service.

National Park Service. (2007). Abandoned Shipwreck Act Guidelines. Retrieved from http://www.nps.gov/archeology/submerged/intro.htm, October 10, 2011.

Naval Base San Diego. (2012). Naval Base San Diego – History. Retrieved from http://www.cnic.navy.mil/SanDiego/About/History/index.htm, February 16, 2012.

Neyland, R. S. (2001). Sovereign immunity and the management of United States naval shipwrecks and shipwreck artifacts. Retrieved from http://www.history.navy.mil/branches/org12-7h.htm, 2010, October 22.

New South Wales. (2012). Japanese midget submarine wrecks. Retrieved from http://www.environment.nsw.gov.au/M24/discovery/midgetwrecks.htm.

National Oceanographic and Atmospheric Administration. (2012). Maritime History. Retrieved from http://hawaiihumpbackwhale.noaa.gov/maritime/maritime_history.html, 2012 October 4.

Saunders, Jenan. (2012). Written communication of June 5, 2012 to Andy Yatsko (Naval Facilities Engineering Command, SW) regarding Hawaii-Southern California Training and Testing Activites, Various Ocean Areas Southern California concurrence of Finding of No Effects.

Sutton, M. (2010). The Del Rey Tradition and Its Place in the Prehistory of Southern California. Pacific Coast Archaeological Society Quarterly, 44(2).

U.S. Department of the Navy. (2008a). Hawaii Range Complex, Final Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS). Hawaii Range Complex. Prepared by Pacific Missile Range Facility.

U.S. Department of the Navy. (2008b). Southern California Range Complex Environmental Impact Statement/Overseas Environmental Impact Statement. U.S. Navy Pacific Fleet. Prepared by Naval Facilities Engineering Command Southwest.

U.S. Department of the Navy. (2011). Silver Strand Training Complex Environmental Impact Statement [EIS]. Prepared by U.S. Pacific Fleet.

Zander, C. M. and Varmer, O. (1996). Closing the Gaps in Domestic and International Law: Achieving Comprehensive Protection of Submerged Cultural Resources. Contested Waters Vol 1 (3/4). Retrieved from http://www.nps.gov/archeology/cg/vol1_num3-4/gaps.htm, October 10, 2011.

3.11 Socioeconomic Resources

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

This Page Intentionally Left Blank

3.11 Socioeconomic Resources

SOCIOECONOMIC RESOURCES SYNOPSIS

The United States Department of the Navy considered all potential stressors, and the following have been analyzed for socioeconomic resources:

- Accessibility (limiting access to the ocean and the air)
- Physical disturbance and strike (aircraft, vessels and in-water devices, military expended materials)
- Airborne acoustics (weapons firing, aircraft and vessel noise)
- Secondary

Preferred Alternative (Alternative 2)

- Accessibility: Accessibility stressors are not expected to result in impacts on commercial transportation and shipping, commercial and recreational fishing, subsistence use, or tourism because inaccessibility to areas of co-use would be temporary and of short duration (hours).
- Physical disturbance and strike: Physical disturbance and strikes are not expected to result in impacts on commercial and recreational fishing, subsistence use, or tourism because of the large size of the Study Area, the limited areas of operations, and implementation of the Navy's standard operating procedures.
- Airborne acoustics: Airborne acoustic stressors are not expected to result in impacts to tourism or recreational activity because the Navy's training and testing would occur well out to sea, far from tourism and recreation locations.
- Secondary: Secondary stressors are not expected to result in impacts to fishing, subsistence use, or tourism, based on the level of impacts described in other resources sections.

3.11.1 Introduction and Methods

This section provides an overview of the characteristics of socioeconomic resources in the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area) and describes in general terms the methods used to analyze potential impacts on these resources from the Proposed Action.

The Council on Environmental Quality regulations implementing the National Environmental Policy Act (NEPA) state that when economic or social effects and natural or physical environmental effects are interrelated, the Environmental Impact Statement (EIS) will discuss these effects on the human environment (40 Code of Federal Regulations [C.F.R.] 1508.14). The Council on Environmental Quality regulations state that the "human environment shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment." To the extent that the ongoing and proposed United States (U.S.) Department of the Navy (Navy) training and testing activities in the Study Area could affect the natural or physical environment, the socioeconomic analysis evaluates how elements of the human environment might be affected. The Navy identified four broad socioeconomic topics based on their association with human activities and livelihoods in the Study Area. Each of these socioeconomic resources is an aspect of the human environment that involves economics (i.e., employment, income, or revenue) and social conditions (i.e., enjoyment and quality of life) associated with the marine environment of the Study Area. Therefore, this evaluation considered potential impacts on four topics:

- Commercial transportation and shipping
- Commercial and recreational fishing
- Subsistence use
- Tourism

The baseline for identifying the socioeconomic conditions in the Study Area was derived using relevant published information from sources that included federal, state, regional and local government agencies and databases, academic institutions, conservation organizations, technical and professional organizations, and private groups. Previous environmental studies were also reviewed for relevant information.

The alternatives were evaluated based upon the potential for and the degree to which training and testing activities could impact socioeconomics. The potential for impacts depends on the likelihood that the testing and training activities would interface with public activities or infrastructure. Factors considered in the analysis include whether there would be temporal or spatial interfaces between the public or infrastructure and Navy testing and training. If there is potential for this interface, factors considered to estimate the degree to which an exposure could impact socioeconomics include whether there could be an impact on livelihood, quality of experience, resource availability, income, or employment. If there is no expected potential for the public to interface with an activity, the impacts would be considered negligible.

3.11.2 Affected Environment

The area of interest for assessing potential impacts on socioeconomic resources is the U.S. Territorial Waters of Hawaii and Southern California coasts (seaward of the mean high water line to 12 nautical miles [nm]). This section describes the four socioeconomic resources associated with human activities and livelihoods in the Study Area from shore to 12 nm from shore consistent with NEPA.

3.11.2.1 Transportation and Shipping

Current military and civilian use of the offshore sea and air areas is compatible, with Navy ships accounting for six percent of the total ship presence out to 200 nm (Mintz and Filadelfo 2011). The Navy conducts training and testing activities in operating areas (OPAREAs) away from commercially used waterways and within special use airspace (Mintz and Filadelfo 2011). Notifications of potentially hazardous operations are communicated to all vessels and operators by use of Notices to Mariners, issued by the U.S. Coast Guard and Notices to Airmen, issued by the Federal Aviation Administration. The Department of Defense (DoD) also publishes separate Notices to Airmen about runway closures, missile launches, special traffic management procedures, and malfunction of navigational aids.

3.11.2.1.1 Ocean Traffic

Ocean traffic is the transit of commercial, private, or military vessels at sea, including submarines. The ocean traffic flow in congested waters, especially near coastlines, is controlled by the use of directional shipping lanes for large vessels, including cargo, container ships, and tankers. Traffic flow controls are also implemented to ensure that harbors and ports-of-entry remain as uncongested as possible. There is less control on open-ocean traffic involving recreational boating, sport fishing, commercial fishing, and activity by naval vessels. In most cases, the factors that govern shipping or boating traffic include the following: adequate depth of water, weather conditions (primarily affecting recreational vessels), availability of fish, and temperature. Higher air and water temperatures increase recreational boat traffic (e.g., sailing, power boating, windsurfing, kayaking, and using jet skis) as well as diving activities. Recreational activities also fluctuate seasonally, with increased activity in summer when, along with warmer weather, there are more daylight hours and greater opportunity for recreational activities.

Areas of surface water within the Study Area are designated as danger zones and restricted areas as described in the C.F.R., Title 33 (Navigation and Navigable Waters), Part 334 (Danger Zone and Restricted Area Regulations) and established by the U.S. Army Corps of Engineers. Danger zones are areas used for target practice, bombing, rocket firing, or other especially hazardous training operations. A danger zone may be closed to the public full-time or on an intermittent basis, as stated in the regulations. A restricted area is designated for the purpose of prohibiting or limiting public access to an area. Restricted areas generally provide security for government property and protection to the public from risks of damage or injury arising from government activities occurring in the area (33 C.F.R. 334.2). Danger zones and restricted areas located within 12 nm from shore in the Study Area have the potential to impact the four socioeconomic resources identified above.

3.11.2.1.1.1 Hawaii Range Complex

Ocean shipping is a significant component to Hawaii's economy. Major inter-island ports include Honolulu, Barbers Point, Hilo, Kawaihae, and Kahului. The U.S. Army Corps of Engineers ranked 149 U.S. ports by cargo volume in 2009. Based on those rankings, Barbers Point (Oahu) ranked 48th in total trade (domestic and foreign) with over 9.6 million tons of imports and exports. Other ranked cities in Hawaii were Honolulu at 49th, Kahului at 96th, Kawaihae at 125th, Hilo at 126th, and Nawiliwili (Kauai) at 130 (Table 3.11-1)

Shipping routes around the Hawaiian Islands are shown in Figure 3.11-1.

Table 3.11-1: United States Port Rankings by Cargo Volume for Hawaii Ports in 2009

Port Name	Total Trade Rank (Domestic and Foreign)	Total Foreign Trade	Total Domestic Trade
Barbers Point, Oahu	48th	35th	101st
Honolulu, Oahu	49th	81st	31st
Kahului, Maui	96th	113th	74th
Kawaihae Harbor, Hawaii	125th	130th	105th
Hilo, Hawaii	126th	116th	106th
Nawiliwili, Kauai	130th	118th	108th

Source: Association of Port Authorities 2009

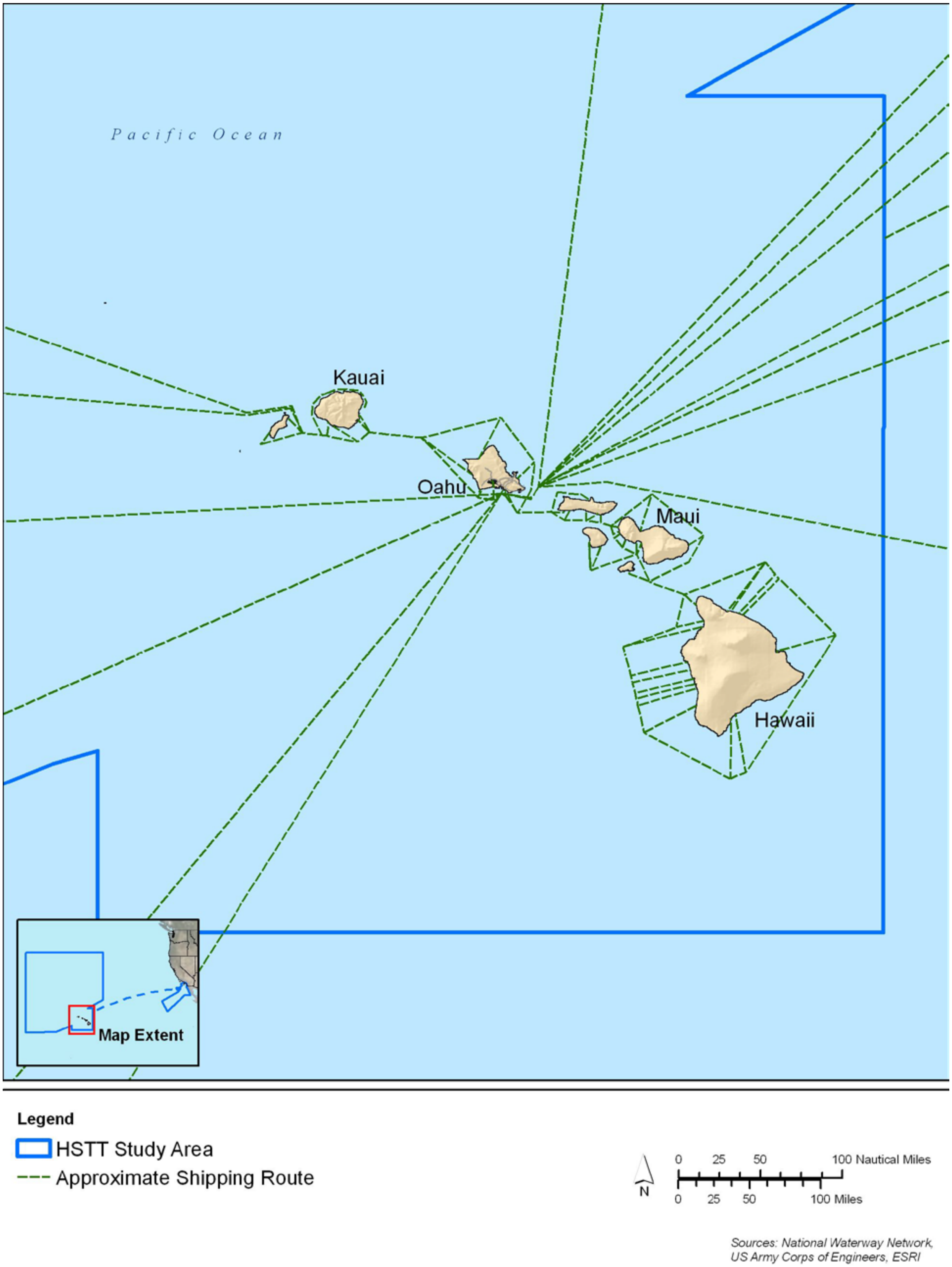


Figure 3.11-1: Hawaiian Islands Shipping Routes

3.11.2.1.1.2 Southern California Range Complex and Silver Strand Training Complex

Ocean shipping is a significant component of the Southern California regional economy. Key ports in Southern California include Los Angeles, Long Beach, and, to a lesser degree, Port Hueneme and San Diego. Of 149 U.S. ports evaluated by the U.S. Army Corps of Engineers, Los Angeles and Long Beach ranked fourth and ninth, respectively, in total trade (measured in tons) in 2009 (the most recent year data are available); Port Hueneme ranked 118th and San Diego ranked 123rd (Intermodal Association of North America 2008; Association of Port Authorities 2009) (Table 3.11-2). Total trade at Long Beach exceeded 72 million tons of foreign and domestic imports and exports. Total trade at Los Angles was over 58 million tons.

Table 3.11-2: United States Port Rankings by Cargo Volume for Southern California Ports in 2009

Port Name	Total Trade Rank (Domestic and Foreign)	Total Foreign Trade	Total Domestic Trade
Long Beach	4th	4th	20th
Los Angeles	9th	5th	38th
Port Hueneme	118th	71st	142nd
San Diego	123rd	76th	139th

Source: Association of Port Authorities 2009

A significant amount of ocean traffic, consisting of both large and small vessels, transits through the Southern California (SOCAL) Range Complex. For instance, there was an annual average of over 1,200 commercial ship transits into and out of the Port of San Diego between 2007 and 2010 (San Diego Unified Port District 2011). For commercial vessels, the major transoceanic routes to the southwest pass north and south of San Clemente Island (Figure 3.11-2).

The approach and departure routes into San Diego and the ports of Los Angeles-Long Beach Harbor pass to the east of San Clemente Island and Santa Catalina Island. Naval vessels operate within and transit through the SOCAL Range Complex. The location of San Clemente Island creates a separation zone within the SOCAL Range Complex. Most vessels entering or leaving the ports of Los Angeles or Long Beach travel northwest through the Santa Barbara Channel, west just south of the northern Channel Islands, or south along the coast to San Diego, the Panama Canal, or South America.

Shipping to and from the south includes an inshore route to the east of San Clemente Island within the SOCAL Range Complex. Ships traveling between Los Angeles/Long Beach and Hawaii via the most direct route pass to the north of the SOCAL Range Complex. Vessels coming or going from the Port of San Diego generally travel along shipping routes north or south near the coast, which includes inshore waters of the SOCAL Range Complex but bypass San Clemente Island to the east. Another commercial shipping route extends from the Port of San Diego to Japan and the eastern Pacific crossing the SOCAL Range Complex just south of San Clemente Island.

Recreational traffic is typically found within a mile from shore and rarely found in the outer waters, shipping lanes, or near San Clemente Island, with the exception of recreational fishing (i.e., charter) vessels traveling to deeper water. Within the SOCAL Range Complex, fishing is centered primarily around San Clemente Island and secondarily in the shallower waters over the Tanner and Cortes Banks. Because those banks are inherently more hazardous, the nearshore waters of San Clemente Island are a more popular destination than the more remote banks.

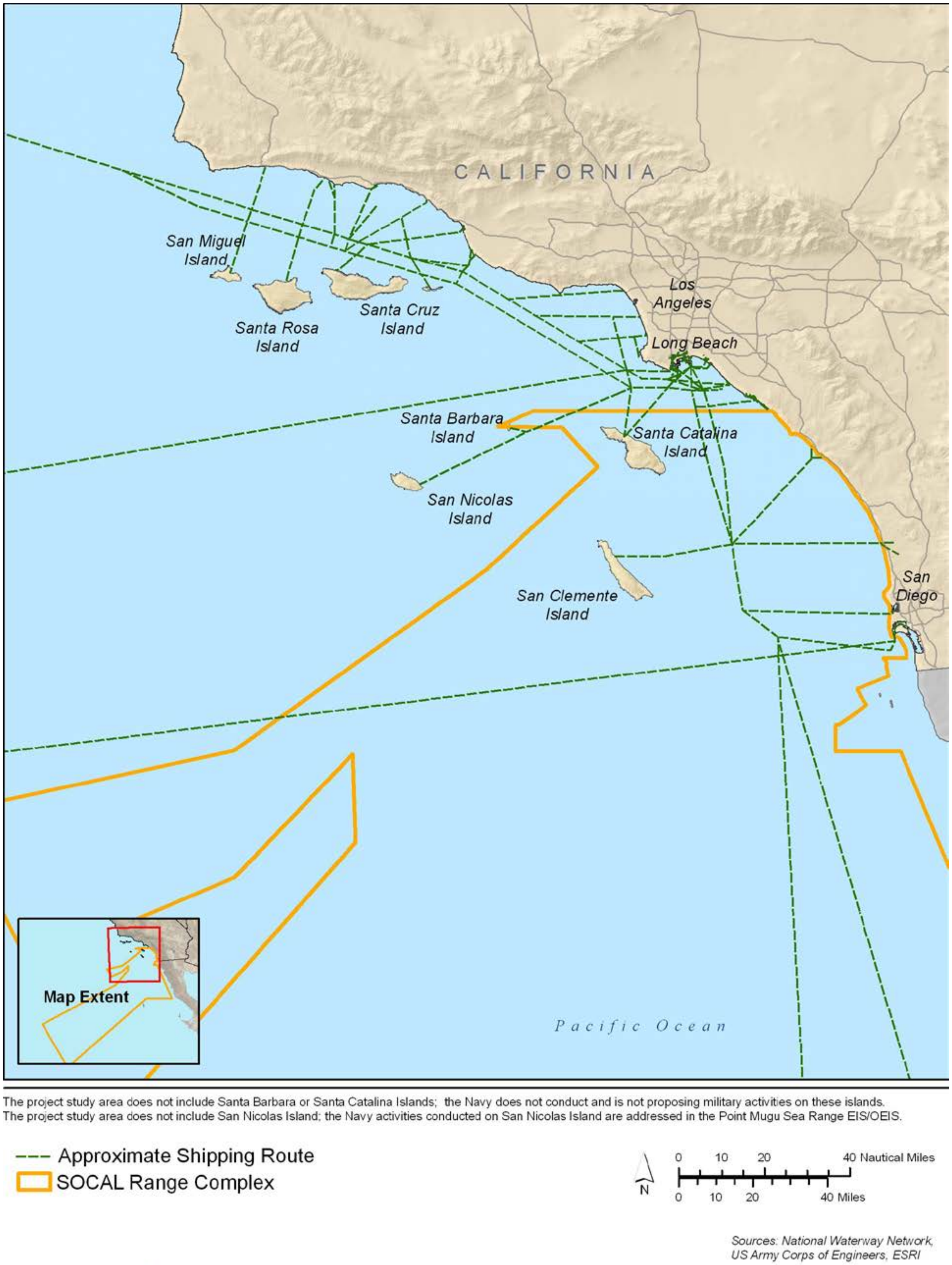


Figure 3.11-2: Southern California Range Complex Shipping Routes

Marine traffic in the Silver Strand Training Complex (SSTC) region consists of vessels transiting to multiple marinas, mooring locations, commercial ports, fishing harbors, and military installations. San Diego Bay is bordered by the cities of San Diego, National City, Chula Vista, Imperial Beach, and Coronado. The SSTC Boat Lanes located on the ocean side of the SSTC are commonly used by sportfishing charters, baitfishing to support sportfishing, lobster fishing, and competition sailing regattas. Access to San Diego Bay by incoming vessels is through the mouth of the harbor to the north, or through the many marinas and boat launch facilities located along the perimeter of the Bay.

3.11.2.1.1.3 Transit Corridor

Major commercial shipping vessels use the transit corridor for shipping goods between Southern California and Hawaii because it is the shortest distance between these two points (Figure 2.1-1). Vessels using this corridor are outside of military training areas and typically follow all U.S. Coast Guard maritime regulations. The Navy also uses this corridor for training and testing activities while en route between Southern California and Hawaii.

3.11.2.1.2 Air Traffic

Air traffic refers to movements of aircraft through airspace (Figure 3.11-3). Safety and security factors dictate that use of airspace and control of air traffic be closely regulated. Accordingly, regulations applicable to all aircraft are promulgated by the Federal Aviation Administration to define permissible uses of designated airspace, and to control that use. These regulations are intended to accommodate the various categories of aviation, whether military, commercial, or general aviation.

The system of airspace designation uses various definitions and classifications of airspace in order to facilitate control. Airspace is categorized generally as either “controlled” airspace or “uncontrolled” airspace. Controlled airspace is further organized into several difference classes of airspace distinguished by altitude range, use (e.g., commercial or military), and proximity to a major airport. Controlled airspace means that services supporting aircraft flying under Instrument Flight Rules are available. Such services include air-to-ground radio communication, navigational aids, and air traffic control services for maintaining separation between aircraft. Controlled airspace does not mean that all flights are controlled by air traffic control.

Special use airspace consists of both controlled and uncontrolled airspace and has defined dimensions where flight and other activities are confined because of their nature and the need to restrict or prohibit non-participating aircraft for safety reasons. Special use airspace are established under procedures outlined in 14 C.F.R. Part 73.1. The majority of special use airspace is established for military flight activities and, with the exception of prohibited areas (e.g., over the White House) may be used for commercial or general aviation when not reserved for military activities. There are multiple types of special use airspace, including prohibited, restricted, warning, alert, and military operations areas (Federal Aviation Administration 2009). One type of special use airspace, of particular relevance to the Study Area, is a warning area, which is defined in 14 C.F.R. Part 1 as follows:

> “A warning area is airspace of defined dimensions, extending from 3 nm outward from the coast of the United States that contains activity that may be hazardous to nonparticipating aircraft. The purpose of such warning areas is to warn nonparticipating pilots of the potential danger. A warning area may be located over domestic or international waters or both.”

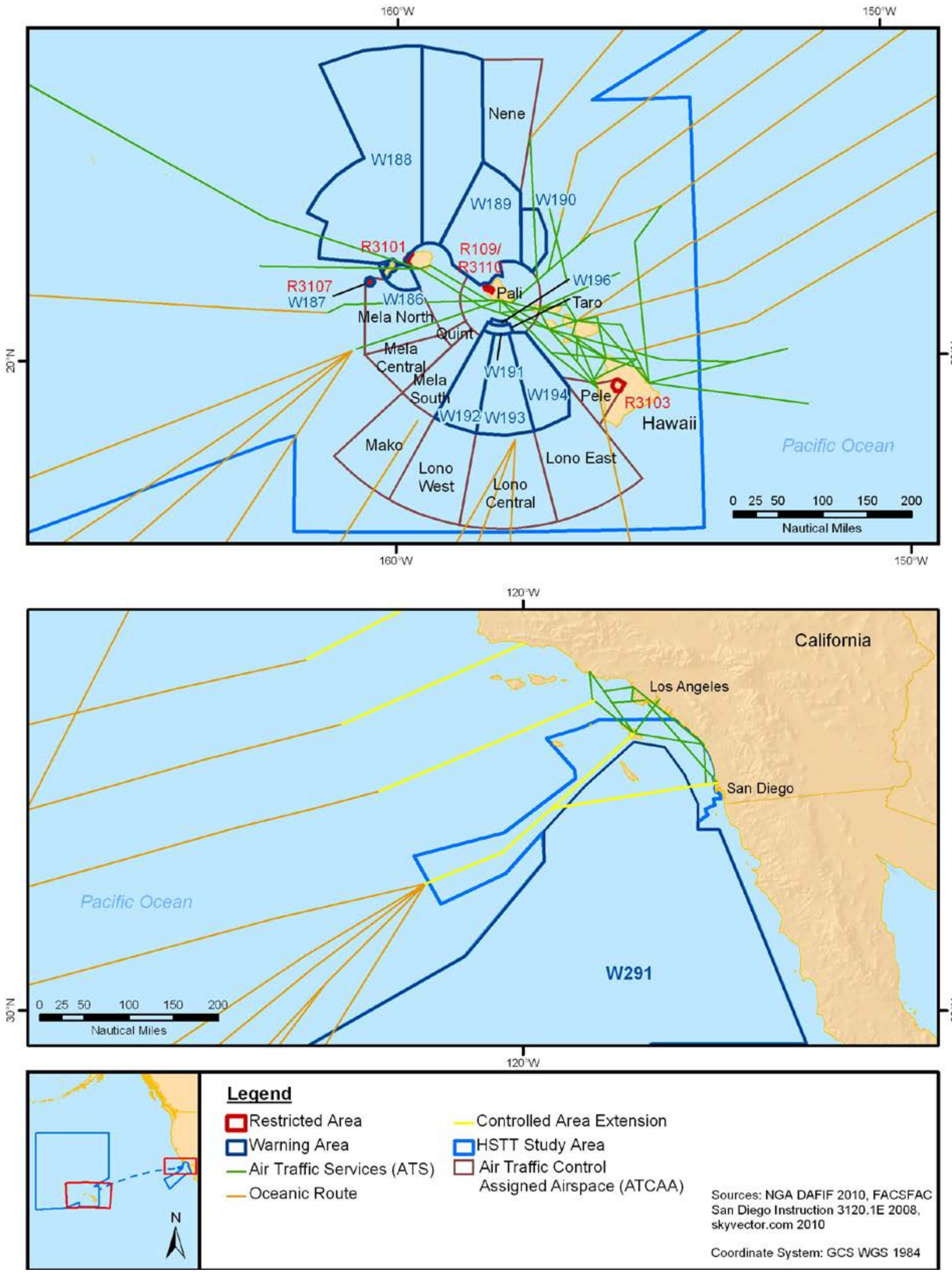


Figure 3.11-3: Air Traffic Routes in the Study Area, Hawaii Range Complex (top) and Southern California Range Complex (bottom)

Warning areas are established to contain a variety of hazardous aircraft and non-aircraft activities, such as aerial gunnery, air and surface missile firings, bombing, aircraft carrier operations, surface and subsurface operations, and naval gunfire. When these activities are conducted in international airspace, the Federal Aviation Administration regulations may warn against, but do not have the authority to prohibit, flight by nonparticipating aircraft. A restricted area, such as Restricted Area 3107 (R-3107), is a type of special use airspace within which nonmilitary flight activities are closely restricted.

3.11.2.1.2.1 Hawaii Range Complex

Military Air Transit

The special use airspace in the region of influence (Figure 3.11-3) consists of W-188 and R-3101 north and west of Kauai, and W-186 southwest of Kauai, controlled by Pacific Missile Range Facility. Warning Areas 188 Rainbow, W-189 and W-190 north of Oahu, W-187 and R-3107 surrounding Kaula Island, and W-191, W-192, W-193, W-194, and W-196 south of Oahu are scheduled through the Navy Fleet Area Control and Surveillance Facility Pearl Harbor, which then coordinates with the Honolulu Combined Facility. There are also 12 Air Traffic Control Assigned Airspace areas within the Hawaii Range Complex (HRC). These Air Traffic Control Assigned Airspace areas provide additional controlled airspace adjacent to and between the warning areas.

Commercial and General Aviation

Most of the airspace within the region of influence is in international airspace, and air traffic is managed by the Honolulu Control Facility. The Honolulu Control Facility includes the Air Route Traffic Control Center, the Honolulu Control Tower, and the Combined Radar Approach Control collocated in a single facility. Airspace outside that managed by the Hawaii Combined Facility is managed by the Oakland Air Route Traffic Control Center.

The airspace within the HRC has several en route high-altitude jet routes, as shown on Figure 3.11-3. Most of the oceanic routes enter the HRC from the northeast and southwest and are generally outside the special use airspace warning areas described above. The Air Traffic Services routes are concentrated along the Hawaiian islands chain. Most of the open-ocean area region of influence is well removed from the jet routes that crisscross the north Pacific Ocean.

3.11.2.1.2.2 Southern California Range Complex

Military Air Transit

The SOCAL Range Complex contains three warning areas (W): W-290, W-291, and a small portion of W-289. Each extends from the surface to 80,000 feet (ft.) (24,384 meters [m]) above mean sea level (Figure 3.11-4). All three warning areas can be activated by the Federal Aviation Administration at the Navy's request when operations that would pose a hazard to nonparticipating aircraft are being conducted. Other special use airspace within W-291 includes nine Tactical Maneuvering Areas and two Missile Ranges.

Military pilots travel under Instrument Flight Rules from local air bases until they reach W-291 and proceed under a Visual Flight Rules to their instructed tactical maneuvering areas or missile range OPAREA. Activation by the Federal Aviation Administration is performed by notifying the controlling air traffic agency of the change in status in the area. This allows the agency to issue notices to pilots to alter their courses to avoid military activities.

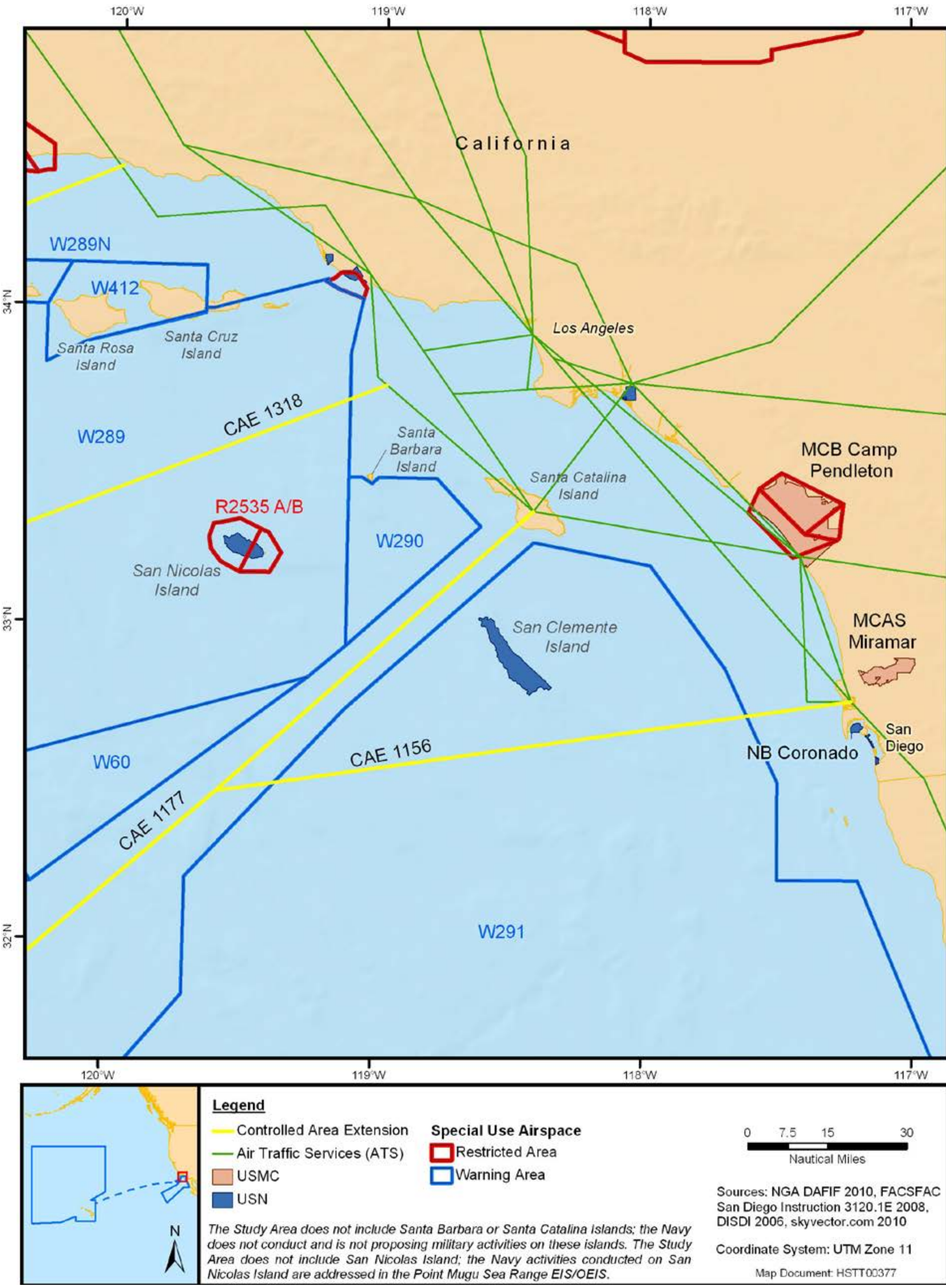


Figure 3.11-4: Southern California Offshore Airspace

In the Fleet Area Control and Surveillance Facility San Diego annual utilization report for fiscal year 2010, (1 October 2009 through 30 September 2010) there were 36,194 air operations in W-291, exclusive of air operations that utilize the Naval Auxiliary Landing Field at San Clemente Island (see below). During fiscal year 2010, W-291 airspace was released to the controlling agency, Los Angeles Air Route Traffic Control Center, for 619 hours of public use.

The Study Area off the coast of Southern California contains a restricted area over San Nicolas Island, R-2535 A/B, which is located within the Pt. Mugu Sea Range. Other types of special use airspace are found within the SOCAL Range Complex OPAREAs including missile ranges and tactical maneuvering areas.

The Naval Auxiliary Landing Field at San Clemente Island is located within W-291 airspace. To support the safe and efficient air traffic movement to/from Naval Auxiliary Landing Field San Clemente Island, Class D airspace has been established. Class D airspace is airspace tailored to the specific needs of the airport to ensure separation between aircraft. The airspace above San Clemente Island consists of a 5 nm radius circle centered on Fleet Area Control and Surveillance Facility San Clemente Island and includes the airspace from the surface to 2,700 ft. (823 m) mean sea level. All aircraft entering this airspace, or operating within it, must maintain radio contact with the Fleet Area Control and Surveillance Facility San Clemente Island control tower. An aircraft operation at Fleet Area Control and Surveillance Facility San Clemente Island is defined as an aircraft event that involves a takeoff, landing, low approach to the airfield, or touch-and-go landing. Thus, a single sortie from the airfield could generate several reportable “operations.” The baseline level of airfield operations at Fleet Area Control and Surveillance Facility is 25,120 operations.

Commercial and General Aviation

Aircraft operating under Visual Flight Rules can fly along the coast between San Diego and Orange County and out to Santa Catalina Island largely unconstrained, except by safety requirements and mandated traffic flow requirements. Aircraft operating under Instrument Flight Rules clearances, authorized by the Federal Aviation Administration, normally fly on the airway route structures. In Southern California, these routes include both high and low altitude routes between San Diego and Los Angeles and to Santa Catalina Island. There are two control area extensions from Southern California through nearby W-291 to facilitate easier access to air routes out to Hawaii and other transpacific locations. These routes allow general aviation and commercial air travel to coexist with military operations. Control area extension 1177 extends from Santa Catalina Island southwest between W-291 and the Pt. Mugu Sea Range. Control area extension 1156 extends west from San Diego through the northern portion of W-291. When W-291 is active, control area extension 1156 is normally closed. Control area extension 1177, the more important route through the coastal warning areas, is closed only when weapons hazard patterns extend into the area, and this closure is fully coordinated with the Federal Aviation Administration. When W-291 is active, aircraft on Instrument Flight Rules clearances are precluded from entering W-291 by the Federal Aviation Administration. However, since W-291 is located entirely over international waters, nonparticipating aircraft operating under Visual Flight Rules are not prohibited from entering the area. Examples of aircraft flights of this nature include light aircraft, fish spotters, and whale watchers, which occur under Visual Flight Rules throughout W-291 on a variable basis.

3.11.2.1.2.3 Silver Strand Training Complex

Military Air Transit

Military overflights generated for SSTC activities are based out of Naval Air Station North Island and Navy Outlying Landing Field Imperial Beach. The airspace over both facilities is classified as Class D airspace defined by a five nautical miles (nine kilometers) radius and extending to 2,800 ft. (853 m) over Naval Air Station North Island and to 1,500 ft. (457 m) over Navy Outlying Landing Field Imperial Beach. The two airspace extend over the SSTC and much of San Diego Bay and the surrounding area. These airspace are under Navy control, and air operations in support of SSTC training, including helicopter insertions and extractions, and parachute drops into designated drop zones must comply with the Air Operations Manual. Flight paths servicing nearby San Diego Airport are geographically separate from helicopter sorties bound for SSTC training areas and approach and departure patterns for fixed wing aircraft into Naval Air Station North Island.

Commercial and General Aviation

Commercial and general aviation air traffic is controlled by the San Diego Air Route Traffic Control Center. Flight paths servicing San Diego Airport located to the North of Naval Air Station North Island are geographically separate from helicopter sorties traveling to SSTC training areas and approach and departure patterns for fixed wing aircraft into Naval Air Station North Island.

3.11.2.1.2.4 Transit Corridor

There are numerous commercial air routes over the transit corridor between Southern California and Hawaii. Commercial aircraft typically fly above 30,000 ft. (9,144 m) in this area. These air routes are controlled by the Federal Aviation Administration.

3.11.2.2 Commercial and Recreational Fishing

Commercial fishing takes place throughout the Study Area from nearshore waters adjacent to the mainland and offshore islands, to the offshore banks and waters within the transit area. Many different types of fishing gear are used by commercial and recreational fishermen in the Study Area, such as gillnets, longline gear, troll gear, trawls, seines, traps or pots, harpoons, and hook and line.

3.11.2.2.1.1 Hawaii Range Complex

The data that individual fishermen report on commercial fishing reports are confidential, protected by Hawaii state law (189-3, Hawaii Revised Statutes), and can only be released to the public in summarized form. Table 3.11-3 shows that commercial landings for all fisheries from 2006 to 2010 in Hawaiian waters totaled 140,142,310 pounds (lb.) (63,567,480 kilograms [kg]). Based on the catch data presented in Table 3.11-3, the total value of reported commercial landings for all accounted species in Hawaii from 2006-2010 was $381,742,062 (National Marine Fisheries Service 2011).

Hawaii does not collect data on non-commercial marine fishing consistently, although occasional surveys have been conducted. In 2001, NMFS and the Hawaii Division of Aquatic Resources began collecting data on recreational fishing in Hawaii using the Marine Recreational Fishing Survey. Results of the survey are reported through the Marine Recreational Fishery Statistics Survey website, which has been reporting similar data for other coastal states since 1979. Hawaii does not have a mandatory recreational marine fishing license as many other coastal states do, and does not have mandatory reporting of recreational catches (National Marine Fisheries Service and Hawaii Division of Aquatic Resources 2010). Fishing destinations vary in response to changing fishing conditions, and many charter boats fish HRC waters on a routine basis. Sport fishermen pursue various fish species with hook and line; some divers also spearfish or take invertebrates by hand within the Hawaii nearshore waters.

Table 3.11-3: Total Commercial Landings (Pounds) and Total Value (Dollars) within the Hawaii Range Complex (2006–2010)

Major Species and Species Group		Total Catch 2006–2010 (pounds)
Fish	Tuna (yellowfin, skipjack, bluefin, albacore, etc.)	81,749,277
	Billfish (blue marlin, striped marlin, swordfish)	25,616,726
	Bottomfish (opakapaka, onaga, uku)	1,522,474
	Other Pelagic Fish (mahimahi and wahoo)	10,433,429
	All Other Fish	20,774,305
	Total Fish	**140,096,211**
Invertebrates	Spiny Lobster	45,046
	Saltwater Shrimp	1,053
Totals	**Total Invertebrates**	**46,099**
	Combined Total	**140,142,310**
	Value of Combined Total	**$381,742,062**

Source: National Marine Fisheries Service 2011, Pacific Islands Fisheries Science Center 2011, National Marine Fisheries Service 2012

Nearshore target fish species include akule, opelu, ta'ape, snapper, moana, weke, ulua, menpachi, o'ie, and bonefish. Longer charters target species typically found father offshore, such as mahi mahi, ono, ahi, swordfish, tuna, and marlin (blue, black, striped). Although, many of these species are caught relatively close to shore (within 3 nm), because water depth increases dramatically only a short distance from shore creating habitat attract to many pelagic species. In many areas, such as off Kona, fishing takes place year round. Tournaments held off of Oahu, Maui, and Kona occur from February through early November; however, most tournaments are scheduled between June and August (Sportfish Hawaii 2008).

The U.S. Fish and Wildlife Service conducts a telephone survey every 5 years to estimate the total numbers of fishermen and hunters in each state. On average, in 1995, about 260,000 people fished recreationally in Hawaii, of which about half were residents. The estimated 130,000 Hawaii residents who fish recreationally far outnumber the 3,500-plus licensed commercial fishermen in Hawaii (National Marine Fisheries Service and Hawaii Division of Aquatic Resources 2010).

State and federal agencies protect a variety of marine areas in Hawaii; fisheries have improved as a result. These areas include Marine Life Conservation Districts, Fisheries Management Areas, Fisheries Replenishment Areas, Bottomfish Restricted Fishing Areas, Hawaii Marine Laboratory Refuge-Coconut Island, Kahoolawe Island Reserve, Paiko Lagoon Wildlife Sanctuary, Ahihi-Kinau Natural Area Reserve, South Kona Opelu Fishing Area, the Hawaiian Islands Humpback Whale National Marine Sanctuary, and the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve (Friedlander, Aeby et al. 2004).

3.11.2.2.1.2 Southern California Range Complex and Silver Strand Training Complex

The California Department of Fish and Game maintains commercial catch block data for waters in the northern part of W-291 (Section 3.9, Fish), and all statements referring to catch are for that part of the Study Area for which data are available. For 2011, the most commonly harvested commercial species in the SOCAL Range Complex were tuna, Pacific sardine, swordfish, spiny lobster, crab, sea urchin, squid, and other invertebrates (Table 3.11-4). During 2011, Southern California accounted for 39 percent of all California fish and invertebrate landings. In 2009, Southern California accounted for 10 percent of all fish and invertebrate landings, for California waters.

Table 3.11-4: Annual Commercial Landing of Fish and Invertebrates and Value within the Southern California Range Complex and Silver Strand Training Complex (2011)

Major Species and Species Group		Annual 2011 Catch (pounds)	Value ($)
Fish	Tuna (yellowfin, bluefin, and albacore)	455,630	$508,914
	Pacific Sardine	38,804,579	$3,378,952
	Swordfish	88,511	$468,963
	All Other Fish	5,724,708	$3,564,549
	Total Fish	**45,073,428**	**$7,921,378**
Invertebrates	Spiny Lobster	503,492	$8,636,545
	Crab	294,392	$344,609
	Other Crustaceans (shrimp and prawn)	176,892	$1,536,512
	Sea Urchins	1,683,458	$1,622,037
	Squid	112,390,626	$30,391,039
	Other Invertebrates	308,146	$1,121,981
Totals	**Total Invertebrates**	**115,357,006**	**$43,652,723**
	Combined Total	**160,430,434**	**$51,574,101**

Source: California Department of Fish and Game 2012

In the SOCAL Range Complex, groundfishes (e.g., flatfishes, skates, sharks, chimeras, rockfishes) are important recreational and commercial species. Highly migratory species (e.g., tuna, billfish, sharks, dolphinfish, and swordfish) and coastal pelagic species such as anchovies, mackerel, sardines, and squid also support extensive fisheries in the area. The harvest of coastal pelagic species is one of the largest fisheries in the SOCAL Range Complex in terms of landed biomass and volume, as well as revenue (California Department of Fish and Game 2012). In 2010, California ranked fourth in the nation for commercial fisheries landings (measured in pounds) (National Marine Fisheries Service 2011). For recreational fisheries, California ranked 14th in the nation in landings of finfish (bony and cartilaginous fish that use fins for locomotion).

Pelagic, flatfish, demersal fish, and other fish associated with the ocean bottom account for about 50 percent of the average annual catch of fish within the Study Area OPAREAs (Table 3.11-4). Pelagic species encompass the majority of the commercial portion of the average annual pound of catch. The average annual catch of pelagic, flatfish, demersal, and all other fish amounts to 36,951,285 lb. (16,760,818 kg) and $8,152,845. The Pacific sardine fishery is one of the most valuable fisheries among the coastal pelagic finfish in California, with the majority of the fish landed in SOCAL and Ensenada (California Department of Fish and Game 2005).

The average annual catch of crustaceans is comprised of approximately half spiny lobster (377,607 lb. [171,279.6 kg] per year) and half crab and shrimp (average 340,845 lb. [154,604.7 kg] per year). The catch of crustaceans in the SOCAL Range Complex OPAREAs was worth $10,517,666 in 2011. In comparison, total commercial landings of market squid in 2011 were worth $30,391,039 and urchins were worth $1,622,037. Red sea urchins are the most commonly harvested invertebrate species within the SOCAL OPAREA. Other invertebrates (e.g., snails, sea cucumbers, sea stars, whelks) were worth $1,121,981 in 2009 (Table 3.11-4) (California Department of Fish and Game 2009).

Fishing activities occur at varying degrees of intensity and duration throughout the year within the SOCAL Range Complex. Fishermen often fish for more than one species and land their catch in various ports depending on the season in order to maximize their economic return. Key commercial fishing ports in Southern California include Los Angeles and San Diego, with numerous smaller ports and harbors located between these major port complexes. A wide range of commercial fishing methods are used in this region that are fishery-specific such as drift gillnets, longline gear, troll gear, trawls, seining, and traps or pots (Naval Undersea Warfare Center 2009).

The SOCAL Range Complex marine environments are popular locations for recreational fishing. Charter and privately operated boats enter the SOCAL Range Complex and San Clemente Island waters for salt-water sport fishing, recreational diving, and other boating activities. Commercial passenger fishing vessels, more commonly target fish further offshore compared to private boats, due to the high cost of private large boat ownership, the capability of the larger vessels to go farther, and the greater experience of professional captains. Recreational fishing and diving are centered primarily around San Clemente Island and secondarily in the shallower waters over Tanner and Cortes banks. These banks are inherently more hazardous due to their distance from shore and open-ocean diving conditions. Therefore, the near shore waters off San Clemente Island are a more popular destination than the more remote banks. Commercial passenger fishing vessels usually perform full-day trips; however, some charter boats occasionally may spend nights at sea (Naval Undersea Warfare Center 2009). More than 200 commercial passenger fishing vessels operate between Point Conception and the U.S./Mexican border (California Marine Life Protection Act Initiative 2009). These vessels operate from ports including San Diego, Oceanside, Dana Point, Newport Beach, Long Beach, Los Angeles, and from other locations all along the coast.

Major sport fish species include albacore and yellowfin tuna, shallow water rockfish (*Sebastes* spp.), yellowtail rockfish (*Sebastes flavidus*), kelp bass (*Paralabrax clathratus*), yellowtail (*Seriola lalandi*), California sheephead (*Semicossyphus pulcher*), ocean whitefish (*Caulolatilus princeps*), dolphin (*Coryphaena hippurus*), marlin (*Tetrapturus audax*), barracuda (*Sphyraena argentea*), swordfish (*Xiphias gladius*) and lingcod (*Opiodon elongatus*) (Fletcher 1999, Helgren 1999). Sport fishermen fish for bluefin tuna, yellowfin tuna, yellowtail rockfish, and rock cod (*Sebastes* spp.) in the vicinity of the offshore islands and on Tanner and Cortes banks (Fletcher 1999, Helgren 1999). Halibut (*Paralichthys californicus*) and white seabass (*Atractoscion nobilis*) are fished in sand channels and kelp beds around San Clemente Island.

Fishing destinations are generally fluid, in response to changing fishing conditions, but a number of charter boats fish waters of the SOCAL Range Complex on a routine basis. Sport fishermen pursue various fish species with almost exclusively rod and reel gear (hook and line); some divers also spearfish or take invertebrates (mainly lobster) by hand within the SOCAL Range Complex. The recreational fishing season is dependent on oceanographic conditions and generally occurs in late spring through the fall (Pacific Fishery Management Council 2007).

3.11.2.2.1.3 Transit Corridor

There are no data on commercial or recreational fishing within the transit corridor area because of the distance from land.

3.11.2.3 Subsistence Use

The U.S. Environmental Protection Agency considers subsistence fishers to be people who rely on noncommercial fish as a major source of protein. Subsistence fishers tend to consume noncommercial fish and/or shellfish at higher rates than other fishing populations, and for a greater percentage of the year, because of cultural and/or economic factors. There are very few studies in the United States that have focused specifically on subsistence fishers. The United States has issued no regulations to determine what or who would be considered a subsistence fisher. In addition, in the United States, there are no particular criteria or thresholds (such as income level or frequency of fishing) that definitively describe subsistence fishers. The U.S. Environmental Protection Agency issued guidance to state that at least 10 percent of licensed fishers in any area will be subsistence fishers (U.S. Environmental Protection Agency 2011). Because the 10 percent estimate is not based on actual subsistence fishing data, the number may overestimate or underestimate the number.
The U.S. Environmental Protection Agency (2011) suggests that Native Americans, lower income urban populations, and Asian-Americans are often subsistence fishers (Gassel et al. 1997). Therefore, an increased number of individuals below the poverty rate or an increased percentage of population classified as Native American or Asian may indicate an area with a higher amount of subsistence fishers.

Low-income populations would have limited means and opportunity to travel offshore to federal waters (i.e., beyond 3 nm from shore) for fishing. Nearshore waters surrounding the city of Coronado and the Silver Strand Training Complex provide fishing opportunities in San Diego Bay and along the Pacific coast of the peninsula. A variety of fish are caught mainly by hook and line from beaches, piers, and small boats (USA Today 2012). Thus, it is assumed that the majority of subsistence fishing would occur in waters close to the coastline. Inshore fishing usually occurs within sight of the shoreline in bays, flats, and marshes or under piers, bridges, or near the jetties where water is generally less than 100 ft. (30 m) deep. Boats used by subsistence fishers are generally smaller and more affordable.

3.11.2.3.1.1 Hawaii Range Complex

There have been no comprehensive surveys of subsistence-fishing activities in Hawaii and economic surveys have been episodic. Therefore, there is limited information from which to fully assess the subsistence fishing contribution to island economies, but the value of fishing for subsistence by contemporary Native Hawaiians is known to be an important component of some communities, particularly rural communities (Pooley 1993). However, it is believed that combined offshore recreational and subsistence catch is likely equal to or greater than the offshore commercial fisheries catch, with more species taken using a wider range of fishing gear (Friedlander et al. 2004).

3.11.2.3.1.2 Southern California Range Complex and Silver Strand Training Complex

In Southern California, people fish off piers and in local bays, harbors, and waterways for regular subsistence rather than for recreation. In Los Angeles County, where a high cost of living and low incomes have produced food insecurity among certain populations, subsistence fishing is more and more common. Although the economic value of subsistence fisheries may often be low, they may be critical for the livelihoods of many communities.

3.11.2.3.1.3 Transit Corridor

It is assumed that there is limited to no subsistence fishing activity within the Transit Corridor because of the distance from land to the Transit Corridor and because the majority of subsistence use occurs nearshore.

3.11.2.4 Tourism

Coastal tourism and recreation can be defined as the full range of tourism, leisure, and recreationally oriented activities that take place in the coastal zone and the offshore coastal waters. These activities include coastal tourism development (hotels, resorts, restaurants, food industry, vacation homes, second homes, etc.), and the infrastructure supporting coastal development (retail businesses, marinas, fishing tackle stores, dive shops, fishing piers, recreational boating harbors, beaches, recreational fishing facilities, etc.). Also included is ecotourism (e.g., whale watching) and recreational activities such as recreational boating, cruises, swimming, recreational fishing, surfing, snorkeling, and diving (National Oceanic Atmospheric Administration 1998).

3.11.2.4.1.1 Hawaii Range Complex

Navy vessels present on the waters of the HRC represent a small fraction of the overall commercial and recreational boat traffic and, correspondingly, account for only a small fraction of the potentially restrictive circumstances present in the open-ocean area around Hawaii.

The waters surrounding the main Hawaiian Islands are used for a variety of recreational, commercial, scientific, transportation, cultural, and institutional purposes. The intensity of use generally declines with increasing distance from shore, although specific resources in the open-ocean area may result in a concentration of use (e.g., seamounts are preferred fishing and diving locations). Offshore areas that are shielded by landmasses from the full force of wind and waves, such as the channels between Maui and adjacent islands, are preferred areas for recreational boating and diving. In addition, there are numerous beaches and parks throughout the islands (Figure 3.11-5 through Figure 3.11-7).

Recreational fishing in Hawaii is very important economically with anglers spending over $755 million on trip and durable expenditures in 2006. This level of expenditures generated $253.6 million in income, supported 7,000 jobs, and generated $105.0 million in government revenue in 2006 (Gentner 2009). Tourism, and by extension recreational fishing by tourists, varies seasonally. Additionally, the country or region of origin (e.g., U.S. west coast, U.S. east coast, Japan, etc.) of the tourists varies seasonally, influencing the types of activities in which tourists participate (Hawai'i Tourism Authority 2010). Surfing can also be found in the nearshore areas of all the Hawaiian Islands depending on the seasonal swell direction. Swells typically approach from the north in the winter months and from the south in the summer.

Humpback whale watching around the Hawaiian Islands peaks from late February through early April (Mobley, Spitz et al. 2001; Carretta, Forney et al. 2005). Direct revenues attributed to whale watching were $11–$16 million in Hawaii during the 1999 whale season (National Oceanic and Atmospheric Administration 2000; Pendleton 2006). Marine mammal sightings are expected to occur from the coast to 50 nm offshore, including the areas off Pacific Missile Range Facility, close to shore at Pyramid Rock Beach on Oahu, or areas within the 100-fathom contours such as the Molokai–Lanai–Maui–Kahoolawe channels and Penguin Bank. However, tourist day trips typically stay closer to shore or from beach vantage points, these activities can occur throughout the HRC. Additional information on humpback whales, including description, habitat, abundance, and distribution, is provided in Section 3.4 (Marine Mammals).

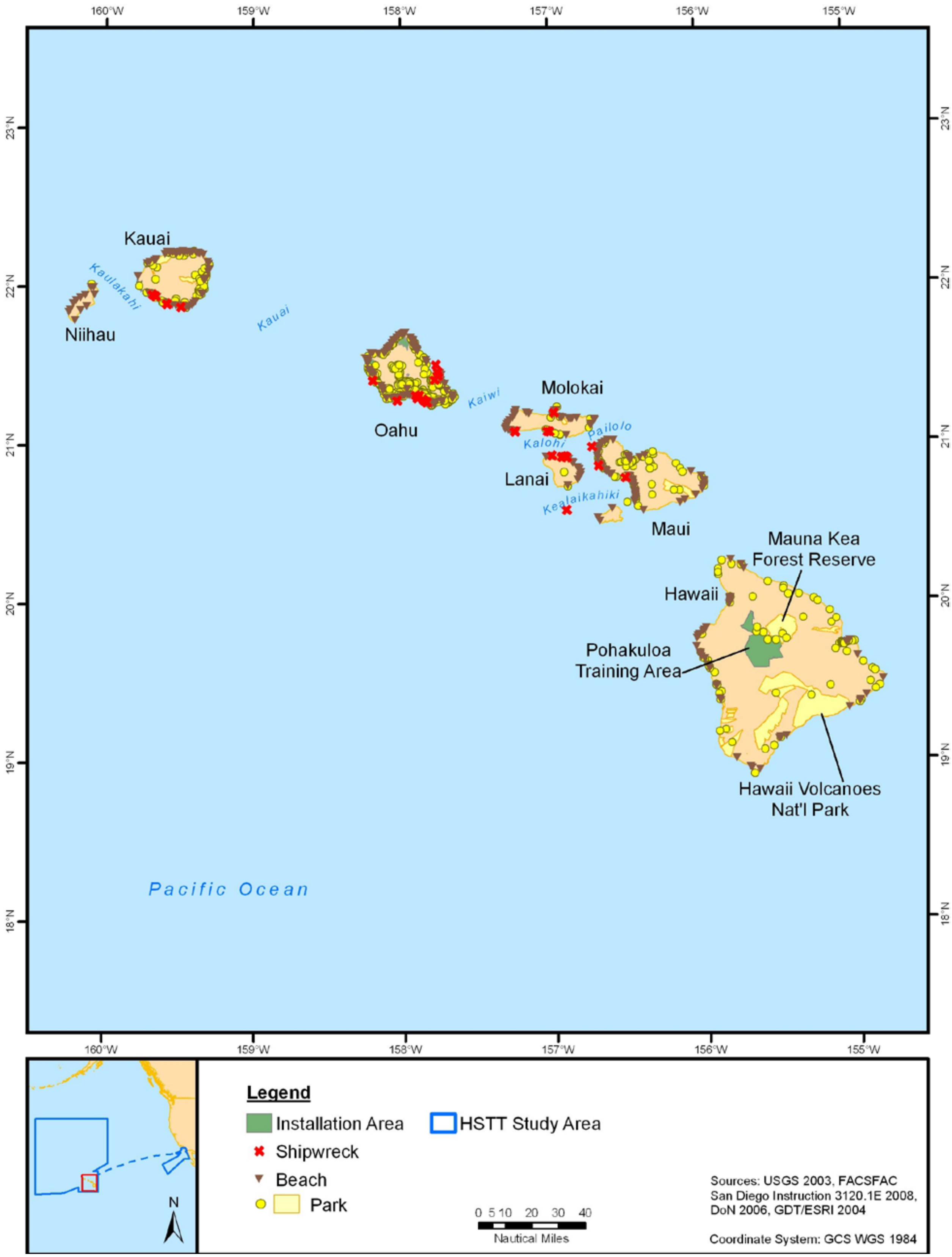


Figure 3.11-5: Hawaiian Island Recreational Areas

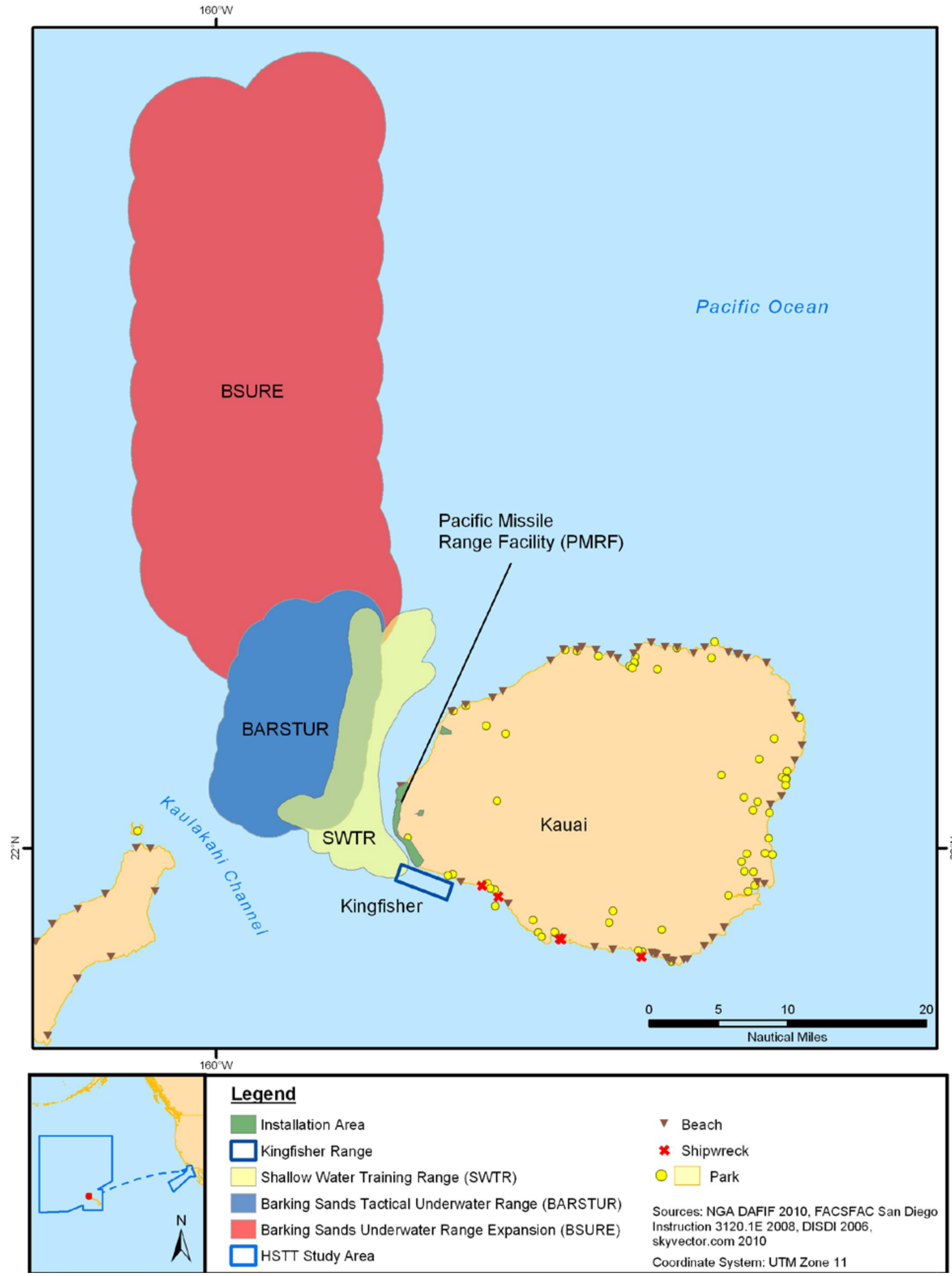


Figure 3.11-6: Kauai–Niihau Island Recreation Areas

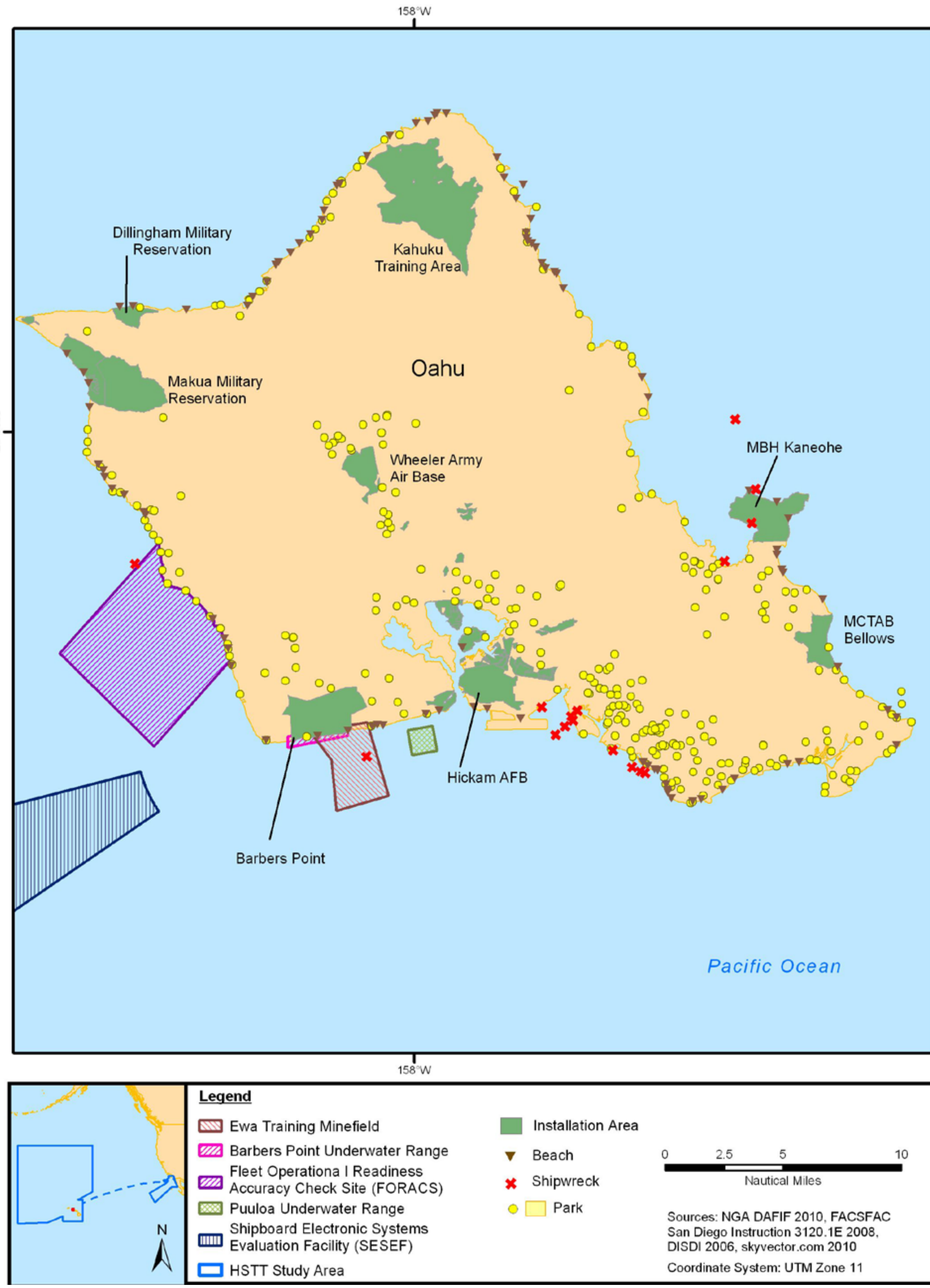


Figure 3.11-7: Oahu Island Recreation Areas

3.11.2.4.1.2 Southern California Range Complex

The SOCAL Range Complex marine environments are popular locations for recreational activities including sightseeing, whale watching, sport fishing, boating, diving, and surfing. Most recreation and tourism activities occur close to the mainland coast of Southern California or between the mainland and the Channel Islands. The shallower waters near the Channel Islands and some offshore banks, such as Tanner and Cortes Banks, are especially popular areas for self-contained underwater breathing apparatus (SCUBA) diving, fishing, and occasionally surfing. There is very little recreational activity in the southwestern portion of the SOCAL Range Complex due to its distance from land and its water depth.

Santa Catalina and Santa Barbara Islands are within the Study Area and visited by tourists. While Navy activities are conducted offshore of these islands, there is little interaction between the public and Navy activities.

Whale watching takes place primarily from December through March, for the annual gray whale southward migration and the northward migration. Though tourist day trips typically stay closer to the mainland, these activities can occur throughout the SOCAL Range Complex.

During the fall-winter period, primarily charter and privately operated boats enter the SOCAL Range Complex OPAREAs and San Clemente Island waters for salt-water sport fishing (Figure 3.11-8), recreational diving, surfing, and other boating activities. Salt-water sport fishing and recreational diving take place primarily around San Clemente Island, and to a lesser extent in the shallower waters over the Tanner and Cortes Banks. Some limited, seasonal surfing can occur near the Tanner and Cortes Banks. Due to distance from shore, Tanner and Cortes Banks are inherently more hazardous due to their open ocean diving conditions. Therefore, the nearshore waters off San Clemente Island are a more popular destination than the more remote banks. This makes them suitable primarily for skilled divers, a more limited market for charter operators.

San Clemente Island's relatively warm waters, good underwater visibility, and largely pristine diving conditions make it a popular destination. Charter dive trips to specific sites are often published and booked as many as six months in advance. Diving occurs year-round, though the number of trips to San Clemente Island and the banks appear to peak during lobster season (October–March).

Fishing destinations are generally more fluid, in response to changing fishing conditions, but a number of charter boats operate in SOCAL Range Complex waters on a routine basis. Sport fishermen pursue various fish species with hook and line; some divers also spearfish or take invertebrates (mainly lobster) by hand within the SOCAL Range Complex OPAREAs. Surfing can also be found in the offshore OPAREAs and nearshore San Clemente Island areas.

In the winter months, when large northern Pacific ocean swell is generated, some charter and private vessels travel out to Cortes Bank to surf the waves created by the rapidly rising seamounts. In addition, surfers can venture year-round to the breaks off of San Clemente Island to surf the island's south points (China and Pyramid Points) and up the west shore of the island depending on the swell direction of the season (Figure 3.11-8). Although both areas within the SOCAL Range Complex OPAREAs are accessed throughout the year, due to the difficulty in access and a rare culmination of conditions necessary for surfing these spots, these areas are rarely accessed.

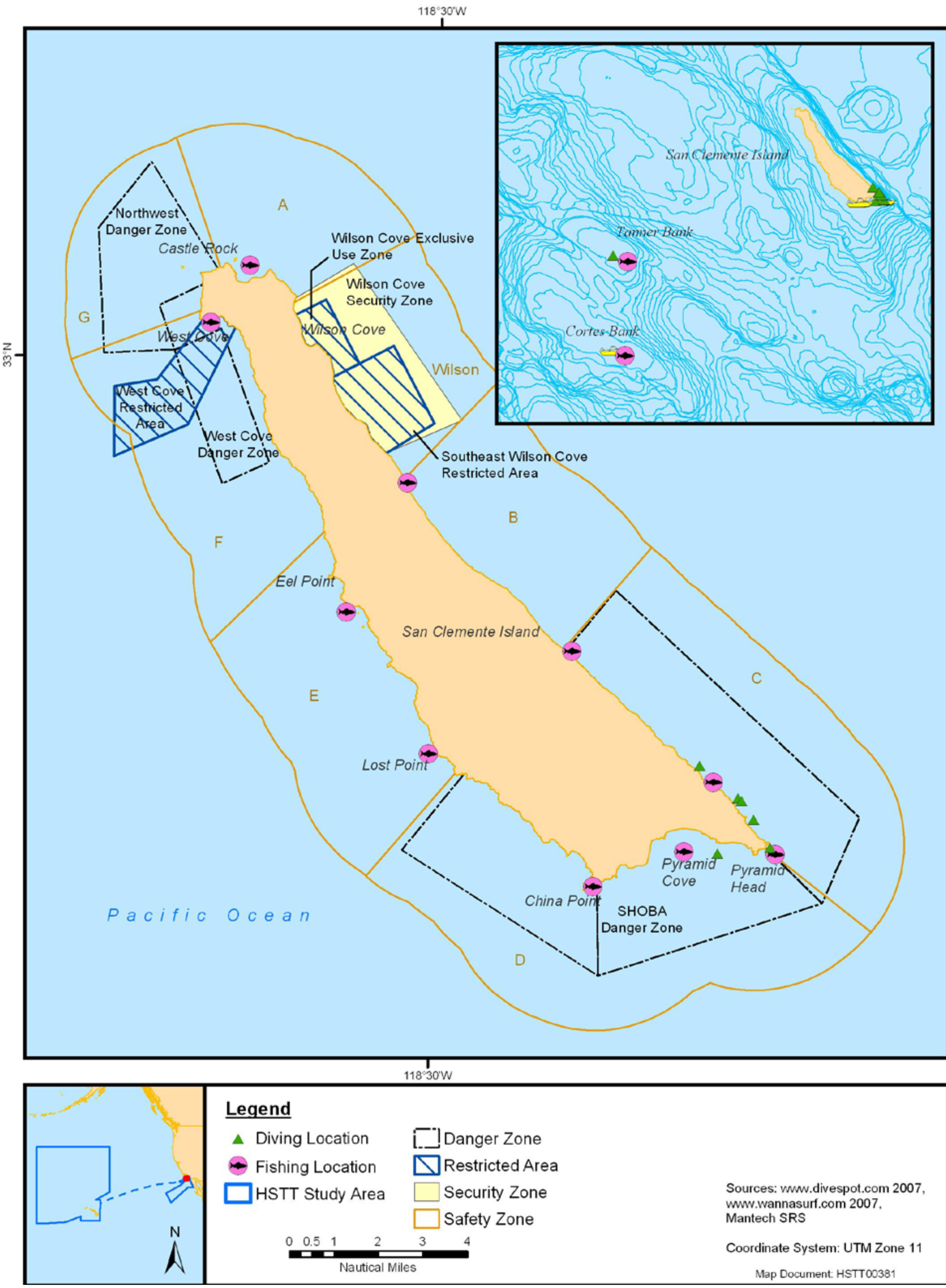


Figure 3.11-8: Recreation Areas around San Clemente Island

Other limited surf spots and dive sites occur throughout the nearshore areas, for diving, at various shipwrecks and reefs and, for surfing, off of Point Loma and around Santa Catalina Island. In addition, “big wave” surfers are known to travel farther offshore to Tanner and Cortez banks when ocean conditions produce large swells that form into giant waves in excess of 60 ft. (18 m) in height when they reach the shallow banks (Casey 2010).

3.11.2.4.1.3 Silver Strand Training Complex

The San Diego Bay is a natural harbor adjacent to downtown San Diego. The San Diego Bay is frequently used by recreational boaters from surrounding marinas and mooring areas. The City of San Diego, City of Coronado, City of Imperial Beach, City of Chula Vista, and National City all surround, and have an interest in activities within San Diego Bay. The Sweetwater Canal, located in south San Diego Bay is the site of the National City Marina and Pepper Park. Further south in San Diego Bay is the Chula Vista Marina. Both marinas are recreational boating access points that contribute to the amount of vessels within San Diego Bay (Figure 3.11-9).

Fiddler’s Cove Marina, operated by the Navy, is located to the south of SSTC-North on the bayside along Silver Strand State Highway/SR-75, just north of Loews Coronado Resort. The marina has approximately 150 moorings and approximately 130 dock slips; the recreational vehicle park offers year-round camping. Both facilities are open to active duty, retirees, DoD civilians, and sponsored civilian guests.

Glorietta Bay is located to the north of SSTC-North on the bayside and is used by the public for recreation and pleasure boating (Figure 3.11-9). Navy piers at the Naval Amphibious Base Coronado extend into Glorietta Bay from its southern shore and support small boat training activities at the SSTC.

In San Diego Bay, there is a designated restricted area from the northern and eastern boundary of Naval Amphibious Base Coronado (33 C.F.R. 334.860) (Figure 3.11-9); activities such as swimming, fishing, waterskiing, and mooring are not allowed within this area. All vessels entering the restricted area must proceed across the area by the most direct route and without unnecessary delay. For vessels under sail, necessary tacking constitutes a direct route. A portion of the restricted area extending 120 ft. from pierheads and from the low water mark on shore where piers do not exist is closed to all persons and vessels except those owned by, under hire to, or performing work for, the Naval Amphibious Base.

Recreational activities offshore of SSTC and the Naval Amphibious Base Coronado are permitted outside of the restricted areas and include sportfishing, bait fishing for the sport fishermen, lobster fishing, and sailboat regattas. Organized activities (such as sail races and regattas) within the restricted area may be allowed providing that a request has been made to the Commanding Officer, Naval Amphibious Base, Coronado. Silver Strand State Beach offers ocean side camping, kite surfing, and surfing. The City of Coronado beach, which lies between Naval Air Station North Island and Naval Amphibious Base Coronado, is a major public beach. The YMCA Surf Camp at SSTC-S is a major recreational facility for military and civilian families with surfing and beach activities.

3.11.2.4.1.4 Transit Corridor

It is assumed that there is limited to no tourism activity within the transit corridor because of the distance from land to the transit corridor and because the majority of tourism activity occurs nearshore.

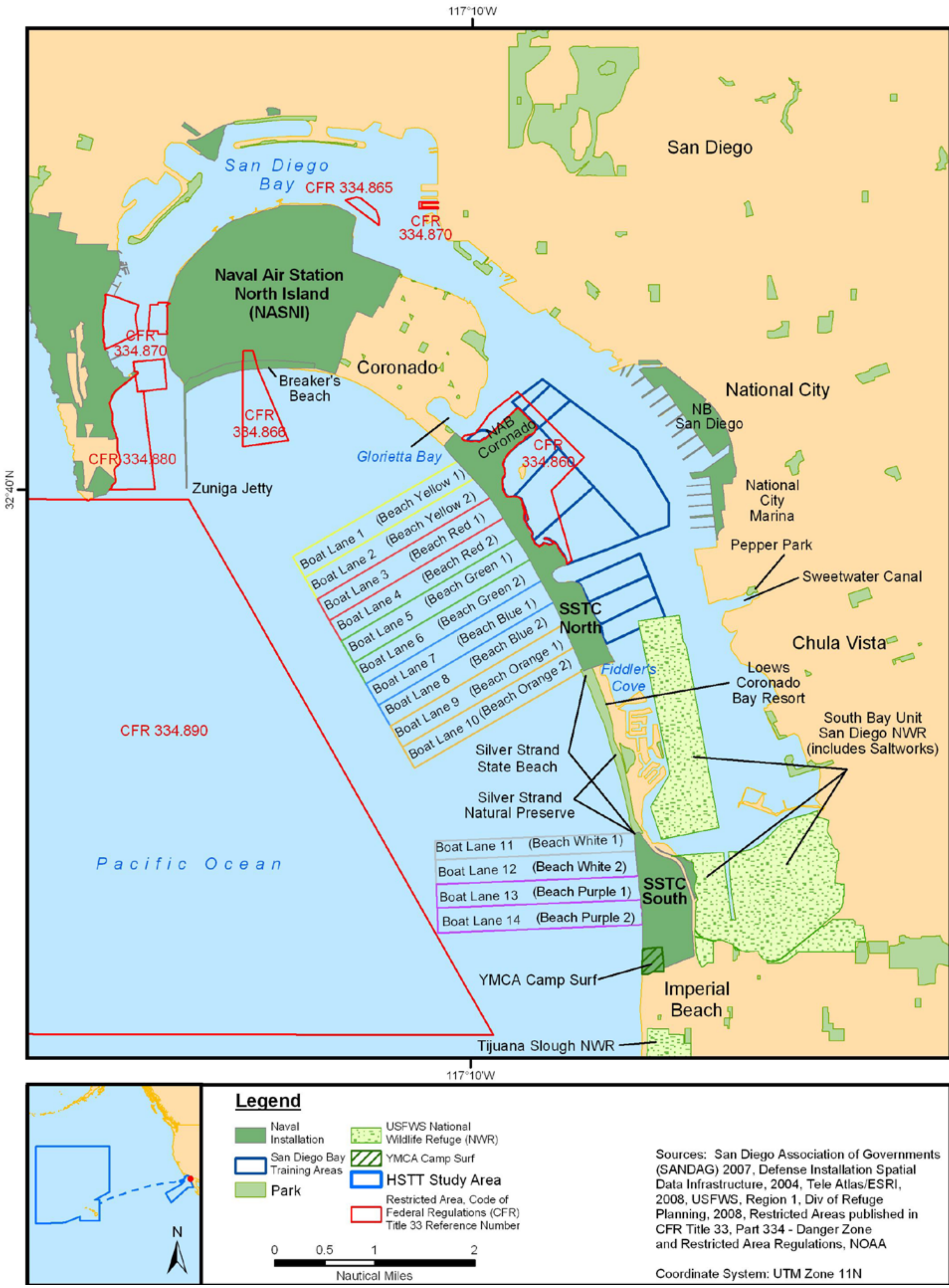


Figure 3.11-9: Recreational Map of the Silver Strand Training Complex

3.11.3 Environmental Consequences

This section evaluates how and to what degree the activities described in Chapter 2 (Description of Proposed Action and Alternatives) could impact socioeconomic resources of the Study Area. Tables 2.8-1 through 2.8-5 present the baseline and proposed training and testing activity locations for each alternative (including number of events and ordnance expended). Each socioeconomic resource stressor is introduced, analyzed by alternative, analyzed for training and testing activities, and then a NEPA determination is made by stressor. Table H-3 in Appendix H shows the warfare areas and associated stressors that were considered for analysis of socioeconomic resources. The stressors vary in intensity, frequency, duration, and location within the Study Area. The primary stressors applicable to socioeconomic resources in the Study Area and that are analyzed include the following:

- Accessibility
- Physical disturbance and strikes
- Airborne acoustics
- Secondary

Secondary stressors resulting in indirect impacts to socioeconomic resources are discussed in Section 3.11.4. Analysis of economic impacts evaluates the impacts of the alternatives on the economy of the region of influence while analysis of social impacts considers the change to human populations and how the action alters the way individuals live, work, play, relate to one another, and function as members of society. Because proposed HSTT activities are predominantly offshore, socioeconomic impacts would be associated with economic activity, employment, income, and social conditions (i.e., livelihoods) of industries or operations that use the ocean resources within the Study Area. Although there are no permanent population centers in the region of influence and the typical socioeconomic considerations such as population, housing, and employment are not applicable, this section will analyze the potential for fiscal impacts on marine-based activities and coastal communities. When considering impacts on recreational activities such as fishing, boating, and tourism, both the economic impact associated with revenue from recreational tourism and public enjoyment of recreational activities are considered.

The proposed HSTT training and testing activities were evaluated to identify specific components that could act as stressors by having direct or indirect effects on sources of commercial transportation and shipping, commercial and recreational fishing, subsistence use, and tourism. For each stressor, a discussion of impacts on these sources is included for each alternative.

The evaluation indicated that the relative potential for socioeconomic impacts would be similar across various areas and marine ecosystems in the Study Area. Therefore, the analysis of environmental consequences was not broken down by large marine ecosystem. Based on an initial screening of potential impacts of sonar maintenance and testing, pierside locations have been eliminated from detailed consideration in the analysis of impacts on energy, mineral extraction, and transportation and shipping. Elimination of these resources was based on the extremely limited potential for active sonar to damage infrastructure or interfere with transportation operations.

3.11.3.1 Accessibility

Navy training and testing activities have the potential to temporarily limit access to areas of the ocean for a variety of human activities associated with commercial transportation and shipping, commercial recreation and fishing, subsistence use, and tourism in the Study Area.

When training or testing activities are scheduled that require specific areas to be free of nonparticipating vessels due to public safety concerns, the Navy requests that the U.S. Coast Guard issue Notices to Mariners to warn the public of upcoming Navy activities. Training and testing activities occur in established restricted or danger areas as published on navigation charts.

The changes in accessibility to human activities in the ocean would be an impact if it directly contributed to loss of income, revenue, or employment. Disturbance to human activities that result in impacts on payrolls, revenue, or employment is quantified by the amount of time the activity may be halted or rerouted or the ability to move to another location.

Accessibility, or restrictions to the availability of ocean space, would be a temporary condition. While mariners have a responsibility to be aware of conditions on the ocean, it is not expected that direct conflicts in accessibility would occur. The locations of restricted areas are published and available to mariners, who typically review such information before boating in any area. Restricted areas are typically avoided by experienced mariners. Prior to initiating a training activity, the Navy would follow standard operating procedures to visually scan an area to ensure that nonparticipants are not present. If nonparticipants are present, the Navy delays, moves, or cancels its activity. Public accessibility is no longer restricted once the activity concludes.

3.11.3.1.1 Socioeconomic Activities

3.11.3.1.1.1 Commercial Transportation and Shipping

The offshore and nearshore areas of the Study Areas include established Navy OPAREAs used for military training and testing activities. Commercial vessels entering OPAREAs, including established restricted areas and danger zones, within the Study Area operate under maritime regulations and are not limited by Navy activities. Potential disruptions to commercial shipping are limited or avoided by the Navy issuing Notices to Mariners through the U.S. Coast Guard. Notices to Mariners advise commercial ship operators, commercial fishermen, recreational boaters, and other users of the area that the military will be operating in a specific area, allowing them to plan their activities accordingly. These temporary clearance procedures are established and implemented for the safety of the public and have been employed regularly over time without significant socioeconomic impacts on commercial shipping activities.

3.11.3.1.1.2 Commercial and Recreational Fishing

Commercial and recreational fishing activities make an appreciable contribution to the overall economy within the Study Area. The Navy has performed military activities within this region in the past with limited interruption to fishing or recreational activities. Commercial and recreational interests such as fishing, boating, and beach use are only restricted temporarily. Temporary closing of areas within the Study Area (typically offshore areas of the Pacific Missile Range Facility and areas in the vicinity of San Clemente Island) for security and safety does not limit public access to surrounding areas. These areas that are temporarily closed are only closed for the duration of the activity and are re-opened at the completion of the activity.

These temporary range clearance procedures for safety purposes do not adversely affect commercial and recreational fishing activities because displacement is of short duration (less than 24 hours). When range clearance is required, the public is notified via Notices to Mariners. These measures provide mariners with advance notice of areas being used by the Navy for training and testing activities. This allows the public to select an alternate destination without appreciable effect to their activities.

Scheduled closures to Navy training and testing areas are also posted on several publicly accessible Navy websites. Online searches for San Clemente Island or the Southern California Offshore Range (SCORE) should provide links with information on closures around San Clemente Island. The public website for the Naval Base Coronado provides advance notice of training activities originating from the base.

The Notices to Mariners and postings on Navy websites are intended to prevent fishermen from expending time and fuel resources transiting to a closed location. In 2009, the Navy completed a study to assess the effects of Navy activities on commercial and recreational fishing near San Clemente Island in the SOCAL Range Complex (Naval Undersea Warfare Center 2009). The SOCAL Fisheries Study reported the results of a survey of local fishermen and resulted in several recommendations to improve communications between the Navy and commercial and recreational fishermen. Improved communications would enable fishermen to be better informed of range closures, and would reduce the number of times fishermen traveled to temporarily closed areas. To enhance communications with fishermen and the local community, the Navy (1) issues regular and up-to-date broadcasts of scheduled closures on very high frequency (VHF) radio, (2) provides frequent updates to the San Clemente Island website, (3) has established a single Navy point of contact with the most up-to-date information on closures for fishermen without website access, and (4) specifies if a scheduled Navy activity requires a complete closure or if fishing can occur simultaneously with the Navy activity. During the course of the study, some of the recommendations have been addressed by the Southern California Offshore Range, which has operational authority over the San Clemente Island ranges. In particular, the Southern California Offshore Range initiated development of more robust range operations control, which allows fishermen to contact the San Clemente Island range in real-time using marine band VHF radio or cellular phones to obtain the status of OPAREA availability. In addition, a list of acronyms and codes was generated and posted as a link on the main page of the San Clemente Island website, which, along with other user-friendly website implementations (e.g., Twitter link for updates to safety zone scheduling), have been added to the San Clemente Island website.

Upon completion of training, the range would be reopened and fishermen would be able to return to fish in the previously closed area. To help manage competing demands and maintain public access in the Study Area, the Navy conducts its offshore operations in a manner that minimizes restrictions to commercial fisherman. Navy ships, fishermen, and recreational users operate within the area together, and keep a safe distance between each other, and the Navy exercise participants relocate as necessary to avoid conflicts with nonparticipants. Only specific areas within the HRC, SSTC, and SOCAL Range Complex have been designated as danger zones or restricted areas. In addition to these areas, the Navy may temporarily establish an exclusion zone for the duration of a specific activity (e.g., an activity involving the detonation of explosives) to prevent non-participating vessels and aircraft from entering and unsafe area. Exclusion zones typically have a radius of only a couple of miles (this varies depending on the activity), are surveyed before during, and after the activity takes place, and end after the activity is completed (see Section 3.12, Public Health and Safety).

The Navy does not exclude fishing activities from occurring in areas of the HRC, SOCAL Range Complex, and SSTC that are not being used by the Navy during training and testing activities. The Navy has been conducting training and testing activities within the Study Area for decades, and has taken and will continue to take measures to prevent interruption of commercial and recreational fishing activities. To minimize potential military/civilian interactions, the Navy will continue to publish scheduled operation times and locations on publicly accessible Navy websites and through U.S. Coast Guard issued Notices to Mariners up to 6 months in advance. These efforts are intended to ensure that commercial and recreational users are aware of the Navy's plans and allow users to plan their activities to avoid scheduled Navy activities. Therefore, decreases in the frequency of fishing trips or in the availability of desirable fishing locations due to Navy activities is not expected. For safety reasons, the Navy may restrict access to a specific surface water area through the establishment of an exclusion zone, which would temporarily limit commercial and recreational fishing in that specific area; however, other areas in the Study Area would remain open to commercial and recreational fishing. A Navy activity involving the use of explosive ordnance is one example of an activity that could require establishment of a temporary exclusion zone. Typically, an exclusion zone is established only for a few hours and extends over a circular area with a radius of a couple of miles (depending on the activity). Commercial and recreational fishing activities could occur in the area before and after the temporary restriction. Should the Navy find nonparticipants present in an exclusion zone, the Navy would halt or delay (and reschedule, if necessary) all potentially hazardous activity until the nonparticipants have exited the exclusion zone.

3.11.3.1.1.3 Subsistence Use

Subsistence uses typically occur from the shore or from small vessels within state waters (3 nm or closer to shore). Navy training and testing activities occur farther from shore in offshore waters where subsistence fishing typically does not occur. Therefore, there would be no foreseeable impact on subsistence uses from conducting proposed training and testing activities in the Study Area.

3.11.3.1.1.4 Tourism

Tourism activities make an appreciable contribution to the overall economy within the Study Area. Temporary range clearance procedures in the area, mainly around the Pacific Missile Range Facility and San Clemente Island, for safety purposes, do not adversely affect tourism activities because displacement is of short duration (typically less than 24 hours) and are in areas where tourism activities are not as prevalent. The Navy temporarily limits public access only to areas where there is a risk of injury or property damage and publishes scheduled activities through the use of Notices to Mariners and publically accessible websites. The Navy strives to conduct its operations in a manner that is compatible with recreational ocean users by minimizing temporary access restrictions. Published notices allow recreational users to adjust their routes to avoid temporary restricted areas. If civilian vessels are within a testing or training area at the time of a scheduled operation, Navy personnel would continue operations only where and when it is safe and possible to avoid the civilian vessels. If avoidance is not safe or possible, the operation would be halted and may relocate or be delayed. In some instances where safety requires exclusive use of a specific area, nonparticipants in the area are asked to relocate to a safer area for the duration of the operation.

3.11.3.1.2 No Action Alternatives

<u>Training</u>

Under the No Action Alternative, potential accessibility impacts would be associated primarily with anti-air warfare, anti-surface warfare, anti-submarine warfare, mine warfare, amphibious warfare, and naval special warfare. Training activities would continue at current levels and within established ranges and training locations. There would be no anticipated impacts on commercial transportation and shipping, commercial and recreational fishing, subsistence use, or tourism because inaccessibility to areas of co-use would be temporary and of short duration (hours). In addition, the Navy has implemented recommendations from the SOCAL Fisheries Study, which should improve communications between the Navy and fishermen, both recreational and commercial, and reduce the number of instances when fishermen must leave a temporarily closed area (Naval Undersea Warfare Center 2009). Based on the Navy’s standard operating procedures and the large expanse of the Study Area that would be available to the public, accessibility impacts would remain negligible.

Testing

Under the No Action Alternative, the impact on accessibility would be negligible for the same reasons stated for training activities above.

3.11.3.1.3 Alternative 1

Alternative 1 consists of the No Action Alternative plus the expansion of the Study Area boundaries, adjustments to the tempo of training and testing activities, and the addition of new weapons, platforms, and systems. The changes in the tempo of training and testing activities would result in an increase in sonar activities, underwater detonations, aircraft transits, and weapons firing throughout the Study Area.

Training

Training activities as described under the No Action Alternative would continue but with an approximate 5 percent increase in tempo within the Study Area. There would be no changes to the Navy's current standard operating procedures defining safety precautions and actions taken by the Navy to protect the public during hazardous training activities on the ocean. Under Alternative 1, potential impacts affecting accessibility to areas of the Study Area would be the same as those associated with the No Action Alternative. Despite the increase in tempo of training activities and the expansion of the Study Area, no impacts from Alternative 1 activities on commercial transportation and shipping, commercial and recreational fishing, subsistence use, or tourism are anticipated, because training activities would place only temporary and short duration (hours) restrictions on public use of scheduled training areas. In addition, the Navy is implementing recommendations from the SOCAL Fisheries Study, which should improve communications between the Navy and fishermen, both recreational and commercial, and reduce the number of instances when fishermen must leave a temporarily closed area (Naval Undersea Warfare Center 2009). Based on the Navy's standard operating procedures and the large expanse of the Study Area that would be available to the public, accessibility impacts would remain negligible.

Testing

Under the Alternative 1, the impact on accessibility from testing activities would be negligible for the same reasons stated for training activities above.

3.11.3.1.4 Alternative 2

Alternative 2 consists of Alternative 1 plus an increase in tempo. Changes in testing tempo under Alternative 2 would result in an increase in sonar activities, underwater detonations, aircraft transiting, and weapons firing throughout the Study Area.

Training

Training activities as described under Alternative 1 would continue at the same tempo within the Study Area. There would be no changes to the Navy's current standard operating procedures defining safety precautions and actions taken by the Navy to protect the public during hazardous training activities on the ocean. Despite the increase in tempo of training activities, no impacts from Alternative 2 activities on commercial transportation and shipping, commercial and recreational fishing, subsistence use, or tourism are anticipated, because training activities would place only temporary and short duration (hours) restrictions on public use of scheduled training areas. In addition, the Navy is implementing recommendations from the SOCAL Fisheries Study which should improve communications between the Navy and recreational fishermen and reduce the number of instances when fishermen must leave a temporarily closed area (Naval Undersea Warfare Center 2009). Based on the Navy's standard operating procedures and the large expanse of the Study Area that would be available to the public, accessibility impacts would remain negligible.

Testing

Under the Alternative 2, the impact on accessibility from testing activities would be negligible for the same reasons stated for training activities above.

3.11.3.2 Physical Disturbances and Strikes

The evaluation of impacts on socioeconomic resources from physical disturbance and strike stressors focuses on direct physical encounters or collisions with objects moving through the water or air (e.g., vessels, aircraft, unmanned devices, and towed devices), dropped or fired into the water (non-explosive practice munitions, other military expended materials, and ocean bottom deployed devices), or resting on the ocean floor (anchors, mines, targets) that may damage or encounter civilian equipment. Physical disturbances that damage equipment and infrastructure could disrupt the collection and transport of products, which may impact industry revenue or operating costs.

Navy training and testing equipment and vessels moving through the water could collide with non-Navy vessels and equipment. Most of the training and testing activities involve vessel movement and use of towed devices. However, the likelihood that a Navy vessel would collide with a non-Navy vessel is remote because of the prevalent use of navigational aids or buoys separating vessel traffic, shipboard lookouts, radar, and marine band radio communications by both Navy and civilians. Therefore, the potential to impact commercial transportation and shipping by physical disturbance or strike is negligible and requires no further analysis.

Aircraft conducting training or testing activities in the Study Area operate in designated military special use airspace (e.g., warning areas). All aircraft, military and civilian, are subject to Federal Aviation Administration regulations, which define permissible uses of designated airspace, and are implemented to control those uses. These regulations are intended to accommodate the various categories of aviation, whether military, commercial, or general aviation. By adhering to these regulations, the likelihood of civilian aircraft coming into contact with military aircraft or ordnance is remote. In addition, Navy aircraft follow procedures outlined in Navy air operations manuals, which are specific to a warning area or other special use airspace, and which describe procedures for operating safely when civilian aircraft are in the vicinity.

Military expended materials can physically interact with civilian equipment and infrastructure. Almost all training and testing activities produce military expended materials such as chaff, flares, projectiles, casings, target fragments, missile fragments, rocket fragments, and ballast weights.

3.11.3.2.1 Socioeconomic Activities

3.11.3.2.1.1 Commercial and Recreational Fishing/Subsistence Use

The majority of commercial and recreational fishing in the Study Area takes place in state waters, where the Navy conducts very limited training and testing activities. Less than 10 percent of recreational fishing takes place in federal waters, which are located beyond 3 nm from shore. Therefore, most recreational fishing would occur away from physical disturbances and strikes associated with training and testing activities. Some commercial fishing may occur beyond 3 nm in Navy training and testing areas and could be affected by the proposed activities if those activities were to alter fish population levels in those areas to such an extent that commercial fishers would no longer be able to find their target species. As described in Section 3.9.3 (Fish, Environmental Consequences), the behavioral responses that could occur from various types of physical stressors associated with training and testing activities would not compromise the general health or condition of fish and, as such, commercial or recreational fishing resources.

Commercial fishing activities have the potential to interact with equipment placed in the ocean or on the ocean floor for use during proposed Navy training and testing activities. This equipment could include ship anchors, moored or bottom mounted targets, mines and mine shapes, tripods, and use of towed system and attachment cables. Many different types of commercial fishing gear are used in the Study Area, including gillnets, longline gear, troll gear, trawls, seines, and traps or pots. Commercial bottom fishing activities that use these types of gear have a greater potential to be affected by interaction with Navy training and testing equipment, resulting in the loss of or damage to both the Navy equipment and the commercial fishing gear. The Navy recovers many of the targets (e.g., mines and mine shapes) and target fragments used in training and testing activities, and would continue to do so to minimize the potential for interaction with fishing gear and fishing vessels. Unrecoverable items are typically small, constructed of soft materials (such as target cardboard boxes or tethered target balloons), or are intentionally designed to sink to the bottom after serving their purpose (such as expended 55-gallon steel drums), so that they would not represent a collision risk to vessels, including commercial fishing vessels. Although larger expended items, such as 55-gallon drums, may pose a risk to certain types of fishing gear used for bottom fishing, the probability of encountering such an item is remote given the large area over which expended materials would be distributed; the depth of the water where most activities using expended materials would occur; and the tendency for larger, heavier materials to become embedded in soft sediments, making them less likely to be snagged by fishing gear.

3.11.3.2.1.2 Tourism

While Navy training and testing activities can occur throughout the Study Area, most (especially hazardous) activities occur well out to sea. Most civilian recreational activities engaged in by both tourists and residents take place within a few miles of land.

Snorkeling and diving take place primarily at known recreational sites, including shipwrecks and reefs. Temporary range clearance procedures in the areas, mainly around the Pacific Missile Range Facility and San Clemente Island, for safety purposes, do not adversely affect tourism activities because displacement is of short duration (typically less than 24 hours) and are in areas where tourism activities are not as prevalent. The Navy temporarily limits public access to areas where there is a risk of injury or property damage through the use of Notices to Mariners. The Navy also maintains a website which provides information on scheduled closures around San Clemente Island. Published notices allow recreational users to adjust their routes to avoid temporary restricted areas. If civilian vessels are within a testing or training area at the time of a scheduled operation, Navy personnel continue operations and avoid them if it is safe and possible to do so. If avoidance is not safe or possible, the operation may relocate or be delayed. In some instances where safety requires exclusive use of a specific area, nonparticipants in the area are asked to relocate to a safer area for the duration of the operation. Because Navy training and testing activities vary in location and are primarily short-term in duration, impacts on tourism activities from rerouting or postponing activities would be negligible.

Other tourism activities such as whale watching, boating, or use of other watercraft occur farther out at sea and are conducted by boat, aircraft, or from land. These activities would be conducted with boats that are typically well marked and visible to Navy ships conducting training and testing activities. Individual boaters engaged in tourism activities, such as whale watching, plan and monitor navigational information to avoid Navy training and testing areas. Vessels are responsible for being aware of designated danger areas in surface waters and any Notices to Mariners that are in effect. Operators of recreational or commercial vessels have a duty to abide by maritime requirements as administered by the U.S. Coast Guard. At the same time, Navy vessels ensure that an area is clear of nonparticipants prior to testing and training exercises. As a result, conflicts between Navy training and testing activities in offshore areas and whale watching or other offshore recreational use would not occur. Changes to current offshore tourism activities in the Study Area would not be expected from the proposed training and testing activities. Therefore, loss of revenue or employment associated with tourism would not occur.

The Navy would continue to recover many of the targets (e.g., mines and mine shapes) and target fragments used in training and testing activities so that they would not pose a collision risk to vessels. Unrecoverable items are typically small, constructed of soft materials (such as target cardboard boxes or tethered target balloons), or are intentionally designed to sink to the bottom after serving their purpose (such as expended 55-gallon steel drums), so that they would not represent a collision risk to vessels.

3.11.3.2.2 No Action Alternative

Training

Under the No Action Alternative, potential physical disturbance and strike impacts would be associated primarily with anti-air warfare, anti-surface warfare, anti-submarine warfare, mine warfare, and amphibious warfare. Training activities would continue at current levels and within established ranges and training locations.

There would be no anticipated impacts on commercial and recreational fishing, subsistence use, or tourism because of the large size of the Study Area, the limited areas of operations, and implementation of the Navy's standard operating procedures, which includes ensuring that an area is clear of all nonparticipating vessels before training activities take place. In addition, the Navy provides advance notification of training activities to the public through Notices to Mariners and postings on Navy websites (e.g., the San Clemente Island website). Damage to or loss of commercial fishing gear from interaction with Navy equipment or other expended materials is unlikely. The Navy recovers many practice munitions (e.g., mines and mine shapes) for reuse following the activity. The Navy also recovers larger floating objects or materials, such as targets or target fragments, to avoid having them become hazards to navigation. Smaller objects that remain in the water column would be unlikely to pose a risk to fishing gear. Considering the expansive size of the Navy's OPAREAs, the disbursement of military expended materials over these large areas, and the Navy's standard operation procedures and mitigation measures (see Chapter 5), impacts from physical disturbances and strikes on commercial and recreational fishing, subsistence use, or tourism would be negligible.

Testing

Under the No Action Alternative, the impact associated with physical disturbances and strikes from testing activities would be negligible for the same reasons stated for training activities above.

3.11.3.2.3 Alternative 1

Alternative 1 consists of the No Action Alternative plus the expansion of the Study Area boundaries, adjustments to the tempo of training and testing activities, and the addition of new weapons, platforms and systems. The changes in training tempo would result in an increase in sonar activities, underwater detonations, aircraft transiting, and weapons firing throughout the Study Area.

Training

Under Alternative 1, potential physical disturbance and strike impacts would be the same as those associated with the No Action Alternative. Training activities would continue but with an approximate 5 percent increase in tempo and associated increase in the quantity of military expended materials released within the Study Area. There would be no changes to the Navy's standard operating procedures for hazardous training activities performed in the Study Area. The expansive size of the Navy's OPAREAs, the disbursement of military expended materials over these large areas, and implementation of the Navy's standard operating procedures and mitigation measures (see Chapter 5) ensure that impacts from physical disturbances and strikes would be negligible. The advance public release of Notices to Mariners and postings of upcoming activities on Navy websites (e.g., the San Clemente Island website) would inform the public of upcoming activities, and enable them to plan to avoid the area. Therefore, impacts from physical disturbance and strike on commercial and recreational fishing, subsistence use, and tourism would be negligible.

Testing

Under Alternative 1, the impact associated with physical disturbances and strikes from testing activities would be negligible for the same reasons stated for training activities above.

3.11.3.2.4 Alternative 2

Alternative 2 consists of Alternative 1 plus an increase in tempo. Changes in testing tempo under Alternative 2 would result in an increase in sonar activities, underwater detonations, aircraft transiting, and weapons firing throughout the Study Area.

Training

Under Alternative 2, potential physical disturbance and strike impacts would be the same as those associated with the No Action Alternative. Training activities would continue at the same tempo as Alternative 1. There would be no changes to the Navy's standard operating procedures for hazardous training activities performed in the Study Area. The expansive size of the Navy's OPAREAs, the disbursement of military expended materials over these large areas, and implementation of the Navy's standard operating procedures and mitigation measures (see Chapter 5) ensure that impacts from physical disturbances and strikes would be negligible. The advance public release of Notices to Mariners and postings of upcoming activities on Navy websites (e.g., the San Clemente Island website) would inform the public of upcoming activities, and enable them to plan to avoid the area. Therefore, impacts from physical disturbance and strike on commercial and recreational fishing, subsistence use, or tourism would be negligible.

Testing

Under Alternative 2, the impact associated with physical disturbances and strikes from testing activities would be negligible for the same reasons stated for training activities above.

3.11.3.3 Airborne Acoustics

As an environmental stressor, loud noises, sonic booms, and vibrations generated from Navy training and testing activities such as weapons firing, in-air explosions, and aircraft transiting have the potential to disrupt wildlife and humans in the Study Area.

3.11.3.3.1 Socioeconomic Activities

3.11.3.3.1.1 Tourism

Noise interference could decrease public enjoyment of recreational activities. These effects would occur on a temporary basis, only when weapons firing, in-air explosions, and aircraft transiting occur. Of these activities, Navy training and testing activities involving weapons firing and in-air explosions would only occur when the Navy can confirm the area is clear of nonparticipants, reducing the likelihood that noise from these activities would disturb tourists. Most naval training would occur well out to sea, while tourism and civilian recreational activities are largely conducted within a few miles of shore. Tourism and recreational activity revenue is not expected to be impacted by airborne noise.

3.11.3.3.2 No Action Alternative

Training

Under the No Action Alternative, potential airborne noise impacts would be associated primarily with anti-air warfare, anti-surface warfare, anti-submarine warfare, mine warfare, and amphibious warfare. Training activities would continue at current levels and within established ranges and training locations. There would be no anticipated impacts on tourism because (1) most Navy training occurs well out to sea, while most tourism and recreational activities occur near shore; and (2) Navy training activities producing airborne noise are normally short term and temporary. Therefore, airborne noise impacts on tourism would be negligible.

Testing

Under the No Action Alternative, impacts associated with airborne acoustics from testing activities would be negligible for the same reasons stated for training activities above.

3.11.3.3.3 Alternative 1

Alternative 1 consists of the No Action Alternative plus the expansion of the Study Area boundaries, adjustments to the tempo of training and testing activities, and the addition of new weapons, platforms and systems. The changes in training tempo would result in an approximate 5 percent increase in noise-generating activities such as sonar activities, underwater detonations, aircraft transiting, and weapons firing throughout the Study Area.

Training

Under Alternative 1, potential airborne noise would be the same as that associated with the No Action Alternative. Training activities would continue but with an increase in tempo within the Study Area. Similar to the No Action Alternative and despite the increase in tempo, there would be no anticipated impacts on tourism because (1) most Navy training occurs well out to sea, while most tourism and recreational activities occur near shore and (2) Navy training activities producing airborne noise are normally short term and temporary. Therefore, airborne noise impacts on tourism would be negligible.

Testing

Under Alternative 1, impacts associated with airborne acoustics from testing activities would be negligible for the same reasons stated for training activities above.

3.11.3.3.4 Alternative 2

Alternative 2 consists of Alternative 1 plus an increase in tempo. Changes in testing tempo under Alternative 2 would result in an increase in sonar activities, underwater detonations, aircraft transiting, and weapons firing throughout the Study Area.

Training

Under Alternative 2, potential airborne noise would be the same as that associated with the No Action Alternative. Training activities would continue at the same tempo as Alternative 1 within the Study Area. Similar to Alternative 1, there would be no anticipated impacts on tourism because (1) most Navy training occurs well out to sea, while most tourism and recreational activities occur near shore and (2) Navy training activities producing airborne noise are normally short term and temporary. Therefore, airborne noise impacts on tourism would be negligible.

Testing

Under Alternative 2, impacts associated with airborne acoustics from testing activities would be negligible for the same reasons stated for training activities above.

3.11.3.4 Analysis of Secondary Stressors

Socioeconomics could be impacted if the proposed activities led to changes to physical and biological resources to the extent that they would alter the way industries can utilize those resources. The secondary stressor of resource availability pertains to the potential for loss of fisheries resources within the Study Area.

Fishing, subsistence use, and tourism could be impacted if the proposed activities altered fish population levels to such an extent that these activities would no longer be able to find their target species. Similarly, disturbances to marine mammal populations could impact the whale watching industry. Analyses in Sections 3.4 (Marine Mammals), 3.8 (Marine Invertebrates), and 3.9 (Fish) concluded that impacts to marine species from training and testing activities are not anticipated. Based on these conclusions, secondary impacts on commercial or recreational fishing, subsistence use, or tourism are not anticipated.

3.11.4 Summary of Potential Impacts (Combined Impacts of All Stressors) on Socioeconomics

Stressors described in this EIS/OEIS that could result in potential impacts on socioeconomic resources include accessibility to areas within the Study Area, physical disturbance and strikes, airborne acoustics, and secondary stressors resulting from Impacts to marine species populations. Under the No Action Alternative, Alternative 1, and Alternative 2, these activities would be widely dispersed throughout the Study Area. These activities are also dispersed temporally (i.e., few stressors would occur in the same location at the same time). Therefore, no greater impacts from the combined operation of more than one stressor are expected. The aggregate impact on socioeconomics would not observably differ from existing conditions.

This Page Intentionally Left Blank

REFERENCES

Association of Port Authorities. (2009). U.S. Port Rankings by Cargo Volume 2009, U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center. 2012

Calfornia Department of Fish and Game. (2005). Final 2005 California Commercial Landings, Table 15. Retrieved from: http://www.dfg.ca.gov/marine/landings05.asp

California Department of Fish and Game. (2009). Catch Block Data 2009.

California Department of Fish and Game. (2012). Final 2011 California Commercial Landings, Table 15. 2012.

California Marine Life Protection Act Initiative. (2009). Regional Profile of the Marine Life Protection Act (MLPA) South Coast Study Region (Point Conception to the California/Mexico Border). Sacramento, CA, California Resources Agency.

Carretta, J. V., K. A. Forney, M.M. Muto, J. Barlow, J. Baker, B. Hanson, & M.S. Lowry. (2005). U.S. Pacific Marine Mammal Stock Assessments: 2004. NOAA Technical Memorandum NMFS, National Oceanic and Atmospheric Administration.

Casey, S. (2010). The Wave: In Pursuit of the Rogues, Freaks, and Giants of the Ocean. New York, Doubleday.

Federal Aviation Administration. (2009). "Appendix A: National Airspace System Overview." from http://www.faa.gov/air_traffic/nas_redesign/regional_guidance/eastern_reg/nynjphl_redesign/documentation/feis.

Fletcher R. (1999). Sports Fishing Association of California. Personal communication 4 January 1999, San Diego, CA.

Friedlander, A., G. Aeby, R. Brainard, E. Brown, A. Clark, S. Coles, E. Demartini, S. Dollar, S. Godwin, C. Hunter, P. Jokiel, J. Kenyon, R. Kosaki, J. Maragos, P. Vroom, B. Walsh, I. Williams, & W. Wiltse. (2004). Status of Coral Reefs in the Hawaiian Archipelago. In. Status of Coral Reefs of the World: 2004: 411-430.

Gassel, M., R. K. Brodberg, G. A. Pollock, & A.M. Fan. (1997). Chemicals in Fish, Report No. 1, Consumption of Fish and Shellfish in Californis and the United States, Final Draft Report. Berkeley, CA, Pesticide and Environmental Toxicology Section, Office of Environmental Health Hazard Assessment, California Environmental Protection Agency: 101.

Gentner, B. (2009). AN ASSESSMENT OF RECREATIONAL FISHERY DEVELOPMENT OPTIONS, Gentner Consulting Group.

Hawai'i Tourism Authority. (2010). 2010 Annual Visitor Research Report. Honolulu, HI.

Helgren R. (1999). Helgren sport fishing. Personal communication. 11 Jan 1999, Oceanside, CA.

Intermodal Association of North America. (2008). Intermodal Industry Statistics 2004-2008. 2011.

Mintz, J. and R. Filadelfo. (2011). Exposure of Marine Mammals to Broadband Radiated Noise. Specific Authority N0001-4-05-D-0500. CNA Analysis & Solutions: 42.

Mobley, J., S. Spitz, & R. Grotefendt. (2001). Abundance of Humpback Whales in Hawaiian Waters: Results of 1993-2000 Aerial Surveys, Hawaiian Islands Humpback Whale National Marine Sanctuary, Department of Land and Natural Resources, State of Hawaii: 17.

National Marine Fisheries Service. (2011). Fisheries of the United States 2010, National Marine Fisheries Service, 2012, Retrieved from: http://www.pifsc.noaa.gov/wpacfin/hi/dar/Pages/hi_data_1.php.

National Marine Fisheries Service. (2012). Annual Landings by Species for Hawaii As Of 10_JAN-12. 2012.

National Marine Fisheries Service and Hawaii Division of Aquatic Resources. (2010). Hawaii Marine Recreational Fishing Survey (HMRFS). 2011.

National Oceanic and Atmospheric Administration. (1998). 1998 Year of the Ocean, Coastal Tourism and Recreation. 2011.

National Oceanic and Atmospheric Administration. (2000). The Economic Contribution of Whalewatching to Regional Economies: Perspectives From Two National Marine Sanctuaries, National Ocean Service: 90.

Naval Undersea Warfare Center. (2009). Southern California (SOCAL) Fisheries Study: Catch Statistics (2002-2007), Fishing Access, and Fishermen Perception. Newport, Rhode Island, Department of the Navy.

Pacific Islands Fisheries Science Center. (2011). Hawaii Annual Reported Commercial landings (Million Pounds) of Pelagic Fishes, Bottomfishes, Reef Fishes, and Other Fishes. 2012.

Pacific Fishery Management Council. (2007). Fishery Management Plan for U. S. West Coast Fisheries for Highly Migratory Species. As Amended by Amendment 1. Portland, OR, Pacific Fishery Management Council: 129.

Pendleton, L. (2006). Understanding the Potential Economic Impact of Marine Wildlife Viewing and Whale Watching in California: Using the Literature To Support Decision-Making for the Marine Life Protection Act.

Pooley, S. G. (1993). Hawaii's marine fisheries: some history, long term trends, and recent developments. (Fisheries of Hawaii and U.S.-associated Pacific Islands), HighBeam Encyclopedia. 2007.

San Diego Unified Port District. (2011). Annual shipping arrivals in the Port of San Diego from 2007 to 2010, Unpublished data.

Sportfish Hawaii. (2008). Hawaii Fishing Adventures and Charters. 2012.

U.S. Environmental Protection Agency. (2011). Revised Technical Support Document: National-Scale Assessment of Mercury Risk to Populations with High Consumption of Self-caught Freshwater Fish. Research Triangle Park, North Carolina: 196.

USA Today. (2012). Fishing Spots on San Diego Bay.

This Page Intentionally Left Blank

3.12 Public Health and Safety

TABLE OF CONTENTS

LIST OF TABLES

There are no tables in this section.

LIST OF FIGURES

This Page Intentionally Left Blank

3.12 PUBLIC HEALTH AND SAFETY

PUBLIC HEALTH AND SAFETY SYNOPSIS

The United States Department of the Navy considered all potential stressors, and the following stressors have been analyzed for public health and safety:

- Underwater energy
- In-air energy
- Physical interactions
- Secondary

Alternative 2 (Preferred Alternative)

Because of the Navy's standard operating procedures, impacts on public health and safety would be unlikely.

3.12.1 INTRODUCTION AND METHODS

3.12.1.1 Introduction

This section analyzes potential impacts on public health and safety within the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area). Unlike military training and testing activities conducted within the boundaries of a fenced-land installation, public access to ocean areas or to the overlying airspace cannot be physically controlled. The United States (U.S.) Department of the Navy (Navy) coordinates use of these areas through the scheduling of activities, and issues warnings and notices to the public prior to conducting potentially hazardous activities (Section 3.12.2.2). Sensitivity to public health and safety concerns within the Study Area is heightened in areas where the public may be close to certain activities (e.g., pierside testing or littoral training).

Generally, the greatest potential for a proposed activity to affect the public is near the coast because that is where public activities are concentrated. These coastal areas could include dive sites or other recreational areas where the collective health and safety of groups of individuals that could be exposed to the hazards of training and testing would be of concern. Most commercial and recreational marine activities are close to the shore, and are usually limited by the capabilities of the boat used. Commercial and recreational fishing may extend as far as 100 nautical miles (nm) from shore, but are concentrated near the coast.

3.12.1.2 Methods

Baseline public health and safety conditions were derived from the current training and testing activities in the Southern California (SOCAL) Range Complex and the Hawaii Range Complex (HRC). The No Action Alternative does not include the Transit Corridor of the Study Area (Chapter 2, Description of Proposed Action and Alternatives). Existing procedures for assuring public health and safety and other elements of the baseline (e.g., restricted areas) were derived from federal regulations, Department of Defense (DoD) directives, and Navy instructions for training and testing. The directives and instructions provide specifications for mission planning and execution that describe criteria for public health and safety considerations. These directives and instructions include criteria for public health and safety considerations for training and testing planning and execution.

The alternatives were evaluated based on two factors: the potential for a training or testing activity to impact public health and safety and the degree to which those activities could have an impact. The likelihood that the public would be near a training or testing activity determines the potential for exposure to the activity. If the potential for exposure exists, the degree of the potential impacts on public health and safety, including increased risk of injury or loss of life, is determined. If the potential for exposure were zero, then public health and safety would not be affected. Isolated incidents and other conditions that affect single individuals, although important for safety awareness, may not rise to the level of a public health or safety issue, and are not considered in this assessment (i.e., airborne noise effects are not addressed in this section).

3.12.2 Affected Environment

3.12.2.1 Overview

Military, commercial, institutional, and recreational activities take place simultaneously in the Study Area (Figure 3.12-1), and have coexisted safely for decades. These activities coexist because established rules and practices lead to safe use of the waterway and airspace. The following paragraphs briefly discuss the rules and practices for recreational, commercial, and military use in sea surface areas and airspace.

Figure 3.12-1: Simultaneous Activities within the Hawaii-Southern California Training and Testing Study Area

3.12.2.1.1 Sea Space

Most of the sea space in the Study Area is accessible to recreational and commercial activities. However, some activities are prohibited or restricted in certain areas (e.g., danger zones and restricted areas) in accordance with Title 33 Code of Federal Regulations, Part 334 (Danger Zone and Restricted Area Regulations). These restrictions can be permanent or temporary. Nautical charts issued by the National Oceanic and Atmospheric Administration include these federally designated zones and areas. Operators of recreational and commercial vessels have a duty to abide by maritime regulations administered by the U.S. Coast Guard.

In accordance with Title 33 Code of Federal Regulations 72 (Aids to Navigation), the U.S. Coast Guard and the Department of Homeland Security inform private and commercial vessels about temporary closures via Notices to Mariners. These Notices provide information about durations and locations of closures because of activities that are hazardous to surface vessels. Broadcast notices on maritime frequency radio, weekly publications by the appropriate U.S. Coast Guard Navigation Center, and global positioning system navigation charts disseminate these navigational warnings.

3.12.2.1.2 Airspace

Most of the airspace in the Study Area is accessible to general aviation (recreational, private, corporate) and commercial aircraft. Like waterways, however, some areas are temporarily off limits to civilian and commercial use. The Federal Aviation Administration has established Special Use Airspace—airspace of defined dimensions wherein activities must be confined because of their nature or wherein limitations may be imposed upon aircraft operations that are not part of those activities (Federal Aviation Administration 2013). Special Use Airspace in the Study Area includes:

- **Restricted Airspace:** Areas where aircraft are restricted because of unusual (often invisible) hazards to aircraft (e.g., release of ordnance). Some areas are under strict control of the DoD, and some are shared with nonmilitary agencies.
- **Military Operations Areas:** Areas typically below 18,000 feet (ft.) used to separate certain nonhazardous military flight activities from instrument flight rules traffic and to identify visual flight rules traffic where these activities are conducted.
- **Warning Areas:** Areas of defined dimensions, beyond three nm from the coast of the United States, which warn nonparticipating aircraft of potential danger.
- **Air Traffic Controlled Assigned Airspace:** Airspace that is Federal Aviation Administration-defined and is not over an existing operating area. This airspace is used to contain specified activities, such as military flight training, that are segregated from other instrument flight rules air traffic.

Notices to Airmen are created and transmitted by government agencies and airport operators to alert aircraft pilots of any hazards en route to or at a specific location. The Federal Aviation Administration issues Notices to Airmen to disseminate information on upcoming or ongoing military exercises with airspace restrictions. Civilian aircraft are responsible for being aware of restricted airspace and any Notices to Airmen that are in effect. Pilots have a duty to abide by aviation rules as administered by the Federal Aviation Administration.

Weather conditions dictate whether aircraft (general aviation, commercial, or military) can fly under visual flight rules, or whether instrument flight rules are required. Under visual flight rules, the weather is favorable and the pilot is required to remain clear of clouds by specified distances to ensure separation from other aircraft under the concept of see and avoid. Pilots flying under visual flight rules must be able to see outside of the cockpit, control the aircraft’s attitude, navigate, and avoid obstacles and other aircraft based on visual cues. Pilots flying under visual flight rules assume responsibility for their separation from all other aircraft, and are generally not assigned routes or altitudes by air traffic control.

During unfavorable weather, pilots must follow instrument flight rules. Factors such as visibility, cloud distance, cloud ceilings, and weather phenomena cause visual conditions to drop below the minimums required to operate by visual flight referencing. Instrument flight rules are the regulations and restrictions a pilot must comply with when flying in weather conditions that restrict visibility. Pilots can fly under instrument flight rules in visual flight rules weather conditions; however, pilots cannot fly under visual flight rules in instrument flight rules weather conditions.

3.12.2.2 Safety and Inspection Procedures

During training and testing, Navy policy is to ensure the safety and health of personnel and the general public (U.S. Department of the Navy 2011c). The Navy achieves these conditions by considering a location when planning activities, scheduling and notifying potential users of an area, and ensuring that an area is clear of nonparticipants. The Navy also has a proactive and comprehensive program of compliance with applicable standards and implementation of safety management systems.

As previously stated, the greatest potential for a training or testing activity to affect the public is in coastal areas because of the concentration of public activities. When planning a training or testing event, the Navy considers proximity of the activity to public areas in choosing a location. Important factors considered include the ability to control access to an area; schedule (time of day, day of week); frequency, duration, and intensity of activities; range safety procedures; operational control of activities or events; and safety history.

The Navy's Fleet Area Control and Surveillance Facilities actively manage assigned airspace, operating areas, ranges, and training and testing resources to enhance combat readiness of U.S. Pacific Fleet units. The Navy schedules activities through the Fleet Area Control and Surveillance Facilities, which coordinate air and surface use of the operating areas (OPAREAs) with the Federal Aviation Administration and the U.S. Coast Guard, which issue Notices to Airmen and Notices to Mariners, respectively.

During training and testing activities in the Study Area, the Navy ensures that the appropriate safety zone is clear of non-participants before engaging in certain activities, such as firing weapons. Inability to obtain a "clear range" could cause an event to be delayed, cancelled, or relocated. Navy procedures ensure public safety during Navy activities that otherwise could harm nonparticipants. Navy practices employ the use of sensors and other devices (e.g., radar) to ensure public health and safety while conducting training and testing activities. The following subsections outline the current requirements and practices for human safety as they pertain to range safety procedures, range inspection procedures, exercise planning, and scheduling and coordinating procedures for the Navy.

Training activities comply with Fleet Area Control and Surveillance Facility procedures. Fleet Area Control and Surveillance Facilities San Diego and Hawaii have published safety procedures for activities on the offshore and nearshore areas (U.S. Department of the Navy 2011a, b). These guidelines (and others) apply to range users as follows:

- Navy personnel are responsible for ensuring that impact areas and targets are clear before commencing hazardous activities.
- The use of underwater ordnance must be coordinated with submarine operational authorities. The coordination also applies to towed sound navigation and ranging (sonar) arrays and torpedo decoys.
- Aircraft or vessels expending ordnance shall not commence firing without permission of the Range Safety Officer for their specific range area.
- Firing units and targets must remain in their assigned areas, and units must fire in accordance with current safety instructions.

- Aircraft carrying ordnance to or from ranges shall avoid populated areas to the maximum extent possible.
- Strict on-scene procedures include the use of ship sensors, visual surveillance of the range from aircraft and range safety boats, and radar and acoustic data to confirm the firing range and target area are clear of civilian vessels, aircraft, or other nonparticipants.

Testing activities have their own comprehensive safety planning instructions (U.S. Department of the Navy 2008b, 2009). These instructions provide guidance on how to identify the hazards, assess the potential risk, analyze risk control measures, implement risk controls, and review safety procedures. They apply to all testing activities including ground, waterborne, and airborne testing activities involving personnel, aircraft, inert minefields, equipment, and airspace. The guidance applies to system program managers, program engineers, test engineers, test directors, and aircrews that are responsible for incorporating safety planning and review when conducting test programs.

The following safety and inspection procedures are implemented for training activities. Each commanding officer is responsible for implementing safety and inspection procedures for activities inside and outside established ranges. In the absence of specific guidance on matters of safety, the Navy follows the most prudent course of action. The following section contains information on the Navy's program of compliance with applicable standards and implementation of safety management systems.

3.12.2.2.1 Aviation Safety

Navy procedures on planning and managing Special Use Airspace are provided in Chief of Naval Operations Instruction 3770.2K, *Airspace Procedures and Planning Manual* (U.S. Department of the Navy 2007). Scheduling and planning procedures for air operations on range complexes are issued through the Navy's Fleet Area Control and Surveillance Facilities San Diego and Hawaii (U.S. Department of the Navy 2011b). Testing ranges have their own procedures for aviation safety, like the Naval Surface Warfare Center Instruction (U.S. Department of the Navy 2008b) and Naval Undersea Warfare Center Division Instruction (U.S. Department of the Navy 2009).

Aircrews involved in a training or testing exercise must be aware that nonparticipating aircraft and ships are not precluded from entering the area and may not comply with Notices to Airmen or Notices to Mariners. Aircrews are required to maintain a continuous lookout for nonparticipating aircraft while operating in warning areas under visual flight rules. In general, aircraft carrying ordnance are not allowed to fly over surface vessels.

3.12.2.2.2 Submarine Navigation Safety

Submarine crews use various methods to avoid collisions while they are surfaced, including visual and radar scanning, acoustic depth finders, and state-of-the-art satellite navigational systems. When transiting submerged, submarines use all available ocean navigation tools, including inertial navigation charts that calculate position based on the submerged movements of the submarine. Areas with surface vessels can then be avoided to protect both the submarines and surface vessels.

3.12.2.2.3 Surface Vessel Navigational Safety

The Navy practices the fundamentals of safe navigation. While in transit, Navy surface vessel operators are alert at all times, use extreme caution, use state-of-the-art satellite navigational systems, and are trained to take proper action if there is a risk. Surface vessels are also equipped with trained and qualified Navy Lookouts. Individuals trained as lookouts have the necessary skills to detect objects or activity in the water that could be a risk for the vessel.

For specific testing activities, like unmanned surface vehicle testing, a support boat would be used near the testing to ensure safe navigation. Before firing or launching a weapon or radiating a non-eyesafe laser, Navy surface vessels are required to determine that all safety criteria have been satisfied. When applicable, the surface vessel would use aircraft and other boats to aid in navigation. In accordance with Navy instructions presented in this chapter, safety and inspection procedures ensure public health and safety.

3.12.2.2.4 Sound Navigation and Sounding (Sonar) Safety

Surface vessels and submarines may use active sonar in the pierside locations listed in Chapter 2 (Description of Proposed Action and Alternatives) and during transit to the training or testing exercise location. To ensure safe and effective sonar use, the Navy applies the same safety procedures for pierside sonar use as described in Section 3.12.2.2 (Safety and Inspection Procedures).

Naval Sea Systems Command Instruction 3150.2, Appendix 1A, *Safe Diving Distances from Transmitting Sonar*, is the Navy's governing document for protecting divers during active sonar use (U.S. Department of the Navy 2011d). This instruction provides procedures for calculating safe distances from active sonar. These procedures are derived from experimental and theoretical research conducted at the Naval Submarine Medical Research Laboratory and the Navy Experimental Diving Unit. Safety distances vary based on conditions that include diver attire, type of sonar, and duration of time in the water. Some safety procedures include on-site measurements during testing activities to identify an exclusion area for nonparticipating swimmers and divers.

3.12.2.2.5 Electromagnetic Energy Safety

All frequencies (or wavelengths) of electromagnetic energy are referred to as the electromagnetic spectrum, and include electromagnetic radiation and radio frequency radiation. Communications and electronic devices such as radar, electronic warfare devices, navigational aids, two-way radios, cell phones, and other radio transmitters produce electromagnetic radiation. While such equipment emits electromagnetic energy, some of these systems are the same as, or similar to, civilian navigational aids and radars at local airports and television weather stations. Radio waves and microwaves emitted by transmitting antennas are a form of electromagnetic energy collectively referred to as radio frequency radiation. Radio frequency energy includes frequencies ranging from 0 to 3,000 gigahertz. Exposure to radio frequency energy of sufficient intensity at frequencies between 3 kilohertz and 300 gigahertz can adversely affect people, ordnance, and fuel.

To avoid excessive exposures to electromagnetic energy, military aircraft are operated in accordance with standard operating procedures that establish minimum separation distances between electromagnetic energy emitters and people, ordnance, and fuels (U.S. Department of Defense 2009). Thresholds for determining hazardous levels of electromagnetic energy to humans, ordnance, and fuel have been determined for electromagnetic energy sources based on frequency and power output, and current practices are in place to protect the public from electromagnetic radiation hazards (U.S. Department of Defense 2002, 2009). These procedures include setting the heights and angles of electromagnetic energy transmissions to avoid direct exposure, posting warning signs, establishing safe operating levels, activating warning lights when radar systems are operational, and not operating some platforms that emit electromagnetic energy within 15 nm of shore. Safety planning instructions provide clearance procedures for nonparticipants in operational areas prior to conducting training

(U.S. Department of the Navy 2011a, b) and testing (U.S. Department of the Navy 2008b, 2009) activities that involve underwater electromagnetic energy (e.g., mine warfare).

Mine warfare devices are analyzed under other resource topics in this Environmental Impact Statement (EIS)/Overseas EIS (OEIS) because they emit electromagnetic energy. The electromagnetic effects of mine warfare devices are very local, however, unlike radars and radios. Measures to avoid public interaction with mine warfare devices are effective in protecting the public from these effects.

3.12.2.2.6 Laser Safety

Lasers produce light energy. The Navy uses tactical lasers for precision range finding, as target designation and illumination devices for engagement with laser-guided weapons, and for mine detection and mine countermeasures. Laser safety procedures for aircraft require an initial pass over the target prior to laser activation to ensure that target areas are clear. The Navy observes strict precautions, and has written instructions in place for laser users to ensure that nonparticipants are not exposed to intense light energy. During actual laser use, aircraft run-in headings are restricted to avoid unintentional contact with personnel or nonparticipants. Personnel participating in laser training activities are required to complete a laser safety course (U.S. Department of the Navy 2008a).

3.12.2.2.7 High-Explosive Ordnance Detonation Safety

Pressure waves from underwater detonations can pose a physical hazard in surrounding waters. Before conducting an underwater training or testing activity, Navy personnel establish an appropriately sized exclusion zone to avoid exposure of nonparticipants to the harmful intensities of pressure. Naval Sea Systems Command Instruction 3150.2, Chapter 2, *Safe Diving Distances from Transmitting Sonar*, provides procedures for determining safe distances from underwater explosions (U.S. Department of the Navy 2011d). In accordance with training and testing procedures for safety planning related to detonations (see Section 3.12.2.2.8, Weapons Firing and Ordnance Expenditure Safety), the Navy uses the following general and underwater detonation procedures:

- Navy personnel are responsible for ensuring that impact areas and targets are clear before commencing hazardous activities.
- The use of underwater ordnance must be coordinated with submarine operational authorities.
- Aircraft or vessels expending ordnance shall not commence firing without permission of the Range Safety Officer or Test Safety Officer for their specific range area.
- Firing units and targets must remain in their assigned areas, and units must fire in accordance with current safety instructions.
- Detonation activities will be conducted during daylight hours.

3.12.2.2.8 Weapons Firing and Ordnance Expenditure Safety

In accordance with safety and inspection procedures (U.S. Department of the Navy 2011b), any unit firing or expending ordnance shall ensure that all possible safety precautions are taken to prevent accidental injury or property damage. The Officer Conducting the Exercise shall permit firing or jettisoning of aerial targets only when the area is confirmed to be clear of nonparticipating units, both civilian and military.

Safety is a primary consideration for all training and testing activities. The range must be able to safely contain the hazard area of the weapons and equipment employed. The hazard area is based on the size and net explosive weight of the weapon. The type of activity determines the size of the buffer zone. For activities with a large hazard area, special sea and air surveillance measures are implemented to ensure that the area is clear before activities commence. Before aircraft can drop ordnance, they are required to make a preliminary pass over the intended target area to ensure that it is clear of boats, divers, or other nonparticipants. Aircraft carrying ordnance are not allowed to fly over surface vessels.

Training and testing activities are delayed, moved, or cancelled if there is a question about the safety of the public. Target areas must be clear of nonparticipants before conducting training and testing. When using ordnance with flight termination systems (which terminate the flight of airborne missiles or launch vehicles when they veer from their targeted path), the Navy is required to follow standard operating procedures to ensure public health and safety. In those cases where a weapons system does not have a flight termination system, the size of the target area that needs to be clear of nonparticipants is based on the flight distance of the weapon plus an additional distance beyond the system's performance capability.

3.12.3 Environmental Consequences

This section evaluates how and to what degree the activities described in Chapter 2 (Description of Proposed Action and Alternatives) could impact public health and safety. In this section, each public health and safety stressor is introduced, analyzed by alternative, and analyzed for training activities and testing activities. Tables 2.8-1 through 2.8-5 present the baseline and proposed training and testing activity locations for each alternative (including the number of events and ordnance expended). Tables F-1 and F-2 in Appendix F describe all of the warfare areas and associated stressors that were considered for analysis of public health and safety. The stressors vary in intensity, frequency, duration, and location within the Study Area. The stressors applicable to public health and safety are:

- underwater energy
- in-air energy
- physical interactions
- secondary

Alternatives 1 and 2 include an expansion of the Study Area and pierside training areas, as described in Chapter 2 (Description of the Proposed Action and Alternatives). Alternatives 1 and 2 would adjust locations and tempo of training and testing activities, but existing safety procedures and standard operating procedures would be employed such that no new or additional impacts to public health and safety would occur. Therefore, the Study Area expansion will not be addressed in the analysis below.

Potential public health and safety impacts were evaluated assuming continued implementation of the Navy's current safety procedures for each training and testing activity or group of similar activities. Generally, the greatest potential for the proposed activities to be co-located with public activities would be in coastal areas because most commercial and recreational activities occur close to the shore.

Training and testing activities in the Study Area are conducted in accordance with guidance provided in Fleet Area Control and Surveillance Facility Instructions (U.S. Department of the Navy 2011a, b) and Test and Safety Planning Instructions (U.S. Department of the Navy 2008b, 2009). These instructions provide operational and safety procedures for all normal range events. They also provide information to range users that is necessary to operate safely and avoid affecting nonmilitary activities such as shipping, recreational boating, diving, and commercial or recreational fishing. Ranges are managed in accordance with standard operating procedures that ensure public health and safety. Current requirements and practices (e.g., standard operating procedures) designed to prevent public health and safety impacts are identified in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring).

3.12.3.1 Underwater Energy

Underwater energy can come from acoustic sources or from electromagnetic devices. Active sonar, underwater explosions, airguns, and vessel movements all produce underwater acoustic energy. Sound will travel from air to water during aircraft overflights. Electromagnetic energy can enter the water from mine warfare training devices and from unmanned underwater systems. The potential for the public to be exposed to these stressors would be limited to individuals, such as recreational swimmers or self-contained underwater breathing apparatus (SCUBA) divers, that are underwater and within unsafe proximity of a training or testing event.

Many of the proposed activities generate underwater acoustic energy; however, not all sources rise to the level of consideration in this EIS/OEIS. Swimmers or divers might intermittently hear ship noise or underwater acoustic energy from aircraft overflights if they are near a training or testing event, but public health and safety would not be affected because these events would be infrequent and short in duration. Pierside integrated swimmer defenses are tested with underwater airguns during swimmer defense and diver deterrent training and testing activities; public health and safety would be ensured for these local activities because access to pierside locations by nonparticipants is controlled for safety and security reasons. Because of the infrequency and short duration of the events, underwater acoustic energy from vessel movements, aircraft overflights, and airguns is not analyzed in further detail. Active sonar and underwater explosions are the only sources of underwater acoustic energy evaluated for potential impacts on public health and safety.

The proposed activities that would result in underwater acoustic energy include anti-surface warfare, anti-submarine warfare, mine warfare, surface warfare testing, littoral combat ship testing, sonar maintenance, pierside sonar testing, and unmanned vehicle testing. A limited amount of active sonar would be used during transit between range complexes and training and testing locations.

The effect of active sonar on humans varies with the sonar frequency. Of the four types of sonar (very high-, high-, mid-, and low-frequency), mid-frequency and low-frequency sonar have the greatest potential to impact humans because of the range of human hearing. Underwater explosives cause a physical shock front that compresses the explosive material, and the pressure wave then passes into the surrounding water. Generally, the pressure wave would be the primary cause of injury. The effects of an underwater explosion depend on several factors, including the size, type, and depth of the explosive charge and where it is in the water column.

Systems like the Organic Airborne and Surface Influence Sweep emit an electromagnetic field and sound to simulate the presence of a ship. Unmanned underwater vehicles, some unmanned surface vehicles, and towed devices use electromagnetic energy. Electronic warfare activities involve aircraft, surface ship, and submarine crews attempting to control portions of the electromagnetic spectrum to degrade or deny the enemy’s ability to take defensive actions. An electromagnetic signal dissipates quickly with increasing distance from its source. The literature lacks evidence to conclude that any adverse health effects result from exposure to electromagnetic energy, which is why no federal standards have been set for occupational exposures to this type of energy. Because standard operating procedures require an exercise area to be clear of participants, the public would not be exposed to electromagnetic energy the way a worker could experience long-term, occupational exposures. In the unlikely event that the public was exposed, the level of electromagnetic energy associated with the Proposed Action would not be enough to pose a health or safety risk.

As previously stated, the potential for the public to be exposed to these stressors would be limited to divers within unsafe proximity of an event. SCUBA diving is a popular recreational activity that is typically concentrated around known dive attractions such as reefs and shipwrecks. In general, recreational divers should not exceed 130 ft. (39.6 m) (Professional Association of Diving Instructors 2012). This depth limit typically limits this activity's distance from shore. Therefore, training and testing activities closest to shore have the greatest potential to co-occur with the public.

Swimmers and recreational SCUBA divers are not expected to be near Navy pierside locations (which include shipyards) because access to these areas is controlled for safety and security reasons. Locations of popular offshore diving spots are well documented, and dive boats (typically well marked) and diver-down flags would be visible from the ships conducting the training and testing. Therefore, co-occurrence of recreational divers and Navy activities is unlikely. Swimmers and recreational divers are not expected to be near training and testing locations where active sonar, underwater explosions, and electromagnetic activities would occur because of the strict procedures for clearance of nonparticipants before conducting activities.

The U.S. Navy Dive Manual (U.S. Department of the Navy 2011d) prescribes safe distances for divers from active sonar sources and underwater explosions. Safety precautions for use of electromagnetic energy are specified in DoD Instruction 6055.11 (U.S. Department of Defense 2002, 2009) and Military Standard 464A (U.S. Department of Defense 2002). These distances would be used as the standard safety buffers for underwater energy to protect public health and safety. If unauthorized personnel were detected within the exercise area, the activity would be temporarily halted until the area was again cleared and secured. Therefore, the public is unlikely to be exposed to underwater energy at Navy pierside locations, in training or testing areas, or in ports.

3.12.3.1.1 No Action Alternative

3.12.3.1.1.1 Training

Under the No Action Alternative, active sonar training activities such as anti-submarine warfare, mine warfare, and sonar maintenance would continue at current levels and within established ranges and training locations, including the Hawaii Range Complex and the SOCAL Range Complex, and other HSTT areas. Most of the sonar training events would be in the SOCAL and HRC range complexes.

Activities involving underwater explosions, such as anti-surface warfare and mine warfare, also would continue at current levels and within established ranges and training locations. Current locations for underwater explosions include specific training areas in the HRC, in the SOCAL Range Complex, and in Silver Strand Training Complex (SSTC).

The analysis indicates that no impact on public health and safety would result from training activities using underwater energy, based on the Navy's implementation of strict operating procedures that protect public health and safety. These operating procedures include ensuring clearance of the area before commencing training activities involving underwater energy. Because of the Navy's safety procedures, the potential for training activities using underwater energy to impact public health and safety under the No Action Alternative would be low.

3.12.3.1.1.2 Testing

Under the No Action Alternative, active sonar testing activities such as anti-submarine warfare, mine warfare, pierside sonar testing, unmanned vehicle testing, and sonar maintenance would continue at current levels and in current locations, including areas such as the Hawaii and SOCAL OPAREAs. Pierside testing of active sonar would continue in Pearl Harbor and in San Diego Bay. Most of these activities would occur in the SOCAL Range Complex.

Testing activities involving underwater explosions, such as anti-air warfare, anti-surface warfare, anti-submarine warfare, mine warfare, and surface combatant sea trials also would continue at current levels and within established ranges and locations. Current locations for underwater explosions include specific training areas in HRC (Puuloa Underwater Range, Marine Corps Base Hawaii, Marine Corps Training Area Bellows, Barbers Point Underwater Range, Ewa Training Minefield, and Lima Landing) and in the SOCAL Range Complex (San Clemente Island's Northwest Harbor and Horse Beach Cove, Shallow Water Training Range), and SSTC's Boat Lanes 1–14.

The analysis indicates that no impact on public health and safety would result from testing activities using underwater energy, based on the Navy's implementation of strict operating procedures that protect public health and safety. These operating procedures include ensuring clearance of the area before commencing testing activities involving underwater energy. Because of the Navy's safety procedures, the potential for testing activities to impact public health and safety under the No Action Alternative would be low.

3.12.3.1.2 Alternative 1

Alternative 1 consists of the activities in the No Action Alternative plus the expansion of the Study Area and adjustments in the locations and tempos of training and testing activities. Alternative 1 includes changes in force structure (personnel, weapons and assets), new or upgraded weapons and platforms, and the training and testing required for proficiency with these systems. Alternative 1 includes the expansion of the Study Area to include the Transit Corridor and pierside activities in San Diego Bay and Pearl Harbor. This expansion would not increase the potential for public exposure over the No Action Alternative because the same safety procedures would be in place to assure that these areas were clear of nonparticipants.

3.12.3.1.2.1 Training

Active sonar training would continue at current locations under Alternative 1. In many instances, however, the potential activity areas would be expanded (see tables in Chapter 2). Locations for active sonar training include the same areas as described under the No Action Alternative, as well as the Transit Corridor and pierside areas in San Diego Bay and Pearl Harbor. While Alternative 1 would expand the locations and increase the tempos of active sonar training activities, the Navy would continue to implement standard operating and safety procedures; therefore, the potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely to increase.

Activities involving underwater explosions, such as anti-surface warfare, mine warfare, and civilian port defense, would also continue within established ranges and training locations, as described under the No Action Alternative. While Alternative 1 would adjust locations and tempos of underwater explosives training activities, the Navy would continue to implement standard operating and safety procedures; therefore, an increased potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely. The Navy's safety procedures would ensure that the potential for training activities to impact public health and safety under Alternative 1 would be low.

3.12.3.1.2.2 Testing

The locations and tempo of active sonar testing activities would increase over the No Action Alternative. Alternative 1 also includes the expansion of the Study Area, plus changes in force structure (personnel, weapons, and assets), new or upgraded weapons and platforms, and the testing required for these systems.

Under Alternative 1, active sonar testing activities such as anti-submarine warfare, mine warfare, pierside sonar testing, unmanned vehicle testing, and sonar maintenance would increase. These activities would occur in established locations and ranges, as described under the No Action Alternative. Pierside testing of active sonar would continue to occur in San Diego Bay and Pearl Harbor. While Alternative 1 would increase the locations and tempo of active sonar testing activities, the Navy would continue to implement standard operating and safety procedures, so the potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely to increase.

Testing activities involving underwater explosions, such as anti-air warfare, anti-surface warfare, anti-submarine warfare, mine warfare, surface combatant sea trials, littoral combat ship testing, combat ship qualifications, and at-sea explosive testing would occur within established ranges and locations. Proposed locations for underwater explosions are the same as described under the No Action Alternative. While Alternative 1 would increase the tempo of underwater explosives testing activities, the Navy would continue to implement standard operating and safety procedures; therefore, the potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely to increase. Because of the Navy’s safety procedures, the potential for testing activities to impact public health and safety under Alternative 1 would be negligible.

3.12.3.1.3 Alternative 2 (Preferred Alternative)

Alternative 2 consists of the activities in the No Action Alternative, plus adjustments to locations and tempo of training and testing activities. Alternative 2 includes changes in force structure (personnel, weapons, and assets), new or upgraded weapons and platforms, and the training and testing required for proficiency with these systems. Alternative 2 includes the expansion of the Study Area and pierside areas of San Diego Bay and Pearl Harbor. This expansion would not increase the potential for public exposure over the No Action Alternative because the same safety procedures would be in place to make sure these areas are clear of nonparticipants.

3.12.3.1.3.1 Training

Alternative 2 is similar to Alternative 1 in the increase in active sonar, underwater explosions, and electromagnetic activities over the No Action Alternative. Alternative 2 is identical to Alternative 1 in the proposed locations for these activities. As concluded under Alternative 1, because of the Navy’s safety procedures, the potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely to increase.

3.12.3.1.3.2 Testing

Similar to Alternative 1, Alternative 2 would increase active sonar testing activities such as anti-submarine warfare, mine warfare, pierside sonar testing, unmanned vehicle testing, and sonar maintenance. These activities would continue in established locations and ranges, as described under the No Action Alternative. Pierside testing of active sonar would continue in Pearl Harbor and in San Diego Bay. Changes in the locations and tempo of active sonar testing activities would not impact public health or safety because the safety procedures used under the No Action Alternative would still be in place.

Testing activities involving underwater explosions, such as anti-air warfare, anti-surface warfare, anti-submarine warfare, mine warfare, surface combatant sea trials, littoral combat ship testing, combat ship qualifications, and at-sea explosive testing would occur within established ranges and locations, as described under the No Action Alternative. Changes in the locations and tempo of underwater explosion testing activities could not impact public health or safety because the safety procedures used under the No Action Alternative would still be in place. Because of the Navy's safety procedures, the potential for underwater testing activities to impact public health and safety under Alternative 2 would be negligible.

3.12.3.2 In-Air Energy

In-air energy stressors include sources of electromagnetic energy and lasers. The sources of electromagnetic energy include radar, navigational aids, and electronic warfare systems. These systems operate similarly to other navigational aids and radars at local airports and television weather stations throughout the United States. Electronic warfare systems emit electromagnetic energy similar to that from cell phones, hand-held radios, commercial radio stations, and television stations. Current practices protect Navy personnel and the public from electromagnetic energy hazards. These procedures include setting the heights and angles of electromagnetic energy transmissions to avoid direct human exposure, posting warning signs, establishing safe operating levels, and activating warning lights when radar systems are operational. Procedures also are in place to limit public and participant exposure from electromagnetic energy emitted by military aircraft. As stated in Section 3.12.3.1 (Underwater Energy), the level of electromagnetic energy associated with the Proposed Action would not be enough to pose a health or safety risk to the public.

A comprehensive safety program exists for the use of lasers. Current Navy practices protect individuals from the hazard of severe eye injury caused by laser energy. Laser safety requires pilots to verify that target areas are clear prior to commencement of an exercise. In addition, during actual laser use, the aircraft run-in headings are restricted to preclude inadvertent lasing of areas where the public may be present.

Training and testing activities involving electromagnetic energy include electronic warfare activities that use airborne and surface electronic jamming devices to defeat tracking and communications systems. Training activities involving low-energy lasers include anti-surface warfare, mine warfare, and Homeland Security/Anti-Terrorism Force Protection with Unmanned Vehicles. Testing activities involving low-energy lasers include surface warfare, air exercises at the test range, and mine warfare testing.

3.12.3.2.1 No Action Alternative

3.12.3.2.1.1 Training

Under the No Action Alternative, electronic warfare training activities involving electromagnetic energy sources would continue at current levels and locations, including the Hawaii OPAREA and the SOCAL Range Complex's Electronic Warfare Range. Laser targeting activities and mine detection activities using lasers also would continue at current levels and within established ranges and training locations, including the HRC's Warning Area 188 and the SOCAL Range Complex's Southern California Anti-Submarine Warfare Range and San Clemente Island Shore Bombardment Range.

The public would not likely be exposed to electromagnetic energy sources or lasers under the No Action Alternative. Based on the Navy's strict safety procedures for use of lasers and electronic warfare, these activities would not likely be conducted close enough to the public to pose an increased risk. Because of the Navy's safety procedures, the potential for these training activities to impact public health and safety under the No Action Alternative would be negligible.

3.12.3.2.1.2 Testing

Under the No Action Alternative, electronic warfare testing activities involving electromagnetic energy sources would continue at current levels and within established ranges and testing locations. Laser targeting activities and mine detection activities using lasers would continue at current levels and within established ranges and locations.

The public would not likely be exposed to electromagnetic energy sources or lasers from testing activities under the No Action Alternative. Based on the Navy's strict safety procedures for use of lasers and electronic warfare, these activities would not likely be conducted close enough to the public to pose an increased risk. Because of the Navy's safety procedures, the potential for these testing activities to impact public health and safety under the No Action Alternative would be negligible.

3.12.3.2.2 Alternative 1

Alternative 1 consists of the activities in the No Action Alternative plus adjustments to locations and tempos of training and testing activities. Alternative 2 includes changes in force structure (personnel, weapons, and assets), new or upgraded weapons and platforms, and the training and testing required for proficiency with these systems. Alternative 1 includes the expansion of the Study Area to include the Transit Corridor, and Navy piers in San Diego Bay and Pearl Harbor. This expansion would not increase the potential for public exposure over the No Action Alternative because the same safety procedures would be in place to ensure that these areas are clear of nonparticipants.

3.12.3.2.2.1 Training

Under Alternative 1, the number of training activities that use electromagnetic energy would increase, and would continue to occur within established ranges and training locations, as described under the No Action Alternative. Laser targeting activities and mine detection activities using lasers would increase but also would occur within established ranges and training locations.

While Alternative 1 would increase locations and tempos of training activities involving electromagnetic energy and lasers, the Navy would continue to implement standard operating and safety procedures. Therefore, the potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely to increase.

3.12.3.2.2.2 Testing

Under Alternative 1, the number of testing activities that use electromagnetic energy would increase, and would continue to occur within established ranges and testing locations. Testing activities that use electromagnetic energy would take place in the same areas as described under the No Action Alternative. Additional locations proposed under this alternative include pierside locations in San Diego and in Pearl Harbor.

While Alternative 1 would increase locations and tempos of testing activities involving electromagnetic energy and lasers, the Navy would continue to implement standard operating and safety procedures. Therefore, an increased potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely.

3.12.3.2.3 Alternative 2 (Preferred Alternative)

Alternative 2 consists of the activities in the No Action Alternative plus adjustments to locations and tempo of training and testing activities. This alternative includes changes in force structure (personnel, weapons, and assets), new or upgraded weapons and platforms, and the training and testing required for proficiency with these systems. Alternative 2 includes the expansion of the Study Area to include the Transit Corridor and Navy piers in San Diego Bay and Pearl Harbor. This expansion would not increase the potential for public exposure over the No Action Alternative because the same safety procedures would be in place to make sure these areas are clear of nonparticipants.

3.12.3.2.3.1 Training

Alternative 2 is similar to Alternative 1 in the increase in electromagnetic energy and laser training activities over the No Action Alternative. Alternative 2 is identical to Alternative 1 in the proposed locations for these activities. As concluded under Alternative 1, impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely.

While Alternative 2 would adjust locations and tempo of training activities involving electromagnetic energy and lasers, the Navy would continue to implement standard operating and safety procedures; therefore, the potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely to increase.

3.12.3.2.3.2 Testing

Similar to Alternative 1, Alternative 2 would increase electromagnetic energy and laser testing activities. Electromagnetic energy activities would continue to occur in established location and ranges, as described under the No Action Alternative, and at pierside locations in San Diego and Pearl Harbor. Laser targeting activities would occur in the HRC's Warning Area 188 and the SOCAL Range Complex's Southern California Anti-Submarine Warfare Range and San Clemente Island's Shore Bombardment Range. Changes in the locations and tempo of in-air testing activities and the addition of new activities would not impact public health or safety because safety procedures would be in place.

While Alternative 2 would adjust locations and tempos of testing activities involving electromagnetic energy and lasers, the Navy would continue to implement standard operating and safety procedures; therefore, the potential for impacts on public health and safety beyond those identified under the No Action Alternative would be unlikely to increase.

3.12.3.3 Physical Interactions

Public health and safety could be impacted by direct physical interactions with Navy activities. Navy aircraft, vessels, targets, munitions, towed devices, seafloor devices, and other training and testing expended materials could have a direct physical encounter with recreational, commercial, institutional, and governmental aircraft, vessels, and users such as swimmers, divers, and anglers.

Both Navy and public aircraft operate under visual flight rules requiring them to observe and avoid other aircraft. In addition, Notices to Airmen advise pilots about when and where Navy training and testing activities are scheduled. Finally, Navy personnel are required to verify that the range is clear of nonparticipants before initiating any potentially hazardous activity. Together, these procedures would minimize the potential for adverse interactions between Navy and nonparticipant aircraft. The Navy's standard operating procedures assure that private and commercial aircraft traversing the Study Area during training or testing activities do not interact with Navy aircraft, ordnance, or aerial targets.

Both Navy and public vessels operate under maritime navigational rules requiring them to observe and avoid other vessels. In addition, Notices to Mariners advise vessel operators about when and where Navy training and testing activities are scheduled. Finally, Navy personnel are required to verify that the range is clear of nonparticipants before initiating any potentially hazardous activity. Together, these procedures minimize the potential for adverse interactions between Navy and nonparticipant vessels. The Navy's standard operating procedures assure that private and commercial vessels traversing the Study Area during training or testing activities do not interact with Navy vessels, ordnance, or surface targets.

Recreational diving within the Study Area takes place primarily at known diving sites such as shipwrecks and reefs. The locations of these popular dive sites are well documented, dive boats are typically well-marked, and diver-down flags are visible from a distance. As a result, ships conducting training or testing activities would easily avoid dive sites. Interactions between training and testing activities and recreational divers thus would be minimized, reducing the potential for collisions or ship strikes. Similar knowledge and avoidance of popular fishing areas would minimize interactions between training and testing activities and recreational fishing.

Commercial and recreational fishers could encounter military expended materials that could entangle fishing gear and could pose a safety risk. The Navy would continue to recover targets at or near the surface that were used during training or testing to ensure that they would not pose a collision risk. Unrecoverable pieces of military expended materials are typically small (such as sonobuoys), constructed of soft materials (such as target cardboard boxes or tethered target balloons), or intended to sink to the bottom after their useful function was completed, so they would not be a collision risk to civilian vessels or equipment. Thus, these targets do not pose a safety risk to individuals using the area for recreation because the public would not likely be exposed to these items before they sank to the seafloor.

As discussed in Sediments and Water Quality (Section 3.1), a west coast study categorized types of marine debris collected by a trawler during a groundfish survey. Military expended materials were categorized as plastic, metal, fabric and fiber, and rubber comprising 7.4, 6.2, 13.2, and 4.7 percent of the total count of items collected, respectively. The footprint of military expended materials in the Study Area is discussed in Marine Habitats (Section 3.3), which concluded that if all military expended materials were located side by side in the Study Area, the footprint would be approximately 0.05 square nautical miles. Because the footprint of military expended materials in the Study Area is small, recreational and commercial fishers probably would not encounter military expended materials.

Section 3.1 (Sediments and Water Quality) also discussed the low failure rates of munitions, which indicate that most munitions function as intended. While fish trawls may encounter undetonated ordnance lying on the ocean floor, such an encounter would be unlikely because the density of munitions in the Study Area is low. The Army Corps of Engineers prescribes the following procedure if military munitions are encountered: recognize when you may have encountered a munition, retreat from the area without touching or disturbing the item, and report the item to local law enforcement by calling 911 or the U.S. Coast Guard.

The analysis focuses on the potential for a direct physical interaction with an aircraft, vessel, target, or expended training item. All proposed activities have some potential for a direct physical interaction that could pose a risk to public health or safety, so the following analysis is not activity-specific. While some of the activities may not pose a potential for a direct physical interaction (like pierside testing) the platforms used in the activity (aircraft, vessel, towed device) could have a direct physical interaction that could pose a risk. The greatest potential for a physical interaction would be along the coast because of the high concentration there of public activities.

3.12.3.3.1 No Action Alternative

3.12.3.3.1.1 Training

Under the No Action Alternative, training activities would continue at current levels and within established locations. The potential for a direct physical interaction between the public and aircraft, vessels, targets, or expended materials would not change from the baseline. The Navy implements strict operating procedures that protect public health and safety. These operating procedures include ensuring clearance of the area prior to commencing training activities.

The analysis indicates that public health and safety would not be affected by physical interactions with training activities, based on the Navy's implementation of strict operating procedures that protect public health and safety. These operating procedures include ensuring clearance of the area before commencing training activities involving physical interactions. Because of the Navy's safety procedures, the potential for training activities to impact public health and safety under the No Action Alternative would be negligible.

3.12.3.3.1.2 Testing

Because the potential for a physical interaction is not activity-specific or location-specific, the analysis of the training activities above applies to testing activities under the No Action Alternative. As concluded above, because of the Navy's safety procedures, the potential for testing activities to impact public health and safety under the No Action Alternative would be negligible.

3.12.3.3.2 Alternative 1

Alternative 1 consists of the activities included in the No Action Alternative, plus adjustments in the locations and tempos of training and testing activities. This alternative includes changes in force structure (personnel, weapons, and assets), new or upgraded weapons and platforms, and the training and testing required for proficiency with these systems. Alternative 1 includes the expansion of the Study Area to include the Transit Corridor, and Navy piers in San Diego Bay and Pearl Harbor. This expansion would not increase the potential for public exposure over the No Action Alternative because the same safety procedures would be in place to make sure these areas are clear of nonparticipants.

3.12.3.3.2.1 Training

Under Alternative 1, the number of training activities would increase, but would continue within established locations. However, the increased number of aircraft and vessel movements or use of targets and expended materials would be conducted under the same safety and inspection procedures as under the No Action Alternative. While Alternative 1 would adjust locations and tempos of training activities, the Navy would continue to implement standard operating and safety procedures. Therefore, the potential for impacts on public health and safety, beyond those identified under the No Action Alternative, would be negligible.

3.12.3.3.2.2 Testing

Because the potential for a physical interaction is not activity-specific or location-specific, the analysis of the training activities presented above also applies to testing activities under Alternative 1. As concluded above, because of the Navy's safety procedures, the potential for testing activities to impact public health and safety under Alternative 1 would be negligible.

3.12.3.3.3 Alternative 2 (Preferred Alternative)

Alternative 2 consists of the activities included in the No Action Alternative plus adjustments to locations and tempos of training and testing activities. This alternative includes changes in force structure (personnel, weapons, and assets), new or upgraded weapons and platforms, and the training and testing required for proficiency with these systems. Alternative 2 includes the expansion of the Study Area to include the Transit Corridor and Navy piers in San Diego Bay and Pearl Harbor. This expansion would not increase the potential for public exposure over the No Action Alternative because the same safety procedures would be in place to make sure these areas are clear of nonparticipants.

3.12.3.3.3.1 Training

Under Alternative 2, the number of training activities would increase. The potential for a direct physical interaction between the public and aircraft, vessels, targets, or expended materials would also increase. While Alternative 2 would adjust locations and tempos of training activities, the Navy would continue to implement standard operating and safety procedures. Therefore, the potential for impacts on public health and safety beyond those identified under the No Action Alternative would be negligible.

3.12.3.3.3.2 Testing

The potential for a physical interaction is not activity-specific or location-specific, so the analysis of the training activities presented above also applies to testing activities under Alternative 2. As concluded above, because of the Navy's safety procedures, the potential for testing activities to impact public health and safety under Alternative 1 would be negligible.

3.12.3.4 Secondary Impacts

Public health and safety could be impacted if sediment or water quality were degraded. Section 3.1 (Sediments and Water Quality) considered the impacts on marine sediments and water quality of explosives and explosive byproducts, metals, chemicals other than explosives, and other materials (marine markers, flares, chaff, targets, and miscellaneous components of other materials). The analysis determined that neither state nor federal standards or guidelines would be violated by the No Action Alternative, Alternative 1, or Alternative 2. Because these standards and guidelines are structured to protect human health, and the proposed activities do not violate them, no secondary impacts on public health and safety would result from the training and testing activities proposed by the No Action Alternative, Alternative 1, or Alternative 2.

3.12.4 Summary of Potential Impacts (Combined Impacts of All Stressors) on Public Health and Safety

Activities described in this EIS/OEIS that could affect public health or safety include those that release underwater energy, in-air energy, or physical interactions, or that have secondary impacts from changes in sediment or water quality. Under the No Action Alternative, Alternative 1, or Alternative 2, these activities would be widely dispersed throughout the Study Area. Such activities also are dispersed temporally (i.e., few stressors would be present at the same time). For these reasons, no greater impacts from the combined operation of more than one stressor are expected. The aggregate impact on public health and safety would not observably differ.

REFERENCES

Federal Aviation Administration. (2013). Air Traffic Organization Policy: Special Use Airspace Federal Aviation Administration (Ed.). (FAA Order JO 7400.8V).

Professional Association of Diving Instructors. (2012). Scuba Certification Frequently Asked Questions Professional Association of Diving Instructors. Retrieved from http://www.padi.com/scuba/scuba-diving-guide/start-scuba-diving/scuba-certification-faq/default.aspx as accessed on 2011, March 08.

U.S. Department of Defense. (2002). Electromagnetic environmental effects: Requirements for systems. (MIL-STD-464A).

U.S. Department of Defense. (2009). Protecting personnel from electromagnetic fields. (DOD Instruction 6055.11).

U.S. Department of the Navy. (2007). Airspace procedures and planning manual. (OPNAV INSTRUCTION 3770.2K).

U.S. Department of the Navy. (2008a). Navy laser hazard control program. (OPNAVINST 5100.27B).

U.S. Department of the Navy. (2008b). Test and safety planning. (NSWC PCD Instruction 5100.30D).

U.S. Department of the Navy. (2009). Narragansett Bay shallow water test facility. (NUWCDIVNPTINST 8590.1E).

U.S. Department of the Navy. (2011a). Fleet Area Control and Surveillance Facility. (FACSFACJAX INSTRUCTION 3000.1F).

U.S. Department of the Navy. (2011b). Manual for the utilization of Fleet Area Control and Surveillance Facility, Virginia Capes Operations Areas. (FACSFACVACAPESINST 3120.1L).

U.S. Department of the Navy. (2011c). Navy safety and occupational health program manual. (OPNAVINST 5100.23G CH-1).

U.S. Department of the Navy. (2011d). U.S. Navy dive manual. (Vol. 1–5).

This Page Intentionally Left Blank

4 Cumulative Impacts

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

There are no figures in this section.

4 CUMULATIVE IMPACTS

4.1 INTRODUCTION

The analysis of cumulative impacts (or cumulative effects)[1] presented in this section follows the requirements of the National Environmental Policy Act (NEPA) and Council on Environmental Quality guidance (Council on Environmental Quality 1997). The Council on Environmental Quality regulations (40 Code of Federal Regulations [C.F.R.] §§ 1500-1508) provide the implementing regulations for NEPA. The regulations define cumulative impacts as

> "…the impact on the environment which results from the incremental impact of the action when added to the other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 C.F.R. § 1508.7)."

While a single project may have minor impacts, overall impacts may be collectively significant when the project is considered together with other projects on a regional scale. A cumulative impact is the additive effect of all projects in the geographic area. The Council on Environmental Quality provides guidance on cumulative impact analysis in *Considering Cumulative Impacts under the National Environmental Policy Act* (Council on Environmental Quality 1997). This guidance further identifies cumulative impacts as those environmental impacts resulting "from spatial and temporal crowding of environmental perturbations. The impacts of human activities will accumulate when a second perturbation occurs at a site before the ecosystem can fully rebound from the impacts of the first perturbation." This guidance observes that "no universally accepted framework for cumulative impacts analysis exists…" while noting that certain general principles have gained acceptance. The Council on Environmental Quality provides guidance on the extent to which agencies of the federal government are required to analyze the environmental impacts of past actions when they describe the cumulative environmental effect of an action. This guidance provides that an analysis of cumulative impacts might encompass geographic boundaries beyond the immediate area of an action and a timeframe that includes past actions and foreseeable future actions. Thus, the Council on Environmental Quality guidelines observe, "[it] is not practical to analyze cumulative impacts of an action on the universe; the list of environmental impacts must focus on those that are truly meaningful."

4.2 APPROACH TO ANALYSIS

4.2.1 OVERVIEW

Cumulative impacts were analyzed for each resource addressed in Chapter 3 (Affected Environment and Environmental Consequences) for the No Action Alternative, Alternative 1, and Alternative 2 (the alternatives) in combination with past, present, and reasonably foreseeable future actions. The cumulative impacts analysis included the following steps, described in more detail below:

1. Identify appropriate level of analysis for each resource.
2. Define the geographic boundaries and timeframe for the cumulative impacts analysis.
3. Describe current resource conditions and trends.

[1] Council on Environmental Quality Regulations provide that the terms "cumulative effects" and "cumulative impacts" are synonymous (40 C.F.R. § 1508.8[b]); the terms are used interchangeably by various sources, but the term "cumulative impacts" will be used in this document except for quotations, for continuity.

4. Identify potential impacts of each alternative that might contribute to cumulative impacts.
5. Identify past, present, and other reasonably foreseeable future actions that affect each resource.
6. Analyze potential cumulative impacts.

4.2.2 IDENTIFY APPROPRIATE LEVEL OF ANALYSIS FOR EACH RESOURCE

In accordance with Council on Environmental Quality guidance (Council on Environmental Quality 1997), the cumulative impacts analysis focused on impacts that are "truly meaningful." The level of analysis for each resource was commensurate with the intensity of the impacts identified in Chapter 3 (Affected Environment and Environmental Consequences). The rationale for the level of analysis applied to each resource is described in Section 4.4 (Resource-Specific Cumulative Impacts).

4.2.3 DEFINE THE GEOGRAPHIC BOUNDARIES AND TIMEFRAME FOR ANALYSIS

The geographic boundaries for the cumulative impacts analysis included the entire Hawaii-Southern California (SOCAL) Training and Testing (HSTT) Study Area (Study Area) (Figure 2.1-1). The geographic boundaries for cumulative impacts analysis for marine mammals and sea turtles were expanded to include activities outside the Study Area that might impact migratory marine mammals and sea turtles. Primary considerations from outside the Study Area include impacts associated with maritime traffic (e.g., vessel strikes and underwater noise) and commercial fishing (e.g., bycatch and entanglement).

Determining the timeframe for the cumulative impacts analysis requires estimating the length of time the impacts of the Proposed Action would last (Council on Environmental Quality 1997) and considering the specific resource in terms of its history of degradation. The Proposed Action includes ongoing and anticipated future training and testing activities. While Navy training and testing requirements change over time in response to world events and several other factors, the general types of activities addressed by this Environmental Impact Statement (EIS)/Overseas EIS (OEIS) are expected to continue indefinitely, and the associated impacts would occur indefinitely. Likewise, some reasonably foreseeable future actions and other environmental considerations addressed in the cumulative impacts analysis are expected to continue indefinitely (e.g., oil and gas production, maritime traffic, commercial fishing). Therefore, the cumulative impacts analysis is not bounded by a specific future timeframe. For past actions, the cumulative impacts analysis only considers those actions or activities that have ongoing impacts.

While the cumulative impacts analysis is not limited by a specific timeframe, it should be recognized that available information, uncertainties, and other practical constraints limit the ability to analyze cumulative impacts for the indefinite future. Navy environmental planning and compliance for training and testing activities is an ongoing process. The Navy intends to submit applications to the National Marine Fisheries Service (NMFS) for Marine Mammal Protection Act (MMPA) authorizations supported by this EIS/OEIS. The anticipated effective dates for these MMPA authorizations would be a 5-year period from January 2014 through December 2018. Future environmental planning documents will include cumulative impacts analysis based on information available at that time.

4.2.4 DESCRIBE CURRENT RESOURCE CONDITIONS AND TRENDS

The Affected Environment sections of Chapter 3 (Affected Environment and Environmental Consequences) describe current resource conditions and trends, and they discuss how past and present human activities influence each resource. The current aggregate impacts of past and present actions are reflected in the baseline information presented in Chapter 3 (Affected Environment and Environmental

Consequences). This information is used in the cumulative impacts analysis to understand how past and present actions are currently impacting each resource and to provide the context for the cumulative impacts analysis.

4.2.5 Identify Potential Impacts of The Alternatives That Might Contribute to Cumulative Impacts

Direct and indirect impacts of the alternatives, presented in Chapter 3 (Affected Environment and Environmental Consequences), were reviewed to identify impacts relevant to the cumulative impacts analysis. Key factors considered included the current status and sensitivity of the resource and the intensity, duration, and spatial extent of the impacts for each stressor. In general, long-term rather than short-term impacts and widespread rather than localized impacts were considered more likely to contribute to cumulative impacts. For example, for biological resources, population-level impacts were considered more likely to contribute to cumulative impacts than were individual-level impacts. Negligible impacts were not considered further in the cumulative impacts analysis. For marine mammals, any stressor that is expected to result in Level A harassment or Level B harassment, as defined by MMPA, was considered in the cumulative impacts analysis. For Endangered Species Act (ESA)-listed species, any stressor that may affect and is likely to adversely affect the species was considered in the cumulative impacts analysis. Stressors that were determined by the Navy to have no effect or that may affect but are not likely to adversely affect ESA-listed species were not analyzed in detail in the cumulative impacts analysis. A determination of "may affect, not likely to adversely affect" indicates that the impacts would be discountable (extremely unlikely) or insignificant.

4.2.6 Identify Other Actions and Other Environmental Considerations That Affect Each Resource

A list of other actions was compiled for the Study Area and surrounding areas based on information obtained during the scoping process (Appendix E [Public Participation]), communications with other agencies, a review of other military activities, literature review, previous NEPA analyses for some of the other actions, and other available information. Identified future actions were reviewed to determine if they should be considered further in the cumulative impacts analysis. Factors considered when identifying other actions to be included in the cumulative impacts analysis included the following:

- Whether the other action is likely or probable (i.e., reasonably foreseeable), rather than merely possible or speculative.
- The timing and location of the other action in relationship to proposed training and testing activities.
- Whether the other action and each alternative would affect the same resources.
- The current conditions, trends, and vulnerability of resources affected by the other action.
- The duration and intensity of the impacts of the other action.
- Whether the impacts have been truly meaningful, historically significant, or identified previously as a cumulative impact concern.

In addition to identifying reasonably foreseeable future actions, other environmental considerations for the cumulative impacts analysis were identified and described. These other considerations include major environmental stressors or issues (e.g., ocean pollution, ocean noise, coastal development, etc.) that tend to be widespread and arise from routine human activities and multiple past, present, and future actions. Including these other environmental considerations allows an analysis of the current aggregate impacts of past and present actions, as well as reasonably foreseeable actions.

4.2.7 Analyze Potential Cumulative Impacts

The current impacts of past and present actions and the anticipated impacts of reasonably foreseeable future actions were characterized and summarized. The incremental impacts of each alternative were then added to the combined impacts of all other actions to describe the cumulative impacts that would result if the No Action Alternative, Alternative 1, or Alternative 2 were implemented. The cumulative impacts analysis considered additive, synergistic, and antagonistic impacts. A qualitative analysis was conducted in most cases based on the available information. The analysis in Chapter 3 (Affected Environment and Environmental Consequences) indicates that the direct and indirect impacts of the No Action Alternative, Alternative 1, and Alternative 2 would be similar for many of the stressors. Therefore, much of the cumulative impacts discussion applies to all three alternatives. Specific differences between the alternatives are discussed when appropriate.

4.3 Other Actions Analyzed in the Cumulative Impacts Analysis

4.3.1 Overview

Table 4.3-1 lists the other actions and other environmental considerations identified for the cumulative impacts analysis. Descriptions of each action and environmental consideration carried forward for analysis are provided in the following sections.

4.3.2 Oil and Natural Gas Exploration, Extraction, and Production

4.3.2.1 Proposed Outer Continental Shelf Oil and Gas Leasing Program 2012–2017

Military activities and oil and gas operations have been conducted concurrently offshore in southern and south-central California for more than 50 years. During that period there have been no major incidents or accidents involving military and outer continental shelf oil and gas operations. Oil and gas resources of the Outer Continental Shelf are governed by the Outer Continental Shelf Lands Act which requires a 5-year leasing program. Areas off the Pacific coast are not included in the 2012–2017 Outer Continental Shelf Oil and Gas Leasing Program finalized by the U.S. Department of the Interior Bureau of Ocean Energy Management.

4.3.2.2 Liquefied Natural Gas Terminals

Liquefied natural gas facilities have been proposed at several locations throughout North America in recent years in response to the quickly escalating domestic demand for this fuel. Currently the only existing terminal near the Study Area is in Baja California, Mexico and only one additional terminal is proposed for the area immediately north of the Study Area (Federal Energy Regulatory Commission 2011).

Potential environmental impacts include those associated with additional ship traffic, underwater noise from construction and operation, and potential releases of liquefied natural gas. Releases of liquefied natural gas can result from equipment leaks or spills during operations. Releases can be accidental (e.g., ship collision) or intentional (e.g., sabotage or terrorist acts).

Table 4.3-1: Other Actions and Other Environmental Considerations Identified for the Cumulative Impacts Analysis

#	Name of Action	Lead Agency or Proponent	Location in the Study Area/LME	Timeframe	Retained for Further Analysis?
Oil and Natural Gas Exploration, Extraction, and Production					
1	Outer Continental Shelf Oil and Gas Leasing Program 2012–2017	Bureau of Ocean Energy Management	All LMEs	Past, present, and foreseeable future	Dismissed, as this leasing program does not include any Pacific Region areas and it therefore poses no potential impact within the Study Area.
2	Liquefied Natural Gas Terminals	Bureau of Ocean Energy Management, Regulation and Enforcement	California Current LME	Past, present, and foreseeable future	Retained.
Offshore Power Generation					
3	Marine Hydrokinetic Projects	Federal Energy Regulatory Commission	All LMEs	Foreseeable future	Retained.
Dredge Disposal, Beach Nourishment, and Mining					
4	Offshore Dredge Disposal Program	U.S. Army Corps of Engineers	All LMEs	Past, present, and future	Dismissed because action involves programs related to dredging and beach nourishment projects. These activities (if applicable) would be analyzed on an individual basis for cumulative impacts.
5	Beach Nourishment Programs	U.S. Army Corps of Engineers	All LMEs	Past, present, and future	Dismissed because of negligible to minor impacts on resources in the area affected by this activity and the Proposed Action.
Other Military Activities					
6	Scripps Pier Replacement at Point Loma	U.S. Department of the Navy	California Current LME	Present and future	Retained.
7	Naval Base Point Loma Fuel Pier	U.S. Department of the Navy	California Current LME	Past, present, and future	Retained.
9	Submarine Drive-In Magnetic Silencing Facility Beckoning Point, Oahu, Hawaii	U.S. Department of the Navy	Insular Pacific-Hawaiian LME	Past, present, and future	Retained.

Table 4.3-1: Other Actions and Other Environmental Considerations Identified for the Cumulative Impacts Analysis (continued)

#	Name of Action	Lead Agency or Proponent	Location in the Study Area/LME	Timeframe	Retained for Further Analysis?
Other Military Activities (continued)					
10	Establishment and Realignment of Navy Helicopter Squadrons on the West Coast	U.S. Department of the Navy	California Current LME	Future	Retained.
11	San Clemente Island Fuel Storage and Distribution System	U.S. Department of the Navy	California Current LME	Past, present, and future	Retained.
12	Wave Energy Test Site	U.S. Department of the Navy University of Hawaii U.S. Department of Energy	Insular Pacific-Hawaiian LME	Future	Retained.
13	Pier 12 Replacement and Dredging Naval Base San Diego	U.S. Department of the Navy	California Current LME	Future	Retained.
14	Homeporting Littoral Combat Ships on the West Coast	U.S. Department of the Navy	California Current LME	Future	Retained for activities associated with homeporting. While NEPA has not been completed and a decision has not been made, the Navy's envisaged homeporting location for the west coast Littoral Combat Ships is Naval Base San Diego. Impacts from Littoral Combat Ship training are considered under Alternatives 1 and 2 and are not considered in cumulative impacts.
15	Surveillance Towed Array Sensor System Low Frequency Active Sonar	U.S. Department of the Navy	All LMEs	Future	Retained
16	Space and Naval Warfare Systems Command Electronic Harbor Security System	U.S. Department of the Navy	California Current LME	Current	Retained.

Table 4.3-1: Other Actions and Other Environmental Considerations Identified for the Cumulative Impacts Analysis (continued)

#	Name of Action	Lead Agency or Proponent	Location in the Study Area/LME	Timeframe	Retained for Further Analysis?
Other Military Activities (continued)					
17	Construction of SEAL Delivery Vehicle Team One Waterfront Operations Facility	U.S. Department of the Navy	Insular Pacific-Hawaiian LME	Current	Retained.
18	Basing of MV-22 and H-1 Aircraft in Support of III Marine Expeditionary Force Elements in Hawaii	U.S. Department of the Navy	Insular Pacific-Hawaiian LME	Future	Retained.
19	Marine Corps Base Hawaii Pyramid Beach Cottage Construction	U.S. Department of the Navy	Insular Pacific-Hawaiian LME	Future	Retained.
20	U.S. Marine Corps Joint Strike Fighter	U.S. Marine Corps	All LMEs	Future	Dismissed. Homebasing activities such as new construction and personnel relocation are not expected to impact marine resources. Joint Strike Fighter training activities are addressed under Alternatives 1 and 2.
21	U.S. Navy Climate Change Roadmap	U.S. Department of the Navy	All LMEs	Present and future	Retained.
22	Hawaii Air National Guard F-22 Beddown	U.S. Air Force	All LMEs	Future	Retained.
23	U.S. Coast Guard Training Activities in Southern California and Hawaii	U.S. Coast Guard	California Current LME Insular Pacific-Hawaiian LME	Past, present, and future	Retained.
24	Joint Logistics Over-the-Shore Training	U.S. Department of the Navy, Marine Corps	California Current LME	Future	Retained.

Table 4.3-1: Other Actions and Other Environmental Considerations Identified for the Cumulative Impacts Analysis (continued)

#	Name of Action	Lead Agency or Proponent	Location in the Study Area/LME	Timeframe	Retained for Further Analysis?
Other Military Activities (continued)					
	Environmental Regulations and Planning				
23	Coastal and Marine Spatial Planning	Regional Ocean Commissions	All LMEs	Future	Dismissed because action involves only planning and policy-related activities (discussed in Chapter 6 [Additional Regulatory Considerations]).
24	Marine Mammal Protection Act Incidental Take Authorizations	National Marine Fisheries Service	All LMEs	Past, present, and future	Retained.
	Other Environmental Considerations				
25	Commercial and Recreational Fishing	National Marine Fisheries Service and private industry	All LMEs and open ocean areas	Past, present, and future	Retained.
26	Maritime Traffic	Not applicable	All LMEs and open ocean areas	Past, present, and future	Retained.
27	Development of Coastal Lands	Local regulatory agencies	All LMEs	Past, present, and future	Retained.
28	Oceanographic Research	Numerous	All LMEs and open ocean areas	Past, present, and future	Retained.
29	Ocean Noise	Not applicable	All LMEs and open ocean areas	Past, present, and future	Retained.
30	Ocean Pollution	U.S. Environmental Protection Agency Applicable State Agencies	All LMEs and open ocean areas	Past, present, and future	Retained.
31	Marine Tourism	Numerous	All LMEs	Past, present, and future	Retained.
32	Commercial and General Aviation	Not applicable	All LMEs and open ocean areas	Past, present, and future	Retained.

Notes: LME = large marine ecosystem, U.S. = United States, EA = Environmental Assessment, MDA = Missile Defense Agency

4.3.3 OFFSHORE POWER GENERATION

4.3.3.1 Outer Continental Shelf Renewable Energy Program

The Outer Continental Shelf (OCS) Renewable Energy Program was finalized in 2009. These regulations provide a framework for leases, easements, and rights-of-way for activities on the OCS that support production and transmission of energy from sources other than oil and natural gas.

4.3.3.2 Offshore Wind Energy

Despite tremendous offshore wind capacity, the United States has no offshore wind energy production to date.

4.3.3.3 Marine Hydrokinetic Projects

Emerging water power technologies offer the potential to capture energy from waves, thermal gradients, tides, and ocean currents. These new technologies once developed will offer alternatives to fossil fuels. At the present time, there is significant research into the performance and economic viability of hydropower technologies. Because no fully developed marine hydrokinetic projects exist in the North American or Polynesia region, the impact on marine species and ecosystems in the region remains largely speculative. Concerns raised include the potential for collisions, noise, physical disturbance, disruption of marine species' behavioral patterns, impacts to local community and fishing industry, ability to monitor projects, cumulative impacts of multiple hydrokinetic projects along the coasts, habitat alteration due to anchors and cables, and release of toxins and chemicals by the projects or by vessels servicing the project. Other considerations include habitat disturbance and the displacement of benthic organisms. These concerns provide the potential for habitat loss and changes to the ecology of a region (Pacific Fishery Management Council 2011); however, initial studies have indicated that with appropriate protocols for siting and design indicates that these impacts are likely to be minimal (Union of Concerned Scientists 2008).

As of June 2011, the Federal Energy Regulatory Commission has issued 70 preliminary permits for hydrokinetic projects and 147 preliminary permits are pending. In California there are four wave preliminary permits and one tidal preliminary permit. In Hawaii there is one wave preliminary permit that has been issued (Center for Climate and Energy Solutions 2012).

4.3.4 DREDGE DISPOSAL, BEACH NOURISHMENT, AND MINING

4.3.4.1 Offshore Dredge Disposal Program

The offshore dredge disposal program is dismissed from analysis because the action involves programs related to dredging and beach nourishment projects. These activities (if applicable) would be analyzed on an individual basis for cumulative impacts.

4.3.4.2 Beach Nourishment Programs

Beach nourishment programs are dismissed from analysis because they result in negligible to minor impacts on resources in the area affected by this activity and the Proposed Action.

4.3.5 OTHER MILITARY ACTIVITIES

4.3.5.1 Scripps Pier Replacement at Point Loma

The proposed project is a joint project between the Navy and University of California San Diego that involves the replacement of the existing Scripps Pier. The project is proposed to begin in the fall of 2013.

4.3.5.2 Naval Base Point Loma Fuel Pier

The proposed project involves the replacement of the existing fuel pier at Point Loma, which will likely require the temporary relocation of the marine mammals from the Space and Naval Warfare Systems Command mammal program and dredging approximately 87,000 cubic yards of sediment to facilitate navigation in the vicinity of the fuel pier.

4.3.5.3 Submarine Drive-In Magnetic Silencing Facility Beckoning Point, Oahu, Hawaii

Construction of a new drive-in submarine magnetic silencing facility was completed on 31 December 2010, at Joint Base Pearl Harbor-Hickam's Beckoning Point. The project was a 2-year effort that replaced existing submarine deperming piers and structures and construction of land-based facilities to include a new rectifier building, back-up generator building, and renovations to the existing control building. Deperming (also known as degaussing) is accomplished by wrapping heavy gauge copper cables around the hull and superstructure of the vessel; very high electrical currents are pulsed through the cables in order to erase the permanent magnetism from ships and submarines to camouflage them against magnetic detection vessels and interference with communications and navigation equipment (U.S. Department of the Navy 2008a, b).

4.3.5.4 Establishment and Realignment of Navy Helicopter Squadrons on the West Coast

The Navy will add four helicopter squadrons on the west coast: establishing three new squadrons and relocating one squadron from the east coast. The realignment will increase the number of helicopters homebased at North Island by 52, from the current number of 151, to 203 helicopters by 2016. Most helicopter squadrons homebased at North Island will transition to the MH-60R and MH-60S helicopters to gradually replace older model H-60 helicopters. A new organizational maintenance hangar and supporting facilities will be constructed and 800 personnel (738 military and 62 civilian) will be added at North Island to support the additional squadrons (U.S. Department of the Navy 2011c).

4.3.5.5 San Clemente Island Fuel Storage and Distribution System

An Environmental Assessment has been implemented to replace the aging underground JP-5 jet fuel tanks and improve the receipt, storage, and delivery capabilities at San Clemente Island.

4.3.5.6 Navy, University of Hawaii, and United States Department of Energy Wave Energy Test Site

Naval Facilities Engineering Command Engineering Services Center proposes to construct and operate a deep-water wave energy test site for offshore wave energy conversion devices at a water depth of up to 328 feet (ft.) (100 meters [m]), roughly 8,200 ft. (2,500 m) offshore from North Beach of MCBH. Upon completion of deep-water test site construction, two additional wave energy conversion devices would be installed and operated at the deep test site, and the existing site (one) operating at about 98 ft. (30 m) depth (known as the medium depth site would remain. Therefore, the existing and expanded test sites would accommodate a maximum of three wave energy conversion devices (U.S. Department of the Navy 2012a).

4.3.5.7 Pier 12 Replacement and Dredging Naval Base San Diego

An Environmental Assessment has been implemented to evaluate the potential environmental consequences for a project at Naval Base San Diego, California that would involve demolition of Pier 12, dredging in berthing and approach for a new pier, dredged material disposal at an approved ocean disposal site and permitted upland landfill, construction of a new pier and associated pier utilities, including upgrades to the electrical infrastructure at the adjacent Pier 13, and re-use of demolition concrete to create fish enhancement structures (artificial reefs) (U.S. Department of the Navy 2011d).

4.3.5.8 Homeporting Littoral Combat Ships on the West Coast

An Environmental Assessment has been implemented to evaluate the potential environmental effects of a naval proposal to homeport up to 16 Littoral Combat Ships and unmanned aerial systems at Naval Base Ventura County Point Mugu and Naval Base San Diego. No in-water construction is proposed and the homeporting would take place between Fiscal Year (FY) 2013 and FY 2020 (U.S. Department of the Navy 2012b).

4.3.5.9 Surveillance Towed Array Sensor System Low Frequency Active Sonar

In August 2011, the Navy released a Draft Supplemental EIS/Supplemental OEIS that evaluated the potential environmental impacts of employing the Surveillance Towed Array Sensor System Low Frequency Active Sonar (U.S. Department of the Navy 2011b). The Navy currently plans to operate up to four Surveillance Towed Array Sensor System Low Frequency Active Sonar systems for routine training, testing, and military operations. Based on current Navy national security and operational requirements, routine training, testing, and military operations using these sonar systems could occur in the Pacific Ocean (including the Study Area), Atlantic Ocean, Indian Ocean, and Mediterranean Sea.

4.3.5.10 Space and Naval Warfare Systems Command – Electronic Harbor Security System Environmental Assessment

A swimmer detection system is to be installed near Naval Base Point Loma and Naval Base San Diego.

4.3.5.11 Construction of Sea, Air, Land Delivery Vehicle Team One Waterfront Operations Facility

This project will construct a 20,000-square-foot addition to Building 987 for Sea, Air, Land (SEAL) Delivery Vehicle Team One platoon operators, divers, and support technicians. Work is expected to begin in 2013.

4.3.5.12 Basing of MV-22 and H-1 Aircraft in Support of III Marine Expeditionary Force Elements in Hawaii

An EIS is currently being prepared for the proposed basing and operation of MV-22 Osprey tiltrotor aircraft and H-1 helicopters in Hawaii. The Proposed Action includes basing and operating up to two Marine Medium Tiltrotor squadrons with a total of 24 MV-22 Osprey aircraft and one Marine Light Attack Helicopter squadron with 15 AH-1 Cobra and 12 UH-1 Huey attack and utility helicopters and conducting aviation training, readiness, and special exercise operations at training facilities statewide. Demolition, new construction, and renovation are proposed to develop basing facilities at Marine Corps Base Hawaii, Kaneohe Bay for the squadrons. Personnel increases would occur from 2012 through 2018 (U.S. Department of the Navy 2011e). The EIS analyzes the impacts of developing basing facilities at Marine Corps Base Hawaii Kaneohe Bay; conducting aviation operations at training areas on the islands of Kauai, Oahu, Molokai, Maui, and Hawaii; and constructing improvements at three existing training facilities.

4.3.5.13 Marine Corps Base Hawaii Pyramid Beach Cottage Construction

Construction of 10 new beach cottages is expected to begin in FY 2015.

4.3.5.14 United States Marine Corps Joint Strike Fighter

This project has been dismissed from further analysis as the homebasing activities included new construction and personnel relocation which are not expected to impact marine resources. Joint Strike Fighter training activities are addressed under Alternatives 1 and 2.

4.3.5.15 United States Department of the Navy Climate Change Roadmap

The Navy Climate Change Roadmap outlines the Navy's approach to observing, predicting, and adapting to climate change by providing a chronological list of Navy-associated action items, objectives and desired effects for FY 2010–2014 (U.S. Department of the Navy 2010).

4.3.5.16 Hawaii Air National Guard F-22 Beddown

The Hawaii Air National Guard and the U.S. Air Force will be conducting "joint" training with the F-22 aircraft which will be a replacement of the existing F-15 aircraft. Training in the F-22 aircraft will be similar to the training currently conducted with the F-15 aircraft (U.S. Department of the Navy 2011a).

4.3.5.17 United States Coast Guard Training Activities in Southern California and Hawaii

Coast Guard Sector San Diego, a shore command within the Coast Guard 11th District, carries out its mission to serve, protect, and defend the American public, maritime infrastructure, and the environment. The Sector San Diego Area of Responsibility extends southward from the Dana Point harbor to the border with Mexico. Equipment utilized by the Coast Guard includes 25 ft. (8 m) response boats, 41 ft. (12 m) utility boats, and 87 ft. (27 m) patrol boats, as well as HH-60 helicopters. Training events include search and rescue, maritime patrol training, boat handling, and helicopter and surface vessel live-fire training with small arms.

Similarly, the Coast Guard's 14th District carries out its mission and conducts unit training in and around Hawaii. U.S. Coast Guard training in Hawaii includes surface vessel live-fire training with small- and medium-caliber weapons, primarily conducted in Warning Areas 189, 193, and 194 within the Hawaii Range Complex.

4.3.5.18 Joint Logistics Over-the-Shore Training

Joint Logistics Over-The-Shore training consists of loading/unloading ships without fixed port facilities. This training may be conducted jointly by the Navy, Marine Corps, and Army at Marine Corps Base Camp Pendleton, California, and includes in-water and land-based activities. Training activities associated with elevated causeway set up and break down in the Camp Pendleton Amphibious Assault Area are addressed under Alternatives 1 and 2 of this EIS/OEIS. Land-based training will be addressed in a separate NEPA document.

4.3.6 Environmental Regulations and Planning

4.3.6.1 Coastal and Marine Spatial Planning

Dismissed because action involves only planning and policy-related activities.

4.3.6.2 Marine Mammal Protection Act Incidental Take Authorizations

The MMPA generally prohibits "take" of marine mammals in U.S. waters by any person and by U.S. citizens in international waters. The National Oceanic and Atmospheric Administration can authorize "take" for specific activities (National Oceanic and Atmospheric Administration 2012).

4.3.7 Other Environmental Considerations

4.3.7.1 Commercial and Recreational Fishing

Commercial and recreational fishing constitutes an important and widespread use of the ocean resources throughout the Study Area. Fishing can adversely affect fish populations, other species, and habitats. Potential impacts of fishing include overfishing of targeted species and bycatch, both of which negatively affect fish stocks and other marine resources. Bycatch is the capture of fish, marine mammals, sea turtles, seabirds, and other nontargeted species that occur incidental to normal fishing operations. Use of mobile fishing gear such as bottom trawls disturbs the seafloor and reduces habitat structural complexity. Indirect impacts of trawls include increased turbidity, alteration of surface sediment, removal of prey (leading to declines in predator abundance), removal of predators, ghost fishing (i.e., lost fishing gear continuing to ensnare fish and other marine animals), and generation of marine debris. Lost gill nets, purse seines, and long-lines may foul and disrupt bottom habitats and have the potential to entangle or be ingested by marine animals.

Fishing can have a profound influence on individual targeted species populations. In a study of retrospective data, Jackson et al. (2001) analyzed paleoecological records of marine sediments from 125,000 years ago to present, archaeological records from 10,000 years before the present, historical documents, and ecological records from scientific literature sources over the past century. Examining this longer-term data and information, they concluded that ecological extinction caused by overfishing precedes all other pervasive human disturbance of coastal ecosystems, including pollution and anthropogenic climatic change. Fisheries bycatch has been identified as a primary driver of population declines in several marine species, including sharks, mammals, seabirds, and sea turtles (Wallace et al. 2010).

4.3.7.2 Maritime Traffic

Portions of the Study Area are heavily traveled by commercial, recreational, and government marine vessels, with several commercial ports occurring in or near the Study Area. The United States has grown increasingly dependent on international trade over the past 50 years. Section 3.11 (Socioeconomic Resources) provides additional information for marine vessel traffic in the Study Area. Primary concerns for the cumulative impacts analysis include vessels striking marine mammals and sea turtles, introduction of non-native species through ballast water, and underwater sound from ships and other vessels.

4.3.7.3 Development of Coastal Lands

Coastal land development adjacent to the Study Area is both intensive and extensive. Development has impacted and continues to impact coastal resources through point and nonpoint source pollution; concentrated recreational use; and intensive ship traffic using major port facilities. The Study Area coastline also includes extensive coastal tourism development (hotels, resorts, restaurants, food industry, residential homes, etc.) and the infrastructure supporting coastal development (retail businesses, marinas, fishing tackle stores, dive shops, fishing piers, recreational boating harbors, beaches, recreational fishing facilities, etc.).

Coastal development intensifies use of coastal resources, resulting in potential impacts on water quality, marine habitat, and air quality. Coastal development is therefore closely regulated by California and Hawaii through the Coastal Zone Management Act. New development in the coastal zone requires a permit from the state or local government to which permitting authority has been delegated (Chapter 6, Additional Regulatory Considerations) provides additional information on coastal zone management in each state).

4.3.7.4 Oceanographic Research

The Auxiliary General Purpose Oceanographic Research (AGOR) 28 research vessel is entering a final design and construction phase and is anticipated to be launched in 2015. The vessel is owned by the U.S. Office of Naval Research for the U.S. Department of the Navy and operated by Scripps. The AGOR 28 is designed to operate globally and support both U.S. Department of the Navy and national oceanographic research objectives to include exploring science and technology in the areas of oceanographic and meteorological observations, modeling and prediction in the battlespace environment, submarine detection and classification and mine warfare application for detecting and neutralizing mines in the ocean and littoral environment. The vessel will be based in the Scripps Nimitz Marine Facility in San Diego Port Loma (Scripps Institution of Oceanography 2012a, c).

Projects are under development to deploy seismometers, pressure gauges, and temperature sensors to measure the size and direction of tsunamis. Future use of the cables could include installation of climate instruments to measure acoustic tomography and water column temperature and conductivity to measure ocean warming. The initial project will focus along a cable route spanning 12,950 kilometers (8,105 miles) from Sydney to Auckland and across the Pacific Ocean to Los Angeles (Scripps Institution of Oceanography 2012b).

The Ocean Conservation Society has three ongoing projects in the Study Area. The Los Angeles Dolphin Project 1 (Ocean Conservation Society 2012a) studies the ecology, social structure and contaminant load comparison of inshore/offshore bottlenose dolphins in the Southern California Bight; the Los Angeles Dolphin Project 2 (Ocean Conservation Society 2012b) studies dolphin, sea lion and seabird aggregations during foraging and feeding activities in the Santa Monica Bay; and the Los Angeles Dolphin Project 3 (Ocean Conservation Society 2012c) studies the effects of coastal pollution and importance of oceanographic features for marine mammals in the waters off Los Angeles, California.

The National Oceanic and Atmospheric Administration has ongoing projects involving such projects as integrated ocean mapping, laser line scanning for habitat assessment, locating and mapping deep-sea coral habitats, species inventory, growth and reproductive studies and food web and species interaction studies, studies designed to understand the use of specific deep-sea species of corals as indicators of climatic change, and the effects on the oceans of deep-sea volcanoes and hydrothermal systems (National Oceanic and Atmospheric Administration 2011b).

4.3.7.5 Ocean Noise

Noise is generally described as unwanted sound—sound that clutters and masks other sounds of interest (Richardson et al. 1995). Anthropogenic sources of noise that are most likely to contribute to increases in ocean noise are vessel noise from commercial shipping and general vessel traffic, oceanographic research, oil and gas exploration, underwater construction, and naval and other use of sound navigation and ranging (sonar).

Any potential for cumulative impact should be put into the context of recent changes to ambient sound levels in the world's oceans as a result of anthropogenic activities. However, there is a large and variable natural component to the ambient noise level as a result of events such as earthquakes, rainfall, waves breaking, and lightning hitting the ocean as well as biological noises such as those from snapping shrimp and the vocalizations of marine mammals.

Andrew et al. (2002) compared ocean ambient sound from the 1960s to the 1990s from a receiver off the California coast. The data showed an increase in ambient noise of approximately 10 decibels (dB) in the frequency ranges of 20 to 80 hertz (Hz) and 200 to 300 Hz, and about 3 dB at 100 Hz over a 33-year period. Each 3 dB increase is noticeable to the human ear and a doubling in sound level. A possible explanation for the rise in ambient noise is the increase in shipping noise. There are approximately 11,000 supertankers worldwide, each operating 300 days per year, producing constant broadband noise at source levels of 198 dB (Hildebrand 2004). Generally the most energetic regularly operated sound sources are seismic airgun arrays from approximately 90 vessels with typically 12 to 48 individual guns per array, firing about every 10 seconds (Hildebrand 2004).

Section 3.0.4 (Acoustic and Explosives Primer), provides additional information about sources of anthropogenic sound in the ocean and other background information about underwater noise. This section describes the different types of effects that are possible and the potential relationships between sound stimuli and long-term consequences for individual animals and populations. A variety of impacts may result from exposure to sound-producing activities. The severity of these impacts can vary greatly between minor impacts that have no real cost to the animal, to more severe impacts that may have lasting consequences. The major categories of potential impacts are: behavioral reactions, physiological stress, auditory fatigue, auditory masking, and direct trauma.

4.3.7.6 Ocean Pollution

Pollution is the introduction of harmful contaminants that are outside the norm for a given ecosystem. Ocean pollution has and will continue to have serious impacts on the marine ecosystems. Common ocean pollutants include toxic compounds such as metals, pesticides, and other organic chemicals; excess nutrients from fertilizers and sewage; detergents; oil; plastics; and other solids. Pollutants enter oceans from non-point sources (i.e., stormwater runoff from watersheds), point sources (i.e., wastewater treatment plant discharges), other land-based sources (i.e., windblown debris), spills, dumping, vessels, and atmospheric deposition.

4.3.7.6.1 Non-Point Sources, Point Sources, and Atmospheric Deposition

Polluted runoff, or nonpoint source pollution, is considered the major cause of impairment of ocean waters. Stormwater runoff from coastal urban areas and beaches carries waste such as plastics and Styrofoam into coastal waters. Sewer outfalls also are a source of ocean pollution. Sewage can be treated to eliminate potentially harmful releases of contaminants; however, releases of untreated sewage occur due to malfunctions or overloads to the infrastructure, resulting in releases of bacteria usually associated with feces, such as *Escherichia coli* and *Enterococci spp*. Bacteria levels are used routinely to determine the quality of water at recreational beaches and as indicators of the possible presence of other harmful microorganisms. In the past, toxic chemicals have been released into sewer systems. While such dumping has long been forbidden by law, the practice left ocean outflow sites contaminated. Sewage treatment facilities generally do not treat or remove persistent organic pollutants, such as polychlorinated biphenyl (PCB) and dichlorodiphenyltrichloroethane (DDT), or other toxins.

Hypoxia (low dissolved oxygen concentration) is a major impact associated with point and non-point sources of pollution. Hypoxia occurs when waters become overloaded with nutrients such as nitrogen and phosphorus, which enter oceans from non-point source runoff, wastewater treatment plants, and atmospheric deposition. Too many nutrients can stimulate algal blooms—the rapid expansion of microscopic algae (phytoplankton). When excess nutrients are consumed, the algae population dies off and the remains are consumed by bacteria. Bacterial consumption causes dissolved oxygen in the water to decline to the point where marine life that depend on oxygen can no longer survive (Boesch et al. 1997).

Harmful algal blooms are proliferations of marine and freshwater algae (including cyanobacteria and non-photosynthetic algae-like organisms) that can produce toxins, causing human illness and massive animal mortalities. They also can accumulate in sufficient numbers to alter ecosystems in detrimental ways.

Non-point sources, point sources, and atmospheric deposition also contribute toxic pollutants such as metals, pesticides, and other organic compounds to the marine environment. Toxic pollutants may cause lethal or sublethal effects if present in high concentrations, and can build up in tissues over time and suppress immune system function, resulting in disease and death.

4.3.7.6.2 Marine Debris

Marine debris is any anthropogenic object intentionally or unintentionally discarded, disposed of, or abandoned that enters the marine environment. Common types of marine debris include various forms of plastic and abandoned fishing gear. Marine debris degrades marine habitat quality and poses ingestion and entanglement risks to marine life and bird (National Marine Fisheries Service 2006).

Plastic marine debris is a major concern because it degrades slowly and many plastics float, allowing the debris to be transported by currents throughout the oceans. Currents in the oceanic convergence zone in the North Pacific Subtropical Gyre act to accumulate the floating plastic marine debris. Additionally, plastic waste in the ocean chemically attracts hydrocarbon pollutants such as PCB and DDT, which accumulate up to one million times more in plastic than in ocean water (Mato et al. 2001). Fish, marine animals, and birds can mistakenly consume these wastes containing elevated levels of toxins instead of their prey. In the North Pacific Subtropical Gyre it is estimated that the fishes in this area are ingesting 12,000 to 24,000 U.S. tons (10,886,216 to 21,772,433 kilograms [kg]) of plastic debris a year (Davison and Asch 2011).

Marine debris has been discovered to be accumulating in gyres throughout the oceans. Law et al. (2010) presented a time series of plastic content at the surface of the western North Atlantic Ocean and Caribbean Sea from 1986 to 2008. More than 60 percent of 6,136 surface plankton net tows collected small, buoyant plastic pieces. The data identified an accumulation zone east of Bermuda that is similar in size to the accumulation zone in the eastern Pacific Ocean.

4.3.7.7 Marine Tourism

Between 1990 and 2000, the ocean-related gross state product for California grew by 10.64 percent, with one of the largest growth trends experienced in coastal recreation and tourism. California's trend reflects the international trend of coastal tourism and recreation growth which has continued in past decades while other industries have declined. Additionally, the growth is seen in the development of "services" rather than "goods-related" activities (Kildow and Colgan 2005). Stakeholders in tourism services have economical motivation to ensure positive management of marine resources on which their industries are based therefore the impacts of marine tourism are generally localized and of small magnitude; however, rapid expansion of tourism could increase pressure for additional coastal and urban development which would result in potential indirect and cumulative effects on marine resources (Harriott 2002). The Marine Institute found that the issues relating to tourism included visitor pressures on coastal ecology; carrying capacity; information gap (i.e., insufficient data to assess impacts of tourism); anthropogenic impacts (i.e., displacement of seabirds, habitat and roosting opportunities, conflicts with users and wildlife, altering food sources); threats to ecology; development pressure; infrastructural support; user conflicts; and motorized crafts (Connolly et al. 2001).

4.3.7.8 Commercial and General Aviation

Commercial and general aviation are retained for analysis and discussion in Section 4.4.4.1 (Greenhouse Gases).

4.4 Resource-Specific Cumulative Impacts

4.4.1 Resource Areas Dismissed from Current Impacts Analysis

In accordance with Council on Environmental Quality guidance (Council on Environmental Quality 2010), the cumulative impacts analysis focused on impacts that are "truly meaningful." The level of analysis for each resource was commensurate with the intensity of the impacts identified in Chapter 3 (Affected Environment and Environmental Consequences). The analysis focused on marine mammals, sea turtles, and cultural resources. While each of the following resources is discussed in the following section, detailed analysis of cumulative impacts was not necessary for the following resources as the incremental contribution of Alternatives 1 and 2 to cumulative impacts would be low. Further analysis of cumulative impacts is not warranted on the following resources:

- Sediments and water quality
- Marine habitats
- Seabirds
- Marine vegetation
- Marine invertebrates
- Fish
- Socioeconomic resources
- Public health and safety

4.4.2 Sediments and Water Quality

The analysis in Section 3.1 (Sediments and Water Quality) indicates that the alternatives could result in local, short- and long-term changes in sediment and water quality. However, chemical, physical, or biological changes to sediments or water quality would be below applicable standards, regulations, and guidelines and would be within existing conditions or designated uses (Section 3.1.1.2, Methods, lists applicable standards, regulations, and guidelines). The short-term impacts would arise from explosions and the byproducts of explosions and combusted propellants. It is unlikely these short-term impacts would overlap in time and space with other future actions that produce similar constituents. For example, training and testing with explosives would not be expected to occur near an oil rig structure-removal operation that could use explosives. Therefore, the short-term impacts described in Section 3.1 (Sediments and Water Quality) are not expected to contribute to cumulative impacts.

The long-term impacts would arise from unexploded ordnance, noncombusted propellant, metals, and other materials. Long-term impacts of each alternative would be cumulative with other actions that cause increases in similar constituents. However, the incremental contribution of the No Action Alternative, Alternative 1, or Alternative 2 to long-term cumulative impacts would be negligible because

- Most training and testing activities are widely dispersed in space and time;
- Most components of expended materials are inert or corrode slowly;

- Numerically, most of the metals expended are small- and medium-caliber projectiles, metals of concern comprise a small portion of the alloys used in expended materials, and metal corrosion is a slow process that allows for dilution;
- Most of the components are subject to a variety of physical, chemical, and biological processes that render them benign; and
- Potential areas of impacts would be limited to small zones immediately adjacent to the explosive, metals, or chemicals other than explosives.

Furthermore, none of the alternatives would result in long-term and widespread changes in environmental conditions, such as nutrient loading, turbidity, salinity, or pH (a measure of the degree to which a solution is either acidic [pH less than 7.0] or basic [pH greater than 7.0]). Based on the analysis presented in Section 3.1 (Sediments and Water Quality) and the reasons summarized above, the changes in sediment or water quality would be measurable, but would still be below applicable standards and guidelines; therefore the incremental contribution of Alternatives 1 and 2 to cumulative impacts would be low and further analysis of cumulative impacts is not warranted.

4.4.3 Air Quality

As detailed in Section 3.2 (Air Quality), increased training and testing activities conducted under Alternatives 1 and 2 would result in increased criteria pollutant emissions and hazardous air pollutant emissions throughout the Study Area. Sources of the increased emissions would include vessels and aircraft, and to a lesser extent munitions. Potential impacts include localized and temporarily elevated pollutant concentrations. Recovery would occur quickly as emissions disperse, and there would be no significant impact on air quality. The impacts of Alternatives 1 or 2 would be cumulative with other actions that involve criteria air pollutant and hazardous air pollutant emissions. However, the incremental contribution of Alternatives 1 or 2 to cumulative impacts would be low for the following reasons:

- Prevailing winds along the Pacific coast generally trend east to west, thus reducing the likelihood that offshore emissions would impact air quality control regions ashore.
- For those proposed activities occurring at latitudes consistent with air quality control region nonattainment or maintenance areas in the Southern California region, most training and testing-related emissions are projected to occur at distances greater than 12 nautical miles (nm) from shore.
- Few stationary offshore air pollutant emission sources exist within the Study Area and few are expected in the foreseeable future.
- International regulations by the International Maritime Organization require commercial shipping vessels to switch to lower-sulfur fuel near U.S. and international coasts beginning in 2012 (National Oceanic and Atmospheric Administration 2011a). The Department of Defense has released the Operational Energy Strategy: Implementation Plan which will reduce demand, diversify energy sources, and integrate energy consideration into planning (Department of Defense 2012). The U.S. Department of the Navy policy commits to a reduction of oil consumption by 50 percent by 2015, 40 percent of the Navy's total energy will come from fossil fuel alternatives and 50 percent of its onshore energy will come from renewable sources by 2020 (Environmental and Energy Study Institute 2009, Paige 2009). Similar low-sulfur fuel regulations in California, including a voluntary state slowdown policy, were found to reduce several pollutants, including sulfur dioxide and particulate matter by as much as 90 percent (Lack et al. 2011).

Based on the analysis presented in Section 3.2 (Air Quality) and the reasons summarized above, the incremental contribution of Alternatives 1 or 2 to cumulative impacts would be low. Further analysis of cumulative impacts on air quality is not warranted.

4.4.4 CLIMATE CHANGE

This section provides background information and an analysis of the cumulative impacts of climate change and greenhouse gas emissions for the Proposed Action. Climate change is also considered in the overall cumulative impacts analysis as another environmental consideration. The Intergovernmental Panel on Climate Change (2007) reports that physical and biological systems on all continents and in most oceans are already being affected by recent climate changes. Global-scale assessment of observed changes shows that it is likely that anthropogenic warming over the last three decades has had a discernible influence on many physical and biological systems. Some of the major potential concerns for the marine environment include

- Sea temperature rise
- Melting of polar ice
- Rising sea levels
- Changes to major ocean current systems
- Ocean acidification

4.4.4.1 Greenhouse Gases

Greenhouse gases are compounds that contribute to the greenhouse effect. The greenhouse effect is a natural phenomenon in which these gases trap heat within the surface-troposphere (lowest portion of the earth's atmosphere) system, causing heating (radiative forcing) at the surface of the earth. Scientific evidence indicates a trend of increasing global temperature over the past century due to an increase in greenhouse gas emissions from human activities (U.S. Environmental Protection Agency 2012). Without greenhouse gases the planet's surface would be about 60 degrees Fahrenheit (°F) cooler than present, according to the National Oceanic and Atmospheric Administration and National Aeronautics and Space Administration data the average surface temperature has increase by about 1.2 to 1.4°F since 1900. If greenhouse gases continue to increase, models predict that the average temperature at the earth's surface could increase from 2.0 to 11.5°F above the 1990 levels by the end of this century (Le Treut et al. 2007).

Predictions of long-term negative environmental impacts due to global warming include sea level rise, changing weather patterns with increases in the severity of storms and droughts, changes to local and regional ecosystems (including the potential loss of species), shrinking glaciers and sea ice, thawing permafrost, a longer growing season, and shifts in plant and animal ranges.

Over the next several decades, temperatures are projected to rise. The projected warming and more extensive climate-related changes could dramatically alter the region's economy, landscape, character, and quality of life (Le Treut et al. 2007).

In 2009, the United States generated about 6,633.2 teragrams (Tg) (or million metric tons) of carbon dioxide (CO_2) equivalents (U.S. Environmental Protection Agency 2012). The 2009 inventory data (U.S. Environmental Protection Agency 2012) show that CO_2, methane (CH_4), and nitrous oxide (N_2O) contributed from fossil fuel combustion processes from mobile and stationary sources (all sectors) include approximately:

- 5,505.2 Tg of CO_2
- 686.3 Tg CH_4
- 295.6 Tg N_2O

The 6,633.2 Tg CO_2 equivalent (CO_2e) generated in 2009 is a decrease from the 7,263.4 Tg CO_2e generated in 2007 (U.S. Environmental Protection Agency 2011). Among domestic transportation sources, light-duty vehicles (including passenger cars and light-duty trucks) represented 64 percent of CO_2 emissions, medium- and heavy-duty trucks 20 percent, commercial aircraft 6 percent, and other sources 9 percent. Across all categories of aviation, CO_2 emissions decreased by 21.6 percent (38.7 Tg) between 1990 and 2009. This includes a 59 percent (20.3 Tg) decrease in emission from domestic military operations. To place military aircraft in context with other aircraft CO_2 emissions, in 2009, commercial aircraft generated 111.4 Tg CO_2e, military aircraft generated 14.1 Tg CO_2e, and general aviation aircraft generated 13.3 Tg CO_2e. Military aircraft represent roughly 10 percent of emissions from the overall jet fuel combustion category (U.S. Environmental Protection Agency 2012).

This section begins by providing the background and regulatory framework for greenhouse gases. It then provides a quantitative evaluation of changes in greenhouse gas emissions that would occur under the Proposed Action and analyzes the cumulative impacts of greenhouse gas emissions.

4.4.4.1.1 Regulatory Framework

Federal agencies address emissions of greenhouse gases by reporting and meeting reductions mandated in laws, executive orders and policies. The most recent of these are Executive Order (EO) 13514 *Federal Leadership in Environmental, Energy, and Economic Performance* of 5 October 2009 and EO 13423 *Strengthening Federal Environmental, Energy, and Transportation Management* of 26 January 2007.

Executive Order 13514 shifts the way the government operates by (1) establishing greenhouse gases as the integrating metric for tracking progress in federal sustainability; (2) requiring a deliberative planning process; and (3) linking to budget allocations and Office of Management and Budget scorecards to ensure goal achievement.

The targets for reducing greenhouse gas emissions discussed in EO 13514 for Scope 1 (direct greenhouse gas emissions from sources that are owned or controlled by a federal agency) and Scope 2 (direct greenhouse gas emissions resulting from the generation of electricity, heat, or steam purchased by a federal agency) have been set for the Department of Defense at a 34 percent reduction of greenhouse gas from the 2008 baseline by 2020. Scope 3 targets (greenhouse gas emissions from sources not owned or directly controlled by a federal agency but related to agency activities such as vendor supply chains, delivery services, and employee travel and commuting) were set at a 13.5 percent reduction. Executive Order 13514 *Strategic Sustainability Performance Plan* submitted to the Council on Environmental Quality on 2 June 2010 contains a guide for meeting these goals.

Executive Order 13423 established a policy that federal agencies conduct their environmental, transportation, and energy-related activities in support of their respective missions in an environmentally economic way. It included a goal of improving energy efficiency and reducing greenhouse gas emissions of the agency through reduction of energy intensity by 3 percent annually through the end of FY 2015, or 30 percent by the end of FY 2015, relative to the baseline of the agency's energy use in FY 2003.

The *Draft NEPA Guidance on Consideration of the Impacts of Climate Change and Greenhouse Gas Emissions* (Council on Environmental Quality 2010) states that "if a proposed action would be reasonably anticipated to cause direct emissions of 25,000 metric tons or more of CO_2e greenhouse gas emissions on an annual basis, agencies should consider this an indicator that a quantitative and qualitative assessment may be meaningful to decision makers and the public." Because the impact of the Navy's Proposed Action exceeds 25,000 metric tons, a quantitative and quantitative assessment follows.

The Navy is committed to improving energy security and environmental stewardship by reducing reliance on fossil fuels. The Navy is actively developing and participating in energy, environmental, and climate change initiatives that will increase use of alternative energy and help conserve the world's resources for future generations. The Navy Climate Change Roadmap identifies actions the Environmental Readiness Division is taking to implement EO 13514 (U.S. Department of the Navy 2010). The Navy's Task Force Energy is responding to the Secretary of the Navy Energy Goals through energy security initiatives that reduce the Navy's carbon footprint. The Climate Change Roadmap (5-year roadmap) action items, objectives, and desired impacts are organized to focus on strategies, policies and plans; operations and training; investments; strategic communications and outreach; and environmental assessment and prediction.

4.4.4.1.2 Cumulative Greenhouse Gas Impacts

Climate change is a global issue, and greenhouse gas emissions are a concern from a cumulative perspective because individual sources of greenhouse gas emissions are not large enough to have an appreciable impact on climate change. This greenhouse gas analysis considers the incremental contribution of Alternatives 1 and 2 to total estimated U.S. greenhouse emissions and their significance on climate change as compared to the No Action Alternative.

To estimate total greenhouse gas emissions, each greenhouse gas was assigned a global warming potential; that is, the ability of a gas or aerosol to trap heat in the atmosphere. The global warming potential rating system is standardized to CO_2, which has a value of one. For example, CH_4 (methane) has a global warming potential of 21, which means that it has a global warming effect 21 times greater than CO_2 on an equal-mass basis (Intergovernmental Panel on Climate Change 2007). To simplify greenhouse gas analyses, total greenhouse gas emissions from a source are often expressed as CO_2e. The CO_2e is calculated by multiplying the emissions of each greenhouse gas by its global warming potential and adding the results together to produce a single, combined emission rate representing all greenhouse gases. While CH_4 and N_2O (nitrous oxide) have much higher global warming potentials than CO_2, CO_2 is emitted in much higher quantities, so it is the overwhelming contributor to CO_2e from both natural processes and human activities. Global warming potential-weighted emissions are presented in terms of equivalent emissions of CO_2, using units of Tg (1 million metric tons, or 1 billion kilograms) of carbon dioxide equivalents (Tg CO_2e).

Greenhouse gas emissions were calculated (Appendix D Air Quality Calculations) for ships and aircraft, which contribute the majority of emissions associated with training and testing in the Study Area. Greenhouse gas emissions from minor sources such as munitions, weapons platforms, and auxiliary equipment are considered negligible and were not calculated. Ship greenhouse gas emissions were estimated by determining annual ship fuel (typically diesel) use based on proposed activities and multiplying total annual ship fuel consumption by the corresponding emission factors for CO_2, CH_4, and N_2O. Aircraft greenhouse gas emissions were calculated by multiplying jet fuel use rates by the total operating hours, by the corresponding jet fuel emission factors for CO_2, CH_4, and N_2O, and by the total annual sorties. Ship and aircraft greenhouse gas emissions are compared to U.S. 2009 greenhouse gas emissions in Table 4.4-1. The estimated CO_2e emissions from the No Action Alternative and Alternative 1 are 0.030 percent of the total CO_2e emissions generated by the United States in 2009. The estimated CO_2e emissions from Alternative 2 would increase as a result of increased training and testing activities to about 0.031 percent of the total CO_2e emissions generated by the United States in 2009.

Based on the analysis presented in Section 3.2 (Air Quality) and the reasons summarized above, the changes in air quality would be measurable, but would still be below applicable standards and guidelines; therefore the incremental contribution of Alternatives 1 and 2 to cumulative impacts would be low and further analysis of cumulative impacts is not warranted.

Table 4.4-1: Comparison of Ship and Aircraft Greenhouse Gas Emissions to United States 2009 Greenhouse Gas Emissions

Alternative	Annual Greenhouse Gas Emissions (teragrams CO_2e)	Increase over the No Action Alternative	Percentage of U.S. 2009 Greenhouse Gas Emissions
No Action Alternative	1.89	N/A	0.030%
Alternative 1	1.94	2.6%	0.031%
Alternative 2	1.93	2.1%	0.031%
U.S. 2009 Greenhouse Gas Emissions	6,633.2		

Notes: CO_2e = carbon dioxide equivalent, N/A = Not Applicable, U.S. = United States
Source: U.S. Environmental Protection Agency 2011

4.4.5 Marine Habitats

The analysis presented in Section 3.3 (Marine Habitats) indicates that marine habitats could be affected by acoustic stressors (underwater detonations) and physical disturbance or strikes (interactions with vessels and in-water devices, military expended materials, or seafloor devices). Potential impacts include localized disturbance of the seafloor, cratering of soft bottom sediments, and structural damage to hard bottom habitats. Impacts on soft bottom habitats would be short-term, and impacts on hard bottom would be long-term. The impacts of Alternatives 1 and 2 would be cumulative with other actions that cause similar disturbances. However, the incremental contribution of Alternatives 1 or 2 to cumulative impacts would be low for the following reasons:

- Most of the proposed activities that might affect marine habitats would occur in areas where hard bottom does not occur.
- Impacts on soft bottom habitats would be confined to a limited area, and recovery would occur quickly.

Based on the analysis presented in Section 3.3 (Marine Habitats) and the reasons summarized above, the incremental contribution of Alternatives 1 and 2 to cumulative impacts would be low. Further analysis of cumulative impacts on marine habitats is not warranted.

4.4.6 Marine Mammals

4.4.6.1 Impacts of Alternatives 1 and 2 That May Contribute to Cumulative Impacts

Based on the analysis presented in Section 3.4 (Marine Mammals) impacts of Alternatives 1 and 2 that might contribute to cumulative impacts on marine mammals include mortality, injury (Level A harassment under the MMPA), and disturbance or behavioral modification (MMPA Level B harassment). Mortality or injury could be caused by underwater explosions or vessel strikes. Injury, in the form of permanent threshold shift (PTS), could also be caused by sonar use. Underwater explosions, pile driving, swimmer defense airguns, and sonar use would result in disturbance that meets the definition of MMPA Level A and B harassment. The remaining stressors analyzed in Section 3.4 (Marine Mammals) are not expected to result in mortality or Level A or B harassment. The incremental contribution of these remaining stressors to cumulative impacts on marine mammals would be negligible. These stressors are discussed in Section 3.4.3.1 through 3.4.3.7. The impacts of Alternatives 1 and 2 considered in the cumulative impacts analysis are summarized in Chapter 3, Section 3.4 (Marine Mammals).

4.4.6.2 Impacts of Other Actions

4.4.6.2.1 Overview

The potential impacts of other actions that are relevant to the cumulative impact analysis for marine mammals include the following:

- Mortality associated with vessel strikes, bycatch in fisheries, and entanglement in fishing and other gear
- Injury associated with vessel strikes, bycatch, entanglement, and underwater sound
- Disturbance, behavioral modifications, and reduced animal fitness associated with underwater noise
- Reduced animal fitness associated with water pollution

Most of the other actions and considerations retained for analysis in Table 4.3-1 would include operation of marine vessels. Exceptions include the actions listed under environmental regulations and permitting. Stressors associated with marine vessel operations that are of primary concern for the cumulative impacts analysis includes vessel strikes and underwater noise. Many of the actions would also result in underwater noise from sources other than vessels, including use of explosives for oil rig removal, seismic surveys, and construction activities. Rather than discussing these stressors for individual actions, their aggregate impacts are considered below as “other environmental considerations” in the maritime traffic and ocean noise subsections. Similarly, many of the actions would result in water pollution. The aggregate impacts of water pollution are addressed below in the ocean pollution section (Section 4.4.6.2.5). Bycatch is associated with commercial fishing, and the primary cause of entanglement is commercial fishing. Therefore, these stressors are discussed below in the commercial fishing section (Section 4.4.6.2.6).

4.4.6.2.2 Surveillance Towed Array Sensor System Low Frequency Active Sonar

Potential impacts on marine mammals from Surveillance Towed Array Sensor System Low Frequency Active Sonar operations include (1) nonauditory injury,[2] (2) permanent loss of hearing, (3) temporary loss of hearing, (4) behavioral change, and (5) masking. The potential effects from Surveillance Towed

[2] Nonauditory injury can be defined as not relating to or functioning in hearing (Merriam-Webster 2012); this includes mortality, strike, and lung injury.

Array Sensor System Low Frequency Active Sonar operations on any stock of marine mammals from injury (nonauditory or permanent loss of hearing) are considered negligible, and the potential effects on the stock of any marine mammal from temporary loss of hearing or behavioral change (significant change in a biologically important behavior) are considered minimal. Any auditory masking in marine mammals due to low-frequency active sonar signal transmissions is not expected to be severe and would be temporary. The operation of Surveillance Towed Array Sensor System Low Frequency Active Sonar with monitoring and mitigation would result in no mortality. The likelihood of low-frequency active sonar transmissions causing marine mammals to strand is negligible (U.S. Department of the Navy 2011b).

4.4.6.2.3 Maritime Traffic and Vessel Strikes

Vessel strikes have been and will continue to be a cause of marine mammal mortality and injury throughout the Study Area. A review of the impacts of vessel strikes on marine mammals is presented in Section 3.4.3.4.1 (Impacts from Vessels). In particular, certain large whales, such as the blue whale, are more prone to vessel strikes (Berman-Kowalewski et al. 2010; Betz et al. 2011). The most vulnerable marine mammals are thought to be those that spend extended periods at the surface or species whose unresponsiveness to vessel sound makes them more susceptible to vessel collisions (Gerstein 2002; Laist and Shaw 2006; Nowacek et al. 2004). Marine mammals such as dolphins, porpoises, and pinnipeds that can move quickly throughout the water column are not as susceptible to vessel strikes. Most vessel strikes of marine mammals reported involve commercial vessels and occur over or near the continental shelf (Laist et al. 2001). The literature review by Laist et al. (2001) concluded that vessel strikes likely have a negligible impact on the status of most whale populations, but that for small populations, vessel strikes may have considerable population-level impacts. The conservation status and abundance of the species struck would determine in large part whether the injury would have population-level impacts on that species (Laist et al. 2001; Vanderlaan and Taggart 2009).

In August 2011, the NMFS Southwest Regional Office provided the Navy with a data summary of all known or suspected ship strikes to marine mammals within California for the period 1988 to June 2011 (National Marine Fisheries Service 2011a). In order to look at a standardized period for the California data, a 20-year subset of the Southwest Regional Office stranding data from 1991 to 2010 was used for this analysis. Similar data for Hawaii was provided by the NMFS' Pacific Island Regional Office in the fall of 2011, and subsequently updated by the Pacific Island Regional Office in March 2012 to cover the period from 2003 to 2010.

In California, there were 86 large whale ship strikes over the 20-year period of the Southwest Regional Office data set analyzed (1991–2010). In looking at the 15-year interval from 1991 to 2005, however, average ship strikes were reported at the rate of three per year. Since 2006, and for the 5-year period from 2006 to 2010, there was an average of eight strikes reported per year.

It is unclear if the differences in pre and post 2006 averages are the result of increasing commercial ship traffic, increasing animal populations, changes in reporting, a statistical anomaly, or any combination of these factors. Some of this pattern of increase must be cautiously viewed in terms of how ship strike data is reported to the NMFS in California. NMFS stranding data is all reported via either self-reporting or from the California stranding network. Vessel-based reporting provides information about the type of ship and exact location where a strike occurred, but may potentially be lacking biological information on the whale struck (species, sex, length/age class, etc.). Stranding network reporting may provide more detailed biological information about the whale struck with determination of ship strike made based on injuries noted during necropsy, but not much may be known about the strike event itself (vessel type, location, ship speed, etc.). Additional temporal variation may arise from increased necropsies over the 20-year interval as more research is conducted to determine large whale mortality from stranded carcasses and from increased interest in the impacts of ship strike as a mortality source.

The California stranding network is composed of up to 17 regional partners throughout the state each with its own area of response and availability of resources. For instance, due to personnel staffing and resources on-hand, necropsies to determine ship strike may be more likely in one geographic region over another. In general, NMFS Southwest Regional Office believes that the state of interest is such that now most if not all of the California stranding network responders will attempt a large whale necropsy. But again over the 20-year time frame of the strike dataset, the percentages of ship strike reporting may have changed (i.e., increased) in some locations (Ms. Sarah Wilkin, Southwest Regional Office stranding coordinator; personal communication February 2012).

The most common species reported struck in the Southwest Regional Office data for all of California include gray whales (35 percent), blue whales (16 percent), fin whales (13 percent), humpback whales (9 percent), and sperm whales (1 percent). However, 25 percent of strikes were to species not identified (either unknown species or unidentified Balaenopterid) and these strikes could have been any of the above species including other large whale species (Bryde’s whale, minke whale, sei whale).

Within the portion of California containing the Navy’s SOCAL Range Complex and for the most part equivalent to Southwest Regional Office’s county listing for San Diego County, there were 23 whale strikes in the period from 1993 to 2010. There were no reported whale strikes from 1991 to 1992. Unknown whale species was the largest percentage of strikes (43 percent or n=10). Gray whales were the second most common (39 percent or n=9). Two fin whales were struck in 2009 by a Navy ship, but there have been no Navy ship strikes in the SOCAL Range Complex since 2009. Of the two blue whale strikes, one was struck by a research vessel in 2003 and the other by a Navy ship in 2004. The number and percentage of ship strikes to large whales in all of California by vessel category were: unknown type (43 percent or n= 37); Navy ship (19 percent or n=16); commercial ship (10 percent or n=9); recreational boat (7 percent or n=6); Coast Guard boat (6 percent or n=5); research vessel or tug (5 percent or n=4); ferry (3 percent or n=3); cruise ship (2 percent or n=2); whale watching boat (2 percent or n=2); and fishing boat (2 percent or n=2). It should be noted that U.S. Navy reports 100 percent of all Navy ship strikes to the NMFS. Only the Navy and the U.S. Coast Guard report vessel strike in this manner.

Therefore, these statistics are skewed by a lack of comprehensive reporting from all non-Navy vessels that may experience vessel strike. For instance, many of the unknown strikes (n=37 or 43 percent of total) may have been from commercial vessels or other non-Navy vessel types. Of the 16 reported Navy ship strikes, 15 occurred within the SOCAL Range Complex (San Diego County).

The Navy stratified the Southwest Regional Office 20-year data set to reflect the relative sub-region along the California coast where a given whale ship strike was reported. Four strata were used and strikes assigned to the most appropriate strata: SOCAL (area only containing SOCAL Range Complex which was mostly equivalent to San Diego County); SOCAL NORTH (area from SOCAL Range Complex northern boundary, including Orange County, Los Angeles County, and Ventura County to Point Conception—areas still within the Southern California Bight, but north and outside of the Study Area); Central California (area from Point Conception to San Francisco); and Northern California (from Marin County to the California-Oregon boundary).

Approximately 74 percent of all reported whale ship strikes occurred north and outside of the Study Area. By geographic sub-strata, the highest percentage of strikes (37 percent) was reported off the northern portion of Southern California (SOCAL NORTH), an area north of the HSTT boundary to Point Conception. This region includes the high volume commercial ship traffic ports of Los Angeles/Long Beach. The second highest percentage of ship strikes (31 percent) was off of central California which includes the commercial ship traffic ports of San Francisco/Oakland.

For the period from 2003 to 2010, there were 53 reported whale ship strikes in Hawaii. Approximately 94 percent of the 2003–2010 Hawaii ship strikes were to humpback whales (n=50), 4 percent to unknown species (n=2), and 2 percent to sperm whale (n=1). The number and percentage of ship strikes to large whales in Hawaii by vessel category were: unknown (34 percent or n=18); tour boat (26 percent or n=14); whale watching boat (9 percent or n=5); Navy ship (8 percent or n=4); research boat (6 percent or n=3); ferry (4 percent or n=2), fishing boat (4 percent or n=2); other non-specified boat (4 percent or n=2); recreational boat (2 percent or n=1); commercial ship (2 percent or n=1); and U.S. Coast Guard boat (2 percent or n=1). Island-specific ship strikes in Hawaii for the years 2003–2010 were: Maui (55 percent or n=29); Hawaii (13 percent or n=7); Kauai (9 percent or n=5); Lanai (9 percent or n=5); Oahu (8 percent or n=4) and at-sea within 300 nm of Hawaii (6 percent or n=3).

4.4.6.2.4 Ocean Noise

As summarized by the National Academies of Science, the possibility that anthropogenic sound could harm marine mammals or significantly interfere with their normal activities is an issue of concern (National Research Council of the National Academies 2005). Noise is of particular concern to marine mammals because many species use sound as a primary sense for navigating, finding prey, and communicating with other individuals. Noise can cause behavioral disturbances, mask other sounds (including their own vocalizations), result in injury, and in some cases, even lead to death (Tyack 2009a; Tyack 2009b, Würsig and Richardson 2008). Human-caused noises in the marine environment come from shipping, seismic and geologic exploration, military training, and other types of pulses produced by government, commercial, industry, and private sources. In addition, noise from whale-watching vessels near marine mammals has received a great deal of attention (Wartzok 2009).

Assessing whether a sound may disturb or injure a marine mammal involves understanding the characteristics of the acoustic sources, the marine mammals that may be present near the sound, and the effects that sound may have on the physiology and behavior of those marine mammals. Although it is known that sound is important for marine mammal communication, navigation, and foraging (National Research Council of the National Academies 2003, 2005), there are many unknowns in assessing the specific effects and significance of responses by marine mammals to sound exposures such as what activity the animal is engaged in at the time of the exposure (Nowacek et al. 2007, Southall et al. 2007). Potential impacts on marine mammals from ocean noise include behavioral reactions, hearing loss in the form of temporary threshold shift (TTS) or PTS, auditory masking, injury, and mortality. Section 3.4.3.1 (Acoustic Stressors) discusses these and other possible impacts of ocean noise on marine mammals.

4.4.6.2.5 Ocean Pollution

As discussed in Section 3.4.3 (Environmental Consequences), pollutants from multiple sources are present in, and continue to be released into, the oceans. Elevated concentrations of certain compounds have been measured in tissue samples from marine mammals. Long-term exposure to pollutants poses potential risks to the health of marine mammals, although for the most part, the impacts are just starting to be understood (Reijnders et al. 2008). Section 3.4.3 (Environmental Consequences) provides an overview of these potential impacts, which include organ anomalies and impaired reproduction and immune function (Reijnders et al. 2008).

If the health of an individual marine mammal were compromised by long-term exposure to pollutants, it is possible that this condition could alter the animal's expected response to stressors associated with Alternatives 1 and 2. The behavioral and physiological responses of any marine mammal to a potential stressor, such as underwater sound, could be influenced by a number of other factors, including disease, dietary stress, body burden of toxic chemicals, energetic stress, percentage body fat, age, reproductive state, size, and social position. Synergistic impacts are also possible. For example, animals exposed to some chemicals may be more susceptible to noise-induced loss of hearing sensitivity (Fechter 2005). While the response of a previously stressed animal might be different than the response of an unstressed animal, there are no data available at this time to accurately predict how stress caused by various ocean pollutants would alter a marine mammal's response to stressors associated with Alternatives 1 and 2.

4.4.6.2.6 Commercial Fishing

Several commercial fisheries operate in the Study Area. Potential impacts from these activities include marine mammal injury and mortality from bycatch and entanglement. Fisheries have also resulted in profound changes to the structure and function of marine ecosystems that adversely affect marine mammals.

Eleven ports in Southern California contain both commercial and commercial passenger fishing vessel (commercial passenger fishing vessel; i.e., recreational) fishing fleets that use the ocean areas within the SOCAL Range Complex portion of the Study Area (U.S. Department of the Navy 2009). Commercial fishing occurs throughout the SOCAL Range Complex from near shore waters adjacent to the mainland and offshore islands, to offshore banks (e.g., Tanner and Cortes Banks), and waters in between. In recent years, the overall number of commercial fishing vessels has decreased which has been attributed to changes in environmental conditions, fishing regulations, and market forces (California Department of Fish and Game 2008a, b).

Between 1990 and 1999, the annual mean bycatch of marine mammals in U.S. fisheries was more than 6,000 animals, and most of these were killed in gill-net fisheries (Read et al. 2006). The impacts of bycatch on marine mammal populations vary based on removal rates, population size, and reproductive rates. Small populations with relatively low reproductive rates are most susceptible. Bycatch rates for about 12 percent of U.S. marine mammal stocks (almost all cetaceans) exceed their potential biological removal levels (Read 2008). The potential biological removal level is the number of animals that can be removed each year without preventing a stock from reaching or maintaining its optimal sustainable population level.

As discussed in Section 3.4.3.5 (Entanglement Stressors), entanglement in fishing gear is another major threat to marine mammals in the Study Area. In addition, overfishing of many fish stocks has resulted in significant changes in trophic structure, species assemblages, and pathways of energy flow in marine ecosystems (Jackson et al. 2001; Myers and Worm 2003; Pauly et al. 1998). These ecological changes may have important and likely adverse consequences for populations of marine mammals (DeMaster et al. 2001).

In summary, future commercial fishing activities in the Study Area are expected to result in significant impacts on some marine mammal species based on the relatively high injury and mortality rates associated with bycatch and entanglement. This mortality could result in or contribute to population declines for some species. Ecological changes brought about by commercial fishing are also expected to adversely impact marine mammals in the Study Area.

Along the U.S. west coast from 1982 to 2010 there have been 272 reported entangled whales (Saez et al. 2012). Entanglements were seen throughout the coast with concentrations near areas where there is higher human population. Identified entangling gear types have included: trap/pot, bottom set longline, and gillnets. Gillnets were the entangling gear type in the majority of reports pre-2000 (64 percent) and trap/pot are the majority post-2000 (45 percent). In the late 1990s, California gillnet regulations changed resulting in a shift and reduction of gillnet fishing effort. Gray and humpback whales are the most frequently reported entangled large whale species along the U.S. West. In California, there were a reported 150 gray whales, 47 humpback whales, 27 unidentified whales, 14 sperm whales, 6 minke whales, and 3 fin whales entangled in fishing gear (Saez et al. 2012). National Marine Fisheries Service provided the Navy with a further breakdown of 16 reported whale fishing gear entanglements within parts of Southern California overlapped by the Navy's SOCAL Range Complex from 2000 to 2011: 8 gray whales (50.0 percent), 3 humpback whales (18.8 percent), 2 unidentified whales (12.5 percent), 2 sperm whales (12.5 percent), and 1 fin whale (6.3 percent) (Saez 2012). National Marine Fisheries Service cautioned that these data represent locations where whales were sighted entangled and may or may not be near the actual location where the entanglement first occurred.

4.4.6.3 Cumulative Impacts on Marine Mammals

The current aggregate impacts of past, present actions and reasonably foreseeable future actions are expected to result in significant impacts on some marine mammal species in the Study Area. The impacts are considered significant because vessel strikes, bycatch, and entanglement associated with other actions are expected to result in relatively high rates of injury and mortality that could cause population declines in some species. Alternatives 1 and 2 could also result in injury and mortality to individuals of some marine mammal species from underwater explosions, sonar, and vessel strikes. Injury and mortality that might occur under Alternatives 1 and 2 would be additive to injury and mortality associated with other actions. However, the relative contribution of the Proposed Action to the overall injury and mortality would be low compared to other actions. While quantitative estimates of marine mammal mortality from other actions are not available, bycatch for cetaceans and pinnipeds in the United States accounted for 4,146 mortalities in 1999 (Read et al. 2006). Some of these mortalities likely occurred in the Study Area or affected individuals that used the Study Area seasonally.

Ocean noise associated with other actions (see Section 4.4.6.2.4, Ocean Noise) and acoustic stressors (underwater explosions and sonar) associated with Alternatives 1 and 2 could also result in additive behavioral impacts on marine mammals. Other future actions such as construction and operation of liquefied natural gas terminals, and wave and tidal energy facilities would be expected to result in MMPA Level B harassment. However, it is unlikely that these actions and underwater explosions or sonar use would overlap in time and space because these activities are dispersed and the sound sources are intermittent. Furthermore, most of these other actions are not compatible with or could interfere with training and testing activities that involve underwater explosions and sonar use. The Navy takes appropriate coordination and scheduling steps (described in Section 3.11, Socioeconomic Resources) to avoid activities that interfere with or are not compatible with training and testing.

It is likely that distant shipping noise, which is more universal and continuous, and sound associated with underwater explosions and sonar would overlap in time and space. However, there is no evidence indicating that the co-occurrence of shipping noise and sounds associated with underwater explosions and sonar use would result in harmful additive impacts on marine mammals.

As discussed in Section 4.4.6.2.5 (Ocean Pollution), the potential also exists for the impacts of ocean pollution and acoustic stressors associated with Alternatives 1 and 2 to be additive or synergistic. It is possible that the response of a previously stressed animal would be more severe than the response of an unstressed animal.

In summary, based on the analysis presented in Section 3.4 (Marine Mammals) the current aggregate impacts of past and present actions and reasonably foreseeable future actions are expected to result in significant impacts on some marine mammal species in the Study Area. Therefore, cumulative impacts on marine mammals would be significant without consideration of the impacts of Alternatives 1 or 2. Alternatives 1 and 2 would contribute to and increase cumulative impacts, but the relative contribution would be low compared to other actions. Further analysis of cumulative impacts on marine mammals is not warranted.

4.4.7 Sea Turtles

4.4.7.1 Impacts of Alternatives 1 and 2 That May Contribute to Cumulative Impacts

Impacts of Alternatives 1 and 2 that might contribute to cumulative impacts on sea turtles include mortality, injury, and short-term disturbance or behavioral modification. Mortality or injury could be caused by underwater explosions or vessel strikes. Injury, in the form of PTS, could also be caused by sonar use. Noninjurious impacts of underwater explosions and sonar use would include short-term disturbance or behavioral modification. The Navy's Endangered Species Act (ESA) determinations presented in Table 3.5-14 are "no effect" or "may affect, not likely to adversely affect" for the remaining stressors analyzed in Section 3.5 (Sea Turtles). The incremental contribution of these remaining stressors to cumulative impacts on sea turtles would be negligible. Therefore, these stressors are not considered further in the cumulative impacts analysis. The impacts of Alternatives 1 and 2 considered in the cumulative impacts analysis are summarized in Table 3.5-14 (Summary of Effects and Impact Conclusions: Sea Turtles).

4.4.7.2 Impacts of Other Actions

The potential impacts of other actions that are relevant to the cumulative impact analysis for sea turtles include the following:

- Mortality associated with vessel strikes, bycatch in fisheries, entanglement, and stressors associated with coastal development and human use of coastal environments (e.g., beach vehicular driving, power plant entrainment [sea turtles being caught in power plant outflow water], etc.)
- Injury associated with vessel strikes, bycatch, entanglement, and underwater sound
- Disturbance, behavioral modifications, and reduced animal fitness associated with underwater noise
- Reduced animal fitness associated with ocean pollution
- Habitat loss related to coastal development

Most of the other actions and considerations retained for analysis in Chapter 3, Section 3.5 (Sea Turtles) would include operation of marine vessels. Exceptions include the actions listed under environmental regulations and planning. Stressors associated with marine vessel operations that are of primary concern for the cumulative impacts analysis includes vessel strikes and underwater noise. Many of the actions would also result in underwater noise from sources other than vessels. Rather than discussing these stressors for individual actions, their aggregate impacts are considered below as "other environmental considerations" in maritime traffic (Section 4.4.6.2.3, Maritime Traffic and Vessel Strikes) and ocean noise (Section 4.4.6.2.4, Ocean Noise). Similarly, many of the actions would result in ocean pollution. The aggregate impacts of water pollution are addressed below in the ocean pollution section (see Section 4.4.6.2.5, Ocean Pollution). Bycatch is associated with commercial fishing, and the primary cause of entanglement is commercial fishing. Therefore, these stressors are discussed below in the commercial fishing section (Section 4.4.6.2.6, Commercial Fishing).

4.4.7.2.1 Surveillance Towed Array Sensor System Low Frequency Active Sonar

Sea turtles could be affected if they are inside the mitigation zone (180 dB sound field) during a Surveillance Towed Array Sensor System Low Frequency Active Sonar transmission. However, because received levels from Surveillance Towed Array Sensor System Low Frequency Active Sonar operations would be below 180 dB sound pressure level within 12 nm or greater distance of any coastlines and offshore biologically important areas, effects on a sea turtle stock could occur only if a significant portion of the stock encountered the Surveillance Towed Array Sensor System Low Frequency Active Sonar vessel in the open ocean. The potential for Surveillance Towed Array Sensor System Low Frequency Active Sonar operations to expose sea turtle stocks to injurious (nonauditory or PTS) sound levels or to cause TTS or behavioral changes is considered negligible because (U.S. Department of the Navy 2011b):

- Most sea turtle species inhabit the earth's oceanic temperate zones, where sound propagation is predominantly characterized by downward refraction (higher transmission loss, shorter range), rather than ducting (lower transmission loss, longer range), which is usually found in cold-water regimes.
- Sea turtle distribution and density are generally low at ranges greater than 12 nm from the coast.
- The Surveillance Towed Array Sensor System Low Frequency Active Sonar signal has a narrow bandwidth (approximately 30 Hz).
- The ship is always moving, and the system has a low duty cycle (estimated 7.5 percent), which means sea turtles would have less opportunity to be in the mitigation zone during a transmission.
- Visual monitoring mitigation is incorporated into the alternatives.

4.4.7.2.2 Maritime Traffic and Vessel Strikes

Maritime traffic has increased over the past 50 years, and continued increases are expected in the future. Vessel strikes have been and will continue to be a cause of sea turtle mortality and injury throughout portions of the Study Area where sea turtles regularly occur. Because of the wide dispersal of large vessels in open ocean areas and the widespread, scattered distribution of turtles at sea, strikes during open-ocean transits are unlikely.

Some vessel strikes would cause temporary reversible impacts, such as diverting the turtle from its previous activity or causing minor injury. A National Research Council report qualitatively ranked the relative importance of various mortality factors for sea turtles. Vessel strikes were ranked 10th, behind leading factors of shrimp trawling and other fisheries (National Research Council 1990). Major strikes would cause permanent injury or death from bleeding, infection, or inability to feed. Apart from the severity of the physical strike, the likelihood and rate of a turtle's recovery from a strike may be influenced by its age, reproductive state, and general condition. Much of what is written about recovery from vessel strikes is inferred from observing individuals some time after a strike. Numerous living sea turtles bear scars that appear to have been caused by propeller cuts or collisions with vessel hulls (Hazel et al. 2007, Lutcavage et al. 1997), suggesting that not all vessel strikes are lethal. Conversely, fresh wounds on some stranded animals may strongly suggest a vessel strike as the cause of death. The actual incidence of recovery versus death is not known, given available data.

4.4.7.2.3 Ocean Noise

Potential impacts on sea turtles from ocean noise include behavioral reactions, hearing loss in the form of TTS or PTS, auditory masking, injury, and mortality. Section 3.4.3.1 (Acoustic Stressors) discusses these and other possible impacts of ocean noise on marine mammals.

4.4.7.2.4 Ocean Pollution

Marine debris can also be a problem for sea turtles through entanglement or ingestion. Sea turtles can mistake debris for prey; one study found 37 percent of dead leatherbacks to have ingested various types of plastic (Mrosovsky et al. 2009). Other marine debris, including abandoned fishing gear and cargo nets, can entangle and drown turtles in all life stages.

4.4.7.2.5 Commercial Fishing

Bycatch is one of the most serious threats to the recovery and conservation of sea turtle populations (National Research Council 1990, Wallace et al. 2010). Among fisheries that incidentally capture sea turtles, certain types of trawl, gillnet, and longline fisheries generally pose the greatest threat. One comprehensive study estimated that worldwide, 447,000 turtles are killed each year from bycatch in commercial fisheries (Wallace et al. 2010).

Other fisheries that result in sea turtle bycatch in the Study Area include pelagic fisheries for swordfish, tuna, shark, and billfish; purse seine fisheries for tuna; commercial and recreational rod and reel fisheries; gillnet fisheries for shark; driftnet fisheries; and bottom longline fisheries (National Marine Fisheries Service 2009).

4.4.7.2.6 Coastal Development

Coastal development and increased human populations in coastal areas will continue to have impacts on sea turtles such as nesting beach habitat degradation, beach vehicular driving, beach lighting, power plant entrainment, and degradation of nearshore water quality and seagrass beds (see Section 3.5, Sea Turtles, for more information on impacts on sea turtles).

4.4.7.2.7 Cumulative Impacts on Sea Turtles

The current aggregate impacts of past, present and reasonably foreseeable future actions are expected to result in impacts on sea turtles. These aggregate impacts include those from bycatch, vessel strikes, entanglement and other stressors associated with other actions, which are expected to result in high rates of injury and mortality that could cause population declines to ESA-listed species or inhibit species recovery. Alternatives 1 and 2 could also result in injury and mortality to individual sea turtles from underwater explosions, sonar, and vessel strikes. Injury and mortality that might occur under Alternatives 1 and 2 would be additive to injury and mortality associated with other actions. However, the relative contribution of Alternatives 1 and 2 to the overall injury and mortality would be low compared to other actions. A total of four potential sea turtle mortalities per year are estimated for the No Action Alternative and five for Alternatives 1 and 2 (see Tables 3.5-9 through 3.5-13).

Ocean noise associated with other actions and acoustic stressors (underwater explosions and sonar) associated with Alternatives 1 and 2 could also result in additive behavioral impacts on sea turtles. Other future actions such as construction and operation of liquefied natural gas terminals, and wave and tidal energy facilities would be expected to result in similar impacts. However, it is unlikely that these actions and underwater explosions or sonar use would overlap in time and space because all of these activities are widespread and the sound sources are intermittent. Furthermore, most of these other actions are not compatible with or could interfere with training and testing activities that involve underwater explosions and sonar use. The Navy takes appropriate steps to avoid activities that interfere with or are not compatible with training and testing.

It is likely that distant shipping noise (which is more pervasive and continuous) and sound associated with underwater explosions and sonar would overlap in time and space. However, there is no evidence indicating that the co-occurrence of shipping noise and sounds associated with underwater explosions and sonar use would result in harmful additive impacts on sea turtles.

The potential also exists for the impacts of ocean pollution and acoustic stressors associated with Alternatives 1 and 2 to be additive or synergistic. It is possible that the response of a previously stressed animal would be more severe than the response of an unstressed animal. However, there are no data indicating that a sea turtle affected by ocean pollution would be more susceptible to stressors associated with Alternatives 1 and 2.

In summary, based upon the analysis in Section 3.5 (Sea Turtles) past and present actions and reasonably foreseeable future actions are expected to result in impacts on sea turtles. Therefore, impacts on sea turtles would occur without consideration of the impacts of Alternatives 1 and 2. Alternatives 1 and 2 would contribute to and increase cumulative impacts, but the relative contribution would be low compared to other actions. Further analysis of cumulative impacts on sea turtles is not warranted.

4.4.8 SEABIRDS

The analysis in Section 3.6 (Seabirds) indicates that birds could be affected by acoustic stressors (tactical acoustic sonar, other acoustic devices, pile driving, underwater explosions, weapons firing noise, aircraft noise, vessel noise), energy stressors (electromagnetic, lasers), physical disturbance and strikes (aircraft, vessels and in-water devices, military expended materials), and ingestion (military expended materials). Potential responses would include a startle response, which includes short-term behavioral (i.e., movement) and physiological components (i.e., increased heart rate). Recovery from the impacts of most stressor exposures would occur quickly, and impacts would be localized. Some stressors, including underwater explosions, physical strikes, and ingestion of military expended materials, could result in mortality. However, the number of individual birds affected would be low, and no population-level impacts are expected. The impacts of Alternatives 1 and 2 would be cumulative with other actions that cause short-term behavioral and physiological impacts and mortality to birds, such as ingestion and entanglement in marine debris. However, the incremental contribution of Alternatives 1 or 2 to cumulative impacts on birds would be low for the following reasons:

- Most of the proposed activities would be widely dispersed in offshore areas where bird distribution is patchy and concentrations of individuals are low. Therefore, the potential for interactions between birds and training and testing activities is low. It is unlikely that training and testing activities would influence nesting because most activities take place in water and away from nesting habitats on land. Alternatives 1 and 2 would not result in destruction or loss of nesting habitat.

- For most stressors, impacts would be short term and localized, and recovery would occur quickly.
- While a limited amount of mortality could occur, no population level impacts would be expected.
- Alternatives 1 and 2 are not likely to adversely affect ESA-listed bird species.

Based on the analysis in Section 3.6 (Seabirds) and the reasons summarized above, the incremental contribution of Alternatives 1 and 2 to cumulative impacts would be negligible. Further analysis of cumulative impacts on birds is not warranted.

4.4.9 Marine Vegetation

The analysis presented in Section 3.7 (Marine Vegetation) indicates that marine vegetation could be affected by acoustic stressors (underwater explosions) and physical stressors (interactions with vessels and in-water devices, military expended materials, or seafloor devices). Potential impacts include localized disturbance and mortality. Recovery would occur quickly, and population level impacts are not anticipated. The impacts of Alternatives 1 or 2 would be cumulative with other actions that cause disturbance and mortality of marine vegetation. However, the incremental contribution of Alternatives 1 and 2 to cumulative impacts would be low for the following reasons:

- Most of the proposed activities would occur in areas where seagrasses and other attached marine vegetation do not grow.
- Impacts would be localized, recovery would occur quickly, and no population level impacts would be expected.
- Alternatives 1 and 2 would not result in impacts that have been historically significant to marine vegetation. For example, Alternatives 1 and 2 would not increase nutrient loading, which can cause algal blooms, decrease light penetration, and impact photosynthesis of seagrasses. Furthermore, Alternatives 1 and 2 would not result in long-term or widespread changes in environmental conditions, such as turbidity, salinity, pH, or water temperature that could impact marine vegetation.
- The Proposed Action would have no effect on ESA-listed species of marine vegetation and would not result in the destruction or adverse modification of critical habitat.

Based on the analysis presented in Section 3.7 (Marine Vegetation) and the reasons summarized above, the incremental contribution of Alternatives 1 and 2 to cumulative impacts would be low. Further analysis of cumulative impacts on marine vegetation is not warranted.

4.4.10 Marine Invertebrates

The analysis presented in Section 3.8 (Marine Invertebrates), indicates that marine invertebrates could be affected by acoustic stressors (tactical acoustic sonar, other acoustic devices, pile driving, underwater explosions, weapons firing noise, aircraft noise, vessel noise), electromagnetic stressors, physical disturbance or strikes (vessels and in-water devices, military expended materials, seafloor devices), entanglement (fiber-optic cables and guidance wires, parachutes), and ingestion (military expended materials). Potential impacts include short-term behavioral and physiological responses. Some stressors could also result in injury or mortality to a relatively small number of individuals, but not to ESA-listed corals. No population-level impacts are anticipated. Stressors from Alternatives 1 and 2 would have no effect or would be not likely to adversely affect ESA-listed corals.

Based upon the analysis in Section 3.8 (Marine Invertebrates) the invertebrate mortality impacts of Alternatives 1 and 2 would be cumulative with other actions that cause mortality (e.g., commercial fishing). However, the incremental contribution of Alternatives 1 and 2 to cumulative impacts would be negligible. Therefore, further analysis of cumulative impacts on marine invertebrates is not warranted.

4.4.11 FISH

The analysis presented in Section 3.9 (Fish) indicates that fishes could be affected by acoustic stressors (tactical acoustic sonar, other acoustic devices, pile driving, underwater explosions, weapons firing noise, aircraft noise, vessel noise), electromagnetic stressors, physical disturbance or strikes (vessels and in-water devices, military expended materials, seafloor devices), entanglement (fiber-optic cables and guidance wires, parachutes), and ingestion (military expended materials). Potential impacts include short-term behavioral and physiological responses. Some stressors could also result in injury or mortality to a relatively small number of individuals, but not to ESA-listed fishes. No population level impacts are anticipated. Stressors from Alternatives 1 and 2 would have no effect or would be not likely to adversely affect ESA-listed fishes.

Based upon the analysis presented in Section 3.9 (Fish), the fish mortality impacts of Alternatives 1 and 2 would be cumulative with other actions that cause mortality (e.g., commercial fishing). However, the incremental contribution of Alternatives 1 and 2 to cumulative impacts would be negligible. Therefore, further detailed analysis of cumulative impacts on fishes is not warranted.

4.4.12 CULTURAL RESOURCES

4.4.12.1 Impacts of Alternatives 1 and 2 That May Contribute to Cumulative Impacts

As discussed in Section 3.10 (Cultural Resources), no impacts on submerged prehistoric sites or previously unidentified submerged historic resources are expected. Testing and training would continue only in areas currently utilized for these activities. As a result, effects on cultural resources are not anticipated within U.S. territorial waters because measures have been previously implemented to protect these resources.

The Navy routinely avoids locations of known obstructions to prevent damage to sensitive Navy equipment and vessels and to ensure the accuracy of training and testing exercises. Known obstructions include some historic shipwrecks.

4.4.12.2 Impacts of Other Actions

With a few exceptions, most of the other actions retained for cumulative impacts analysis (see Table 4.3-1) would involve some form of disturbance to the ocean bottom. Exceptions include environmental regulations and planning actions, ocean pollution, and most forms of ocean noise. Actions that would disturb the ocean bottom could impact submerged cultural resources. For example, ocean bottom disturbance would occur from construction related activities such as installation of offshore natural gas terminals and pipelines, ship anchoring, and installation of wind turbine piers and excavation of cable trenches. Any physical disturbance on the continental shelf and ocean floor could inadvertently damage or destroy submerged prehistoric sites and submerged historic resources. Excavation such as pipeline installation for liquefied natural gas terminals could disrupt the horizontal patterning and vertical stratigraphy of submerged prehistoric sites and submerged historic resources.

The other actions that result in ocean bottom disturbance require some form of federal authorization or permitting. Therefore, requirements of the National Historic Preservation Act apply to actions in territorial waters. Federal agency procedures have been implemented to identify cultural resources, avoid impacts, and mitigate if impacts cannot be avoided. For example, the Bureau of Ocean Energy Management, Regulation and Enforcement has procedures in place to identify the probability for the presence of submerged historic resources and the locations submerged prehistoric sites shoreward from the 148 ft. (45.1 m) isobath, and for project redesign and relocation to avoid identified resources (Minerals Management Service 2007).

4.4.12.3 Cumulative Impacts on Cultural Resources

Impacts on submerged cultural resources from other actions would typically be avoided or mitigated through implementing federal agency programs. Disturbance or destruction of submerged prehistoric sites would diminish the overall archaeological record and decrease the potential for meaningful research on Paleoindian (late Pleistocene) and Early Archaic (early Holocene) occupations. Disturbance or destruction of submerged historic sites, including shipwrecks, would diminish the overall record for these resources and decrease the potential for meaningful research on these resources. Based upon the analysis in Section 3.10 (Cultural Resources), when considered with other actions, Alternatives 1 and 2 would contribute to and increase the cumulative impacts on submerged prehistoric and historic resources. Further analysis of cumulative impacts on cultural resources is not warranted.

4.4.13 Socioeconomics

The analysis in Section 3.11 (Socioeconomic Resources) indicates that the impacts of Alternatives 1 and 2 on socioeconomic resources would be negligible. Alternatives 1 and 2 are not expected to contribute incrementally to cumulative socioeconomic impacts. Therefore, further analysis of cumulative impacts on socioeconomic resources is not warranted.

4.4.14 Public Health and Safety

The analysis presented in Section 3.12 (Public Health and Safety) indicates that the impacts of Alternatives 1 and 2 on public health and safety would be negligible. Alternatives 1 and 2 are not expected to contribute incrementally to cumulative health and safety impacts. Therefore, further analysis of cumulative impacts on public health and safety is not warranted.

4.5 Summary of Cumulative Impacts

Marine mammals and sea turtles are the primary resources of concern for cumulative impacts analysis:

- Past human activities have impacted these resources to the extent that several marine mammal species and all sea turtles species occurring in the Study Area are ESA-listed.
- These resources would be impacted by multiple ongoing and future actions.
- Explosive detonations and vessel strikes under the No Action Alternative, Alternative 1, and Alternative 2 have the potential to disturb, injure, or kill marine mammals and sea turtles.

The aggregate impacts of past, present, and other reasonably foreseeable future actions are expected to result in significant impacts on some marine mammal and all sea turtle species in the Study Area. The No Action Alternative, Alternative 1, or Alternative 2 would contribute to cumulative impacts, but the relative contribution would be low compared to other actions. Compared to potential mortality, strandings, or injury resulting from Navy training and testing activities, marine mammal and sea turtle mortality and injury from bycatch, commercial vessel ship strikes, entanglement, ocean pollution, and other human causes are estimated to be orders of magnitude greater (hundreds of thousands of animals versus tens of animals) (Culik 2004, International Council for the Exploration of the Sea 2005, Read et al. 2006).

The analyses presented in this chapter and Chapter 3 (Affected Environment and Environmental Consequences) indicate that the incremental contribution of the No Action Alternative, Alternative 1, or Alternative 2 to cumulative impacts on sediments and water quality, air quality, marine habitats, birds, marine vegetation, marine invertebrates, fish, socioeconomic resources, and public health and safety would be negligible. When considered with other actions, the No Action Alternative, Alternative 1, or Alternative 2 might contribute to cumulative impacts on submerged prehistoric and historic resources, if such resources are present in areas where bottom-disturbing training and testing activities take place. The No Action Alternative, Alternative 1, or Alternative 2 would also make an incremental contribution to greenhouse gas emissions, representing approximately 0.030 percent, 0.031 percent, and 0.031 percent of U.S. 2009 greenhouse gas emissions, respectively.

REFERENCES

Andrew, R. K., Howe, B. M. & Mercer, J. A. (2002). Ocean ambient sound: Comparing the 1960s with the 1990s for a receiver off the California coast. *Acoustics Research Letters Online, 3*(2). 10.1121/1.1461915.

Berman-Kowalewski, M., Gulland, F. M. D., Wilkin, S., Calambokidis, J., Mate, B., Cordaro, J., Dover, S. (2010). Association Between Blue Whale (*Balaenoptera musculus*) Mortality and Ship Strikes Along the California Coast. *Aquatic Mammals, 36*(1), 59-66. 10.1578/am.36.1.2010.59

Betz, S., Bohnsack, K., Callahan, A. R., Campbell, L. E., Green, S. E. & Labrum, K. M. (2011). *Reducing the Risk of Vessel Strikes to Endangered Whales in the Santa Barbara Channel: An Economic Analysis and Risk Assessment of Potential Management Scenarios.* (A group project submitted in partial satisfaction of the requirements for the degree of Master of Environmental Science and Management). Bren School of Environmental Science & Management, University of California, Santa Barbara.

Boesch, D., Anderson, D., Horner, R., Shumway, S., Tester, P. & Whitledge, T. (1997). Harmful Algal Blooms in Coastal Waters: Options for Prevention, Control and Mitigation *Special Joint Report with the National Fish and Wildlife Foundation*. (pp. 61) National Oceanic and Atmospheric Administration.

Bureau of Ocean Energy Management. (2011). Proposed Outer Continental Shelf Oil & Gas Leasing Program 2012-2017. (pp. 217) U.S. Department of the Interior.

California Department of Fish and Game. (2008a). Average Annual Commercial Landings of Fish and Invertebrates and Value Within the SOCAL Range (2002-2007).

California Department of Fish and Game. (2008b). Digest of California Fishing Laws and Licensing Requirements.

Center for Climate and Energy Solutions. (2012). Hydrokinetic Electric Power Generation. [Fact Sheet]. Retrieved from http://www.c2es.org/technology/factsheet/Hydrokinetic, March 4, 2012.

Connolly, N., Buchanan, C., O'Connell, M., Cronin, M., O'Mahony, C. & Sealy, H. (2001). Assessment of Human Activity in the Coastal Zone A research project linking Ireland and Wales M. Institute (Ed.), *Maritime INTERREG Series*. (pp. 136) Coastal Resources Centre.

Council on Environmental Quality. (1997). Considering Cumulative Effects Under the National Environmental Policy Act. (pp. 5).

Culik, B. (2004). Review of Small Cetaceans Distribution, Behaviour, Migration and Threats. (pp. 343) United National Environment Programme (UNEP) and the Secretariate of the Convention on the Conservation of Migratory Species of Wild Animals.

Davison, P. & Asch, R. G. (2011). Plastic ingestion by mesopelagic fishes in the North Pacific Subtropical Gyre. *Marine Ecological Progress Series, 432*, 173-180.

DeMaster, D. P., Fowler, C. W., Perry, S. L. & Richlen, M. F. (2001). Predation and competition: The impact of fisheries on marine-mammal populations over the next one hundred years. *Journal of Mammalogy, 82*(3), 641–651.

Department of Defense. (2012). Operational Energy Strategy: Implementation Plan. (pp. 28). Washington, D.C. Prepared by Assistant Secretary of Defense for Operational Energy Plans & Programs.

Environmental and Energy Study Institute. (2009). Navy Announces Goals to Reduce Energy Demand, Increase Renewable Supply. In *Educating Congress on energy efficiency and renewable energy; advancing innovative policy solutions,*. Retrieved from http://www.eesi.org/102609_navy

Fechter, L. D. (2005). Ototoxicity. *Environmental Health Perspectives, 113*(7), 443–444.

Federal Energy Regulatory Commission. (2011). Existing and proposed terminals. Retrieved from http://ferc.gov/industries/gas/indus-act/lng.asp, 2011, September 16.

Gerstein, E. R. (2002). Manatees, bioacoustics and boats: hearing tests, environmental measurements and acoustic phenomena may together explain why boats and animals collide. *American Scientist, 90*(2), 154-163. doi: 10.1511/2002.2.154

Harriott, V. J. (2002). Marine tourism impacts and their management on the Great Barrier Reef C. R. R. Centre (Ed.). (pp. 41). Research Centre, Townsville: James Cook University. Available from www.reef.crc.org.au

Hazel, J., Lawler, I., Marsh, H. & Robson, S. (2007, October). Vessel speed increases collision risk for the green turtle *Chelonia mydas*. [Electronic Version]. *Endangered Species Research, 3*, 105-113. Retrieved from www.int-res.com

Hildebrand, J. (2004). Sources of Anthropogenic Sound in the Marine Environment, *International Policy Workshop on Sound and Marine Mammals* (pp. 38). London.

Intergovernmental Panel on Climate Change. (2007). Technical Summary.

International Council for the Exploration of the Sea. (2005). Ad-Hoc Group on the Impact of Sonar on Cetaceans. (pp. 50).

Jackson, J. B. C., Kirby, M. X., Berger, W. H., Bjorndal, K. A., Botsford, L. W., Bourque, B. J, Warner, R. R. (2001, July 27). Historical Overfishing and the Recent Collapse of Coastal Ecosystems. *Science, 293*. Retrieved from www.sciencemag.org

Kildow, J. & Colgan, C. S. (2005). California's Ocean Economy Report to the Resources Agency, State of California *National Ocean Economics Program*. (pp. 167). Prepared by The National Ocean Economics Program.

Lack, D., Cappa, C. & Langridge, J. (2011). Impact of Fuel Quality Regulation and Speed Reductions on Shipping Emissions: Implications for Climate and Air Quality. *Environmental Science & Technology*. 10.1021/es2013424

Laist, D. W., Knowlton, A. R., Mead, J., Collet, A. & Podesta, M. (2001). Collisions between ships and whales. *Marine Mammal Science, 17*(1), 35-75.

Laist, D. W. & Shaw, C. (2006). Preliminary evidence that boat speed restrictions reduce deaths of Florida manatees. *Marine Mammal Science, 22*(2), 472-479. doi:10.1111/j.1748-7692.2006.00027.x

Law, K. L., Moret-Ferguson, S., Maximenko, N. A., Proskurowski, G., Peacock, E. E., Hafner, J. & Reddy, C. M. (2010, September 3). Plastic accumulation in the North Atlantic subtropical gyre. [Research Support, Non-U.S. Gov't Research Support, U.S. Gov't, Non-P.H.S.]. *Science, 329*(5996), 1185-1188. 10.1126/science.1192321 Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/20724586

Le Treut, H., Somerville, R., Cubasch, U., Ding, Y., Mauritzen, C., Mokssit, A., Prather, M. (2007). Historical Overview of Climate Change Science. In: S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor and H. L. Miller (Eds.), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 36). Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

Lutcavage, M., Plotkin, P., Witherington, B. & Lutz, P. (1997). Human impacts on sea turtle survival. In P. Lutz and J. A. Musick (Eds.), *The Biology of Sea Turtles* (Vol. 1, pp. 387–409). Boca Raton, FL: CRC Press.

Mato, Y., Isobe, T., Takada, H., Kanehiro, H., Ohtake, C. & Kaminuma, T. (2001). Plastic Resin Pellets as a Tranport Medium for Toxic Chemicals in the Marine Environment. *Environmental Science Technology, 35*, 318-324.

Merriam-Webster. (2012). Definition of NONAUDITORY. Retrieved from www.merriam-webster.com

Minerals Management Service. (2007). Gulf of Mexico OCS oil and gas lease sales: 2007–2012. Volume I: Chapters 1–8 and appendices. MMS 2007-018.

Mrosovsky, N., Ryan, G. D. & James, M. C. (2009). Leatherback turtles: The menace of plastic. *Marine Pollution Bulletin, 58*(2), 287-289. doi: 10.1016/j.marpolbul.2008.10.018

Myers, R. A. & Worm, B. (2003). Rapid worldwide depletion of predatory fish communities. *Nature, 423*, 280–283.

National Marine Fisheries Service. (2006). Marine debris: Impacts in the Gulf of Mexico.

National Marine Fisheries Service. (2009). Endangered Species Act Section 7 consultation: Biological opinion for U.S. Navy activities in the Northeast, Virginia Capes, Cherry Point, and Jacksonville.

National Marine Fisheries Service. (2011a). Unpublished data- California ship strike stranding records 1988-June 2011. Email from Ms. Sarah Wilkin, Regional Stranding Coordinator, Southwest Regional Office, Office of Protected Resources, National Marine Fisheries Service.

National Marine Fisheries Service. (2011b). Unpublished data- Hawaii ship strike stranding records Feb 2009- Feb 2010. Email from Regional Stranding Coordinator, Pacific Islands Regional Office, Office of Protected Resources, National Marine Fisheries Service.

National Oceanic and Atmospheric Administration. (2011a, Last updated September 12). NOAA-led study: Air pollution caused by ships plummets when vessels shift to cleaner, low-sulfur fuels.

National Oceanic and Atmospheric Administration. (2011b, Last updated 21 April 2011). Ocean, Great lakes and Coastal Research. In *Innovate, Incubate, Integrate NOAA Research,*. Retrieved from http://www.research.noaa.gov/oceans/, March 19, 2012.

National Oceanic and Atmospheric Administration. (2012). Overview of Marine Mammal Permits. In *Marine Mammal Permits and Authorizations*. Retrieved from http://www.nmfs.noaa.gov/pr/permits/mmpa_permits.htm, March 16, 2012.

National Research Council. (1990). *Monitoring Southern California's Coastal Waters* (pp. 15). Washington, D.C.: National Academy Press.

National Research Council of the National Academies. (2003). Ocean Noise and Marine Mammals. In Committee on Potential Impacts of Ambient Noise in the Ocean on Marine Mammals (Ed.), *Ocean Noise and Marine Mammals* (pp. 24): National Research Council of the National Academies.

National Research Council of the National Academies. (2005). Marine Mammal Populations and Ocean Noise Determining when Noise Causes Biologically Significant Effects. In National Research Council of the National Academies (Ed.). Washington DC: The National Academies Press.

Nowacek, D., Johnson, M. & Tyack, P. (2004). North Atlantic right whales (*Eubalaena glacialis*) ignore ships but respond to alerting stimuli. *Proceedings of the Royal Society of London, 271*(B), 227-231. 10.1098/rspb.2003.2570

Nowacek, D., Thorne, L. H., Johnston, D. & Tyack, P. (2007). Responses of cetaceans to anthropogenic noise. *Mammal Review, 37*(2), 81-115.

Ocean Conservation Society. (2012a). L.A. Dolphin Project 1. In *Los Angeles Dolphin Project Bottlenose Studies,*. Retrieved from http://www.oceanconservation.org/research/ladpone.htm, March 19, 2012.

Ocean Conservation Society. (2012b). L.A. Dolphin Project 2. In *Los Angeles Dolphin Project Aggregations,*. Retrieved from http://www.oceanconservation.org/research/ladptwo.htm, March 19, 2012.

Ocean Conservation Society. (2012c). L.A. Dolphin Project 3. In *Los Angeles Dolphin Project Pollution Studies,*. Retrieved from http://www.oceanconservation.org/research/ladpthree.htm, March 19, 2012.

Pacific Fishery Management Council. (2011, Last updated 22 March 2011). Wave, Tidal, and Offshore Wind Energy. In *Habitat and Communities*. Retrieved from http://www.pcouncil.org/habitat-and-communities/wave-tidal-and-offshore-wind-energy/

Paige, P. (2009). SECNAV Outlines Five 'Ambitious' Energy Goals, *U.S. Navy Today*.

Pauly, D., Christensen, V., Guenette, S., Pitcher, T. J., Sumaila, U. R., Walters, C. J., Zeller, D. (1998). Towards sustainability in world fisheries. *Nature, 418*, 689–695.

Read, A. J. (2008). The looming crisis: Interactions between marine mammals and fisheries. *Journal of Mammalogy, 89*(3), 541-548.

Read, A. J., Drinker, P. & Northridge, S. (2006). Bycatch of marine mammals in U.S. and global fisheries. *Conservation Biology, 20*(1), 163–169.

Reijnders, P. J. H., Aguilar, A. & Borrell, A. (2008). Pollution and marine mammals. In W. F. Perrin, B. Wursig and J. G. M. Thewissen (Eds.), *Encyclopedia of Marine Mammals* (2nd ed., pp. 890-898). San Diego, CA: Academic Press.

Richardson, W. J., Greene, C. R., Jr., Malme, C. I. & Thomson, D. H. (1995). Marine Mammals and Noise (pp. 576). San Diego, CA: Academic Press.

Saez, L. (2012). National Marine Fisheries Service.

Saez, L., Lawson, D., DeAngelis, M., Wilkin, S., Petras, E. & Fahy, C. (2012). Co-occurrence of Large Whales and Fixed Commercial Fishing Gear: California, Oregon, and Washington (Poster), *Southern California Marine Mammal Workshop*. Newport Beach, California.

Scripps Institution of Oceanography. (2012a, Last updated 11 January 2012). Around the Pier: Government Funding Supports New Scripps Ship and Vital Seagoing Research. Retrieved from http://explorations.ucsd.edu/around-th-pier/2012/around-th-pier-government-funding-su... March 19, 2012.

Scripps Institution of Oceanography. (2012b, Last updated 27 February 2012). Cables Spanning Pacific Ocean Seafloor to Give Ocean Science a New Edge. Retrieved from http://scrippsnews.ucsd.edu/Releases/?releaseID-1248, March 19, 2012.

Scripps Institution of Oceanography. (2012c, Last updated 28 February 2012). Navy Selects Shipyard to Build Scripps' New State-of-the-art Research Vessel. Retrieved from http://scrippsnews.ucsd.edu/Releases/?releaseID=1249, March 19, 2012.

Southall, B., Bowles, A., Ellison, W., Finneran, J., Gentry, R., Greene, C., Tyack, P. (2007). Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. *Aquatic Mammals, 33*(4), 122.

Tyack, P. (2009a). Acoustic playback experiments to study behavioral responses of free-ranging marine animals to anthropogenic sound. *Marine Ecology Progress Series, 395*, 13. 10.3354/meps08363

Tyack, P. (2009b). Human-generated sound and marine mammals. *Physics Today*, 39–44.

U.S. Department of the Navy. (2008a). Fact Sheet - Submarine Drive-In Magnetic Silencing Facility (MSF) Beckoning Point, Oahu, Hawaii: Naval Facilities Engineering Command, Hawaii.

U.S. Department of the Navy. (2008b). Submarine Drive-In Magnetic Silencing Facility (MSF) Beckoning Point, Oahu, Hawaii [Fact Sheet]. Naval Facilities Engineering Command.

U.S. Department of the Navy. (2009). Southern California (SOCAL) Fisheries Study: Catch Statistics (2002-2007), Fishing Access, and Fishermen Perception. Newport. Prepared by N. U. W. Center.

U.S. Department of the Navy. (2010). Navy Climate Change Roadmap Task Force Climate Change and Oceanographer of the Navy (Eds.). (pp. 28).

U.S. Department of the Navy. (2011a). Cumulative Impacts. In *Draft Environmental Impact Statement Basing of MV-22 and H-1 Aircraft in Support of III MEF Elements in Hawaii* (pp. 40).

U.S. Department of the Navy. (2011b). Draft Supplemental Environmental Impact Statement/Supplemental Oversea Environmental Impact Statement for Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar. (pp. 372).

U.S. Department of the Navy. (2011c). Environmental Assessment and Finding of No Significant Impacts Helicopter Wings Realignment and MH-60R/S Helicopter Transition Naval Base Cornado, California. (pp. 321) U.S. Fleet Forces Command.

U.S. Department of the Navy. (2011d). Environmental Assessment MCON P-327 Pier 12 Replacement and Dredging Naval Base San Diego. (pp. 190). Prepared by Naval Facilities Engineering Command Southwest.

U.S. Department of the Navy. (2011e). Environmental Impact Statement for the Basing of MV-22 and H-1 Aircraft in Support of III Marine Expeditionary Force Elements in Hawaii *Fact Sheet*. (pp. 4).

U.S. Department of the Navy. (2012a). National Environmental Policy Act (NEPA) Environmental Assessment for the Proposed Installation and Operation of a Deep-Water Wave Energy Test Site Off North Beach at Marine Corps Base Hawaii (MCBH) Kaneohe Bay, Oahu, Hawaii. (pp. 7). Prepared by Commander Naval Facilities Engineering Services Center.

U.S. Department of the Navy. (2012b). Navy Publishes Notice of Availability of the Draft Environmental Assesment for Homeporting Littoral Combat Ships on the West Coast. (pp. 2). Prepared by Commander Navy Region Soutwest Public Affairs Office.

U.S. Environmental Protection Agency. (2011). Nonpoint source pollution. Retrieved from http://www.epa.gov/reg3wapd/nps/index.htm, 2011, January 31.

U.S. Environmental Protection Agency. (2012). DRAFT Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010. (pp. 470).

Union of Concerned Scientists. (2008). How Hydrokinetic Energy Works. In *Clean Energy*. Retrieved from http://www.ucsusa.org/clean_energy/technology_and_impacts/energy_technologies/how_

Vanderlaan, A. S. & Taggart, C. T. (2009). Efficacy of a Voluntary Area to Be Avoided to Reduce Risk of Lethal Vessel Strikes to Endangered Whales. *Conservation Biology, 23*(6), 1467-1474. 10.1111/j.1523-1739.2009.01329x

Wallace, B. P., Lewison, R. L., McDonald, S. L., McDonald, R. K., Kot, C. Y., Kelez, S., Crowder, L. B. (2010). Global patterns of marine turtle bycatch. *Conservation Letters, xx*, 1-12. doi: 10.1111/j.1755-236x.2010.00105.x

Wartzok, D. (2009). Marine mammals and ocean noise. In J. H. Steele, K. K. Turekian and S. A. Thorpe (Eds.), *Encyclopedia of Ocean Sciences* (2nd ed., Vol. 3, pp. 628-634). Boston, MA: Academic Press.

Würsig, B. & Richardson, W. J. (2008). Noise, effects of. In W. F. Perrin, B. Wursig and J. G. M. Thewissen (Eds.), *Encyclopedia of Marine Mammals* (2nd ed., pp. 765-773). San Diego, CA: Academic Press.

This Page Intentionally Left Blank

5 Standard Operating Procedures, Mitigation, and Monitoring

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

5 STANDARD OPERATING PROCEDURES, MITIGATION, AND MONITORING

This chapter describes the United States (U.S.) Department of the Navy (Navy) standard operating procedures, mitigation measures, and marine species monitoring and reporting efforts. Standard operating procedures are essential to maintaining safety and mission success, and in many cases have the added benefit of reducing potential environmental impacts. Mitigation measures are designed to help reduce or avoid potential impacts on marine resources. Marine species monitoring efforts are designed to track compliance with take authorizations, evaluate the effectiveness of mitigation measures, and improve understanding of the impacts of training and testing activities on marine resources within the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area).

5.1 STANDARD OPERATING PROCEDURES

Effective training, maintenance, research, development, testing, and evaluation (hereafter referred to collectively as the Proposed Action) require that participants utilize their sensors and weapon systems to their optimum capabilities as required by the activity objectives. The Navy currently employs standard practices to provide for the safety of personnel and equipment, including vessels and aircraft, as well as the success of the training and testing activities. For the purpose of this document, the Navy will refer to standard practices as standard operating procedures. Because of their importance for maintaining safety and mission success, standard operating procedures have been considered as part of the Proposed Action under each alternative, and therefore are included in the Chapter 3 (Affected Environment and Environmental Consequences) environmental analyses for each resource.

Navy standard operating procedures have been developed and refined over years of experience, and are broadcast via numerous naval instructions and manuals, including the following sources:

- Ship, submarine and aircraft safety manuals
- Ship, submarine and aircraft standard operating manuals
- Fleet Area Control and Surveillance Facility range operating instructions
- Fleet exercise publications and instructions
- Naval Sea Systems Command test range safety and standard operating instructions
- Navy instrumented range operating procedures
- Naval shipyard sea trial agendas
- Research, development, test and evaluation plans
- Naval gunfire safety instructions
- Navy planned maintenance system instructions and requirements
- Federal Aviation Administration regulations

In many cases there are incidental environmental, socioeconomic, and cultural benefits resulting from standard operating procedures. Standard operating procedures serve the primary purpose of providing for safety and mission success, and are implemented regardless of their secondary benefits. This is what distinguishes standard operating procedures, which are a component of the Proposed Action, from mitigation measures, which are designed entirely for the purpose of reducing environmental impacts resulting from the Proposed Action. Because standard operating procedures are crucial to safety and mission success, the Navy will not modify them as a way to further reduce impacts on environmental resources. Rather, mitigation measures will be used as the tool for avoiding and reducing potential environmental impacts. Standard operating procedures that are recognized as providing a potential secondary benefit are provided below.

5.1.1 VESSEL SAFETY

For the purposes of this chapter, the term 'ship' is inclusive of surface ships and surfaced submarines. The term 'vessel' is inclusive of ships and small boats (e.g., rigid-hull inflatable boats).

Ships operated by or for the Navy have personnel assigned to stand watch at all times, day and night, when moving through the water (underway). Watch personnel undertake extensive training in accordance with the U.S. Navy Lookout Training Handbook or civilian equivalent, including on-the-job instruction and a formal Personal Qualification Standard program (or equivalent program for supporting contractors or civilians), to certify that they have demonstrated all necessary skills (such as detection and reporting of floating or partially submerged objects). Watch personnel are composed of officers, enlisted men and women, and civilian equivalents. Their duties may be performed in conjunction with other job responsibilities, such as navigating the ship or supervising other personnel. While on watch, personnel employ visual search techniques, including the use of binoculars, using a scanning method in accordance with the U.S. Navy Lookout Training Handbook or civilian equivalent. After sunset and prior to sunrise, watch personnel employ night visual search techniques, which could include the use of night vision devices.

A primary duty of watch personnel is to detect and report all objects and disturbances sighted in the water that may be indicative of a threat to the ship and its crew, such as debris, a periscope, surfaced submarine, or surface disturbance. Per safety requirements, watch personnel also report any marine mammals sighted that have the potential to be in the direct path of the ship as a standard collision avoidance procedure. Because watch personnel are primarily posted for safety of navigation, range clearance, and man-overboard precautions, they are not normally posted while ships are moored to a pier. When anchored or moored to a buoy, a watch team is still maintained but with fewer personnel than when underway. When moored or at anchor, watch personnel may maintain security and safety of the ship by scanning the water for any indications of a threat (as described above).

While underway, Navy ships (with the exception of submarines) greater than 65 feet (ft.) (20 meters [m]) in length have at least two watch personnel; Navy ships less than 65 ft. (20 m) in length, surfaced submarines, and contractor ships have at least one watch person. While underway, watch personnel are alert at all times and have access to binoculars. Due to limited manning and space limitations, small boats do not have dedicated watch personnel, and the boat crew is responsible for maintaining the safety of the boat and surrounding environment.

All vessels use extreme caution and proceed at a "safe speed" so they can take proper and effective action to avoid a collision with any sighted object or disturbance, and can be stopped within a distance appropriate to the prevailing circumstances and conditions.

5.1.2 AIRCRAFT SAFETY

Pilots of Navy aircraft make every attempt to avoid large flocks of birds in order to reduce the safety risk involved with a potential bird strike.

5.1.3 LASER PROCEDURES

The following procedures are applicable to lasers of sufficient intensity to cause human eye damage.

5.1.3.1 Laser Operators

Only properly trained and authorized personnel operate lasers.

5.1.3.2 Laser Activity Clearance

Prior to commencing activities involving lasers, the operator ensures that the area is clear of unprotected or unauthorized personnel in the laser impact area by performing a personnel inspection or a flyover. The operator also ensures that any personnel within the area are aware of laser activities and are properly protected.

5.1.4 WEAPONS FIRING PROCEDURES

5.1.4.1 Notice to Mariners

A Notice to Mariners is routinely issued in advance of missile firing activities. A notice is also issued in advance of explosive bombing activities when they are conducted in an area that does not already have a standing Notice to Mariners. For activities involving large-caliber gunnery, the Navy evaluates the need to publish a Notice to Mariners based on the scale, location, and timing of the activity. More information on the Notices to Mariners is found in Section 3.12.2.1.1 (Sea Space).

5.1.4.2 Weapons Firing Range Clearance

The weapons firing hazard range must be clear of non-participating vessels and aircraft before firing activities will commence. The size of the firing hazard range is based on the farthest firing range capability of the weapon being used. All missile and rocket firing activities are carefully planned in advance and conducted under strict procedures that place the ultimate responsibility for range safety on the Officer Conducting the Exercise or civilian equivalent. All weapons firing is secured when cease fire orders are received from the Range Safety Officer or when the line of fire is endangering any object other than the designated target.

Pilots of Navy aircraft are not authorized to expend ordnance, fire missiles, or drop other airborne devices through extensive cloud cover where visual clearance of the air and surface area is not possible. The two exceptions to this requirement are: (1) when operating in the open ocean, air, and surface clearance through visual means or radar surveillance is acceptable; and (2) when the operational commander conducting the exercise accepts responsibility for the safeguarding of airborne and surface traffic.

During activities that involve recoverable targets (e.g., aerial drones), the Navy recovers the target and any associated parachutes to the maximum extent practicable consistent with operational requirements and personnel safety.

5.1.4.3 Target Deployment Safety

Firing exercises involving the integrated maritime portable acoustic scoring system are typically conducted in daylight hours in Beaufort number 4 conditions or better to ensure safe operating conditions during buoy deployment and recovery. The Beaufort sea state scale is a standardized measurement of the weather conditions, based primarily on wind speed. The scale is divided into levels from 0 to 12, with 12 indicating the most severe weather conditions (e.g., hurricane force winds). At Beaufort number 4, wave heights typically range from 3.5 to 5 ft. (1 to 1.5 m).

5.1.5 SWIMMER DEFENSE TESTING PROCEDURES

5.1.5.1 Notice to Mariners

A Notice to Mariners is issued in advance of all swimmer defense testing.

5.1.5.2 Swimmer Defense Testing Clearance

A daily in situ calibration of the source levels is used to establish a clearance area to the 145 decibels (dB) referenced to (re) 1 micro (µ) Pascal (Pa) sound pressure level threshold for non-participant personnel safety. A hydrophone is stationed during the calibration sequences in order to confirm the clearance area. Small boats patrol the 145 dB re 1 µPa sound pressure level area during all test activities. Boat crews are equipped with binoculars and remain vigilant for non-participant divers and boats, swimmers, snorkelers, and dive flags. If a non-participating swimmer, snorkeler, or diver is observed entering into the area of the swimmer defense system, the power levels of the defense system are reduced. An additional 100-yard (yd.) (91 m) buffer is applied to the initial sighting location of the non-participant as an additional precaution. If the area cannot be maintained free of non-participating swimmers, snorkelers, and divers, testing will cease until the non-participant has moved outside the area.

5.1.6 UNMANNED AERIAL AND UNDERWATER VEHICLE PROCEDURES

For activities involving unmanned aerial and underwater vehicles, the Navy evaluates the need to publish a Notice to Airmen or Mariners based on the scale, location, and timing of the activity. Unmanned aerial vehicles and unmanned aerial systems are operated in accordance with Federal Aviation Administration air traffic organization policy as issued in Office of the Chief of Naval Operations Instructions 3710, 3750, and 4790.

5.1.7 TOWED IN-WATER DEVICE PROCEDURES

Prior to deploying a towed device from a manned platform, there is a standard operating procedure to search the intended path of the device for any floating debris (e.g., driftwood) or other potential obstructions (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies] and animals), which have the potential to cause damage to the device.

5.2 INTRODUCTION TO MITIGATION

The Navy recognizes that the Proposed Action has the potential to impact the environment. Unlike standard operating procedures, which are established for reasons other than environmental benefit, mitigation measures are modifications to the Proposed Action that are implemented for the sole purpose of reducing a specific potential environmental impact on a particular resource. The procedures discussed in this chapter, most of which are currently or were previously implemented as a result of past environmental compliance documents, Endangered Species Act (ESA) Biological Opinions, Marine Mammal Protection Act (MMPA) Letters of Authorization, or other formal or informal consultations with regulatory agencies, have been coordinated with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service through the consultation and permitting processes.

5.2.1 REGULATORY REQUIREMENTS FOR MITIGATION

An Environmental Impact Statement (EIS) must analyze the affected environment, discuss the environmental impacts of the Proposed Action and each alternative, and assess the significance of the impacts on the environment. Mitigation measures are designed to help reduce the severity or intensity of impacts of the Proposed Action. Assessment of mitigation measures can occur early in the planning process. An agency may choose not to take the action or to move the location of the action. Mitigation measure development also occurs throughout the analysis process whenever an impact is minimized by limiting the degree or magnitude of the action or its implementation. Mitigation measures can also include actions that repair, rehabilitate, or restore the affected environment or reduce impacts over time through constant monitoring and corrective adjustments.

In accordance with the National Environmental Policy Act (NEPA) requirement, the environmental benefit of all Navy recommended proposed mitigation measures will apply to all alternatives analyzed in this Final EIS, and according to Navy policy, will also apply to the Final Overseas Environmental Impact Statement (OEIS) where applicable and appropriate. Additionally, the White House Council on Environmental Quality issued guidance for mitigation and monitoring on 14 January 2011. This guidance affirms that federal agencies, including the Navy, should:

- commit to mitigation in decision documents when they have based environmental analysis upon such mitigation (by including appropriate conditions on grants, permits, or other agency approvals, and making funding or approvals for implementing the Proposed Action contingent on implementation of the mitigation commitments);
- monitor the implementation and effectiveness of mitigation commitments;
- make information on mitigation and monitoring available to the public, preferably through agency web sites; and
- remedy ineffective mitigation when the federal action is not yet complete.

The Council on Environmental Quality guidance encourages federal agencies to develop internal processes for post-decision monitoring to ensure the implementation and effectiveness of the mitigation. It also states that federal agencies may use adaptive management as part of an agency's action. Adaptive management, when included in the NEPA analysis, allows for the agency to take alternate mitigation actions if mitigation commitments originally made in the planning and decision documents fail to achieve projected environmental outcomes. Adaptive management generally involves four phases: plan, act, monitor, and evaluate. This process allows the use of the results to update knowledge and adjust future management actions accordingly. Through implementing mitigation measures from the Navy's previous planning, consultations, permits, and monitoring of those efforts, the Navy has collected data to further refine its recommended mitigation measures.

Through the planning, consultation, and permitting processes, federal regulatory agencies suggested that the Navy analyze additional mitigation measures for inclusion in this Final EIS/OEIS and associated consultation and permitting documents. Proposals for additional mitigation measures were based on the federal agency's assessment of the likelihood that such measures will contribute to a notable reduction of the environmental impact. As additional measures were identified, the effectiveness and operational assessment protocols discussed in Section 5.3 (Mitigation Assessment) were applied to determine whether the Navy would recommend the additional measures for implementation. The final suite of mitigations resulting from the ongoing planning, consultation, and permitting processes will be documented in the Navy and NMFS Records of Decision, the MMPA Letters of Authorization, and the ESA Biological Opinions.

5.2.2 Overview of Mitigation Approach

This section describes the approach the Navy took to develop its recommended mitigation measures. The Navy's overall approach to assessing potential mitigation measures was based on two principles: (1) mitigations will be effective at reducing potential impacts on the resource, and (2) from a military perspective, the mitigations are practical to implement, executable, and personnel safety and readiness will not be impacted. The assessment process involved using information directly from Chapter 3 (Affected Environment and Environmental Consequences) and assessing all existing mitigation and proposals for new or modified mitigation in order to determine if recommending a mitigation measure for implementation would be appropriate.

This document organized, and where appropriate, analyzed training and testing activities separately. This separation was needed because the training and testing communities perform activities for differing purposes, and in some cases, with different personnel and in different locations. For example, there is a fundamental difference between the testing of a new mine warfare system with civilian scientists and engineers, and the eventual training of sailors and aviators with that same system. As such, mitigations that the Navy recommends for both training and testing activities are presented together, while mitigations that are designed for and executable only by the training or testing community are presented separately.

5.2.2.1 Lessons Learned from Previous Environmental Impact Statements/Overseas Environmental Impact Statements

In an effort to improve upon past processes, the Navy considered all mitigations previously implemented and adapted its mitigation assessment approach based on lessons learned from previous EISs, ESA Biological Opinions, MMPA Letters of Authorizations, and other formal or informal consultations with regulatory agencies. For example, one lesson learned during the development of the Hawaii Range Complex EIS/OEIS was that relocation of activities was not possible due to a number of factors. The Navy considered reduction or elimination of training in the Hawaii Range Complex, but determined that the amount and cost of travel to other range complexes to fulfill training requirements would result in an unacceptable increase in time away from the homeport. Additionally, the Hawaii Range Complex offers an invaluable facility on which to conduct training and testing in a realistic environment.

Navy planners, scientists, and the operational community assessed the effectiveness of a full suite of potential mitigation measures (a portion of which were specific mitigation areas) on a case-by-case basis, using information and lessons learned from the Navy's internal adaptive management process. The resulting assemblage of recommended measures is comprised of currently implemented measures, modifications of currently implemented measures, and newly proposed measures. Details on the assessment methods are provided in Section 5.2.3 (Assessment Method). The rationale for recommending, modifying, adding, or discontinuing each measure is provided in Section 5.3 (Mitigation Assessment).

5.2.2.2 Protective Measures Assessment Protocol

The Protective Measures Assessment Protocol is a decision support and situational awareness software tool that the Navy uses to facilitate compliance with mitigation measures when conducting certain training and testing activities at sea. The Navy runs the Protective Measures Assessment Protocol program during the event planning process to ensure that personnel involved in the activity are aware of the mitigation requirements and to help ensure that all mitigations are implemented appropriately. In addition to providing notification of the required mitigation, the tool also provides a visual display of the activity location, unit's position in relation to the target area, and any relevant environmental data. The final suite of mitigation measures contained in the Navy and NMFS Records of Decision, the MMPA Letters of Authorization, and the ESA Biological Opinions will be integrated into the Protective Measures Assessment Protocol. Section 5.3.1.1.1.1 (United States Navy Afloat Environmental Compliance Training

Series) contains information about the newly developed Protective Measures Assessment Protocol training module.

5.2.3 ASSESSMENT METHOD

As shown in Figure 5.2-1, the Navy undertook an effectiveness assessment and operational assessment for each potential mitigation measure to ensure its compatibility with Section 5.2.2 (Overview of Mitigation Approach). The Navy used information from published and readily available sources, as well as Navy after-action and monitoring reports. When available, these data were used when they represented the best available science and if they were generally accepted by the scientific community to ensure that they were applicable and contributed to the analysis.

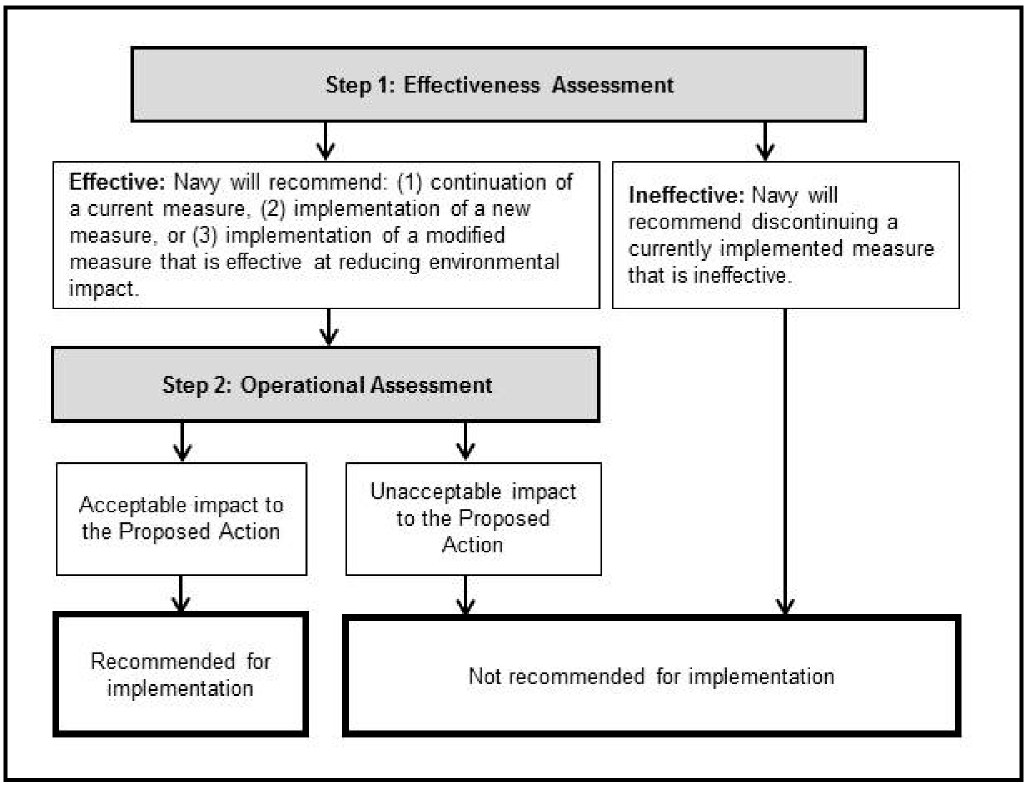


Figure 5.2-1: Flowchart of Process for Determining Recommended Mitigation Measures

5.2.3.1 Effectiveness Assessment

5.2.3.1.1 Procedural Measures

Procedural measures could involve employing techniques or technology during a training or testing activity in order to avoid or reduce a potential impact on a particular resource. For the purposes of organization, procedural measures are discussed within two subcategories: Lookouts and mitigation zones.

A proposed procedural measure was deemed effective if implementing the measure was likely to result in avoidance or reduction of an impact on a resource. The level of avoidance or reduction of the impact gained from implementing a procedural measure was weighed against the potential for a shift in impacts resulting from the activity modification. For example, if predictive modeling results indicate that the use of underwater explosives could cause unacceptable impacts on a particular resource; those impacts could possibly be reduced by substituting non-explosive activities for explosive activities. However, if the increased use of non-explosive activities would consequently produce an unacceptable impact on habitats due to an associated physical disturbance or strike risk from military expended materials, the measure would not necessarily be justifiable.

A proposed procedural measure was deemed ineffective if its implementation would not result in avoidance or reduction of an impact on a resource, or if an unacceptable impact will simply be shifted from one resource to another. For ineffective procedural measures that are currently being implemented, the rationale for terminating, modifying, or continuing to carry out the measure is included in the discussion.

5.2.3.1.2 Mitigation Areas

In order to avoid or reduce a potential impact on a particular resource the Navy would either limit the time of day or duration in which a particular activity could take place, or move or relocate a particular activity outside of a specific geographic area. Within mitigation areas, the measures would only apply to the specific activity that resulted in the requirement for mitigation, and would not prevent or restrict other activities from occurring during that time or in that area.

A proposed mitigation area was deemed effective if implementing the measure would likely result in avoidance or reduction of the impact on the resource. The specific season, time of day, or geographic area must be important to the resource. In determining importance, special consideration was given to time periods or geographic areas having characteristics such as especially high overall density or percent population use, seasonal bottlenecks for a migration corridor, and identifiable key foraging and reproduction areas.

Avoidance or reduction of the impact in the specific time period or geographic area was weighed against the potential for causing new impacts in alternative time periods or geographic areas. For example, if the use of underwater explosives was predicted to cause unacceptable impacts on a particular resource in a known foraging location, those impacts could possibly be reduced by relocating those activities to a new location. However, if the use of explosives at the new location would consequently produce an unacceptable impact on the same or a different resource at the new location, the measure would not necessarily be justifiable.

A proposed mitigation area was deemed ineffective if implementing the measure would not result in avoidance or reduction of an impact on a resource, or if an unacceptable impact would simply be shifted from one time period or location to another. For ineffective mitigation areas that are currently being implemented, the rationale for terminating, modifying, or continuing to carry out the measure is included in the discussion.

5.2.3.2 Operational Assessment

The Navy conducted the operational assessment for procedural measures and proposed mitigation areas using the criteria described below. The Navy deemed procedural and mitigation area measures to have acceptable operational impacts on a particular proposed activity if the following conclusions were reached:

1. Implementation of the measure will not increase safety risks to Navy personnel and equipment.

2. Implementation of the measure is practical. Practicality was defined by the following factors:
    - The measure does not result in an unacceptable increase in resource requirements (e.g., wear and tear on equipment, additional fuel, additional personnel, increased training or testing requirements, or additional reporting requirements).
    - The measure does not result in an unacceptable increase in time away from homeport for Navy personnel.
    - The measure does not result in national security concerns. Should national security require conducting more than the designated number of activities, or a change in how the Navy conducts those activities, the Navy reserves the right to provide the regulatory federal agency with prior notification and include the information in any associated exercise or monitoring reports.
    - The measure is consistent with Navy policy. Navy policy requires that mitigation measures are developed through consultation with regulatory agencies (e.g., the MMPA and ESA processes), would likely result in avoidance or reduction of an impact on a resource as determined by the effectiveness assessment, and would not negatively impact training and testing fidelity. This policy applies to the full suite of potential mitigation measures that the Navy assessed, including measures that were considered but eliminated, and as appropriate, to currently implemented measures that the Navy is no longer recommending to implement.

3. Implementation of the measure will not result in an unacceptable impact on the effectiveness of the military readiness activity. A primary factor that was considered for all mitigation measures is that the measure must not modify the activity in a way that no longer allows the activity to meet the intended objectives, and ultimately must not interfere with the Navy meeting all of its military readiness requirements. Specifically, for mitigation area measures, the following additional factors were considered:
    - The activity is not dependent on a specific range or range support structure within the mitigation area and there are alternate areas with the necessary environmental conditions (e.g., oceanographic conditions).
    - The mitigation area does not hold any current or foreseeable future readiness value. This assessment will be revisited if Navy operations or national security interests conclude that training or testing needs to occur within the mitigation area.
    - Implementation of the measure will not prohibit conducting shipboard maintenance, repair, and testing pierside prior to at-sea operations.

4. The Navy has legal authority to implement the measure.

If all four of the conditions above can be achieved, then the Navy will recommend the mitigation measure for implementation.

5.3 Mitigation Assessment

The effectiveness and operational assessments resulted in potential mitigation measures being organized into the following four sections:

- Section 5.3.1 (Lookout Procedural Measures) includes recommended measures specific to the use of Lookouts or trained marine species observers.

- Section 5.3.2 (Mitigation Zone Procedural Measures) includes recommended measures specific to visual observations with a mitigation zone.
- Section 5.3.3 (Mitigation Areas) includes recommended measures specific to particular locations.
- Section 5.3.4 (Mitigation Measures Considered but Eliminated) includes measures that the Navy does not recommended for implementation due to the measure being ineffective at reducing environmental impacts, having an unacceptable operational impact, or being incompatible with Section 5.2.2 (Overview of Mitigation Approach).

A summary of the Navy recommended measures is provided in Table 5.4-1.

5.3.1 Lookout Procedural Measures

As described in Section 5.1 (Standard Operating Procedures), ships have personnel assigned to stand watch at all times while underway. Watch personnel may perform watch duties in conjunction with job responsibilities that extend beyond looking at the water or air (such as supervision of other personnel). This section will introduce Lookouts, who perform similar duties to watch personnel and whose duties satisfy safety of navigation and mitigation requirements.

The Navy will have two types of Lookouts for the purposes of conducting visual observations: (1) those positioned on ships, and (2) those positioned in aircraft or on small boats. Lookouts positioned on ships will be dedicated solely to diligent observation of the air and surface of the water. They will have multiple observation objectives, which include but are not limited to detecting the presence of biological resources and recreational or fishing boats, observing the mitigation zones described in Section 5.3.2 (Mitigation Zone Procedural Measures), and monitoring for vessel and personnel safety concerns.

Due to aircraft, small boat manning and space restrictions, Lookouts positioned in aircraft or on small boats may include the aircraft crew, pilot, or boat crew. Lookouts positioned in aircraft and small boats may be responsible for tasks in addition to observing the air or surface of the water (e.g., navigation of a helicopter or small boat). However, aircraft and small boat Lookouts will, considering personnel safety, practicality of implementation, and impact on the effectiveness of the activity, comply with the observation objectives described above for Lookouts positioned on ships.

The procedural measures described below primarily consist of having Lookouts during specific training and testing activities.

5.3.1.1 Specialized Training

5.3.1.1.1 Training for Navy Personnel and Civilian Equivalents

5.3.1.1.1.1 United States Navy Afloat Environmental Compliance Training Series

<u>Recommended Mitigation and Comparison to Current Mitigation</u>

The Navy is proposing to continue implementing the Marine Species Awareness Training for watch personnel and Lookouts, and to add the requirement for additional Navy personnel and civilian equivalents to complete one or more environmental training modules.

The Navy has developed the U.S. Navy Afloat Environmental Compliance Training Series to help ensure Navy-wide compliance with environmental requirements, and to help Navy personnel gain a better understanding of their personal roles and responsibilities. The training series contains four interactive multimedia training modules. Personnel will be required to complete all modules identified in their career path training plan.

The first module is the Introduction to the U.S. Navy Afloat Environmental Compliance Training Series. The introduction module provides information on environmental laws (e.g., ESA and MMPA) and responsibilities relevant to Navy training and testing activities. The material is put into context of why environmental compliance is important to the Navy, from the most junior sailor to Commanding Officers. All personnel completing the U.S. Navy Marine Species Awareness Training will also be required to take this module.

The second module is the U.S. Navy Marine Species Awareness Training. Consistent with current requirements, all bridge watch personnel, Commanding Officers, Executive Officers, maritime patrol aircraft aircrews, anti-submarine warfare helicopter crews, civilian equivalents, and Lookouts will successfully complete the Marine Species Awareness Training prior to standing watch or serving as a Lookout. The module contained within the U.S. Navy Environmental Compliance Training Series is an update to the current Marine Species Awareness Training version 3.1. The updated training is designed to improve the effectiveness of visual observations for marine resources, including marine mammals and sea turtles. The Marine Species Awareness Training provides information on sighting cues, visual observation tools and techniques, and sighting notification procedures.

The third module is the U.S. Navy Protective Measures Assessment Protocol. The Protective Measures Assessment Protocol is a decision support and situational awareness software tool that the Navy uses to facilitate compliance with worldwide mitigation measures during the conduct of training and testing activities at sea. The module provides instruction for generating and reviewing Protective Measures Assessment Protocol reports. Section 5.2.2.2 (Protective Measures Assessment Protocol) contains additional information on the benefits of the software tool.

The fourth module is the U.S. Navy Sonar Positional Reporting System and marine mammal incident reporting. The Navy developed the Sonar Positional Reporting System as its official record of underwater sound sources (e.g., active sonar) used under its MMPA permits. Marine mammal incidents include vessel strikes and animal strandings. The module provides instruction on the reporting requirements and procedures for both the Sonar Positional Reporting System and marine mammal incident reporting.

Effectiveness and Operational Assessment

Navy personnel undergo extensive training in order to stand watch. Standard training includes on-the-job instruction under the supervision of experienced personnel, followed by completion of the Personal Qualification Standard program. The Personal Qualification Standard program certifies that personnel have demonstrated the skills needed to stand watch, such as detecting and reporting floating or partially submerged objects.

The U.S. Navy Afloat Environmental Compliance Training Series, including the updated Marine Species Awareness Training, is a specialized multimedia training program designed to help Navy operational and test communities best avoid potentially harmful interactions with marine species. The program provides training on how to sight marine species, focusing on marine mammals. The training also includes instruction for visually identifying sea turtles, concentrations of floating vegetation (*Sargassum* or kelp paddies), jellyfish aggregations, and flocks of seabirds, which are often indicators of marine mammal or sea turtle presence. The Marine Species Awareness Training also addresses the role that watch personnel and Lookouts play in helping the Navy maintain compliance with environmental protection requirements, as well as supporting Navy environmental stewardship commitments.

In summary, the Navy believes that the U.S. Navy Afloat Environmental Compliance Training Series, including the updated Marine Species Awareness Training, is the best and most appropriate forum for teaching watch personnel and Lookouts about their responsibilities for helping reduce impacts on the marine environment. The Marine Species Awareness Training provides the Navy with invaluable training for a relatively large number of personnel. Constantly shifting personnel assignments presents a real challenge; however, the format and structure of the U.S. Navy Afloat Environmental Compliance Training Series will help the Navy reduce costs during fiscally constrained periods and provide constant access to training. Overall, the Marine Species Awareness Training is an effective tool for improving the potential for Lookouts to detect marine species while on duty.

Implementation of the Marine Species Awareness Training has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.1.2 Lookouts

The Navy proposes to use one or more Lookouts during the training and testing activities described below, which are organized by stressor category. A comparison of the currently implemented mitigation measures and recommended mitigation measures are provided where applicable. The effectiveness and operational assessments are discussed for all Lookout measures collectively in Section 5.3.1.2.4 (Effectiveness Assessment for Lookouts) and Section 5.3.1.2.5 (Operational Assessment for Lookouts). A number of training and testing activities involve the participation of multiple vessels and aircraft, which could ultimately increase the cumulative number of personnel standing watch per standard operating procedures or Lookouts posted in the vicinity of the activity (e.g., sinking exercises). The following sections discuss the minimum number of Lookouts that the Navy will use during each activity.

5.3.1.2.1 Acoustic Stressors – Non-Impulsive Sound

5.3.1.2.1.1 Low-Frequency and Hull-Mounted Mid-Frequency Active Sonar

Mitigation measures do not currently exist for low-frequency active sonar sources analyzed in this Final EIS/OEIS, or new platforms or systems. The Navy is proposing to (1) add mitigation measures for low-frequency active sonar and new platforms and systems, and (2) maintain the number of Lookouts currently implemented for ships using hull-mounted mid-frequency active sonar. The recommended measures are provided below.

Ships using low-frequency or hull-mounted mid-frequency active sonar sources associated with anti-submarine warfare and mine warfare activities at sea (with the exception of ships less than 65 ft. [20 m] in length and ships that are minimally manned) will have two Lookouts at the forward position. For the purposes of this document, low-frequency active sonar does not include Surveillance Towed Array Sensor System (SURTASS) Low-Frequency Active (LFA) sonar.

While using low-frequency or hull-mounted mid-frequency active sonar sources associated with anti-submarine warfare and mine warfare activities at sea, ships less than 65 ft. (20 m) in length, and ships that are minimally manned will have one Lookout at the forward position due to space and manning restrictions.

Ships conducting active sonar activities while moored or at anchor (including pierside) will maintain one Lookout.

5.3.1.2.1.2 High-Frequency and Non-Hull Mounted Mid-frequency Active Sonar

Mitigation measures do not currently exist for high-frequency active sonar activities associated with anti-submarine warfare and mine warfare, or for new platforms, such as the Littoral Combat Ship; therefore, the Navy is proposing to add a new measure for these activities or platforms. The Navy is proposing to continue using the number of Lookouts currently implemented for ships or aircraft conducting non-hull mounted mid-frequency active sonar, such as helicopter dipping sonar systems. The recommended measure is provided below.

The Navy will have one Lookout on ships or aircraft conducting high-frequency or non-hull mounted mid-frequency active sonar activities associated with anti-submarine warfare and mine warfare activities at sea.

5.3.1.2.2 Acoustic Stressors – Explosives and Impulsive Sound

5.3.1.2.2.1 Improved Extended Echo Ranging Sonobuoys

The Navy is proposing to continue using the number of Lookouts currently implemented for this activity. The Navy will have one Lookout in aircraft conducting improved extended echo ranging sonobuoy activities.

5.3.1.2.2.2 Explosive Sonobuoys Using 0.6–2.5 Pound Net Explosive Weight

Lookout measures do not currently exist for explosive sonobuoy activities using 0.6–2.5 pound (lb.) net explosive weight. The Navy is proposing to add this measure. Aircraft conducting explosive sonobuoy activities using 0.6–2.5 lb. net explosive weight will have one Lookout.

5.3.1.2.2.3 Anti-Swimmer Grenades

The Navy is proposing to continue using the number of Lookouts currently implemented for this activity. The Navy will have one Lookout on the vessel conducting anti-swimmer grenade activities.

5.3.1.2.2.4 Mine Countermeasure and Neutralization Activities Using Positive Control Firing Devices

As background, mine countermeasure and neutralization activities can be divided into two main categories: (1) general activities that can be conducted from a variety of platforms and locations, and (2) activities involving the use of diver-placed charges that typically occur close to shore. When either of these activities are conducted using a positive control firing device, the detonation is controlled by the personnel conducting the activity and is not authorized until the area is clear at the time of detonation.

The Navy is proposing to modify the number of Lookouts currently implemented for general mine countermeasure and neutralization activities using positive control firing devices to account for additional categories of net explosive weights. The recommended measures are provided below.

- During general mine countermeasure and neutralization activities under positive control using up to a 500 lb. net explosive weight detonation (bin E10 and below), vessels greater than 200 ft. (61 m) will have two Lookouts, while vessels less than 200 ft. (61 m) or aircraft will have one Lookout.

- During general mine countermeasure and neutralization activities under positive control using a 501–650 lb. net explosive weight (bin E11) detonation, the Navy will have two Lookouts (one positioned in an aircraft and one in a small boat.

The Navy is proposing to (1) continue using the number of Lookouts currently implemented for mine neutralization activities involving positive control diver-placed charges up to a 29 lb. or 250–500 lb. net explosive weight, and (2) extend the implementation of its current mitigation to all additional categories of net explosive weights. Mitigation measures for activities involving diver-placed charges under positive control do not currently exist for 30–249 lb. net explosive weight detonations. The recommended measures are provided below.

- During activities involving diver-placed mines under positive control, activities using up to a 500 lb. net explosive weight (bin E10) detonation will have a total of two Lookouts (one Lookout positioned on two small boats, or one small boat in combination with either a helicopter or shore-based. The shore-based observer would be stationed at an elevated on-shore position and would only be used during activities conducted in very shallow waters.
- All divers placing the charges on mines will support the Lookouts while performing their regular duties. The divers will report all marine mammal and sea turtle sightings to their supporting small boat or Range Safety Officer.

5.3.1.2.2.5 Mine Neutralization Activities Using Diver-Placed Time-Delay Firing Devices

As background, when mine neutralization activities using diver-placed charges (up to a 29 lb. net explosive weight) are conducted with a time-delay firing device, the detonation is fused with a specified time-delay by the personnel conducting the activity and is not authorized until the area is clear at the time the fuse is initiated. During these activities, the detonation cannot be terminated once the fuse is initiated due to human safety concerns.

Current mitigation involves the use of six Lookouts and three small boats (two Lookouts positioned in each of the three boats) for mitigation zones equal to or larger than 1,400 yd. (1,280 m), or four Lookouts and two small boats for mitigation zones smaller than 1,400 yd. (1,280 m). The Navy is proposing to modify the number of Lookouts currently used for mine neutralization activities using diver-placed time-delay firing devices because the measure is impractical to implement and is currently resulting in an unacceptable impact on military readiness. The Navy does not have the resources to maintain six Lookouts and three small boats during mine neutralization activities using diver-placed time-delay firing devices. Due to a lack of personnel and small boats available for this activity, the requirement for six Lookouts and three small boats would require reassigning personnel from other assigned duties or training activities, thus impacting the ability of the reassigned personnel to complete his or her assigned duties or other training requirements. Therefore, the Navy is currently unable to conduct the activities that require six Lookouts and three small boats, which is reducing the Navy's ability to maintain military readiness for these activities. Four Lookouts and two small boats represent the maximum level of effort that the Navy can commit to observing mitigation zones for this activity given the number of personnel and assets available. To prevent these unacceptable impacts, the Navy recommends the following measures:

During activities using up to a 29 lb. net explosive weight (bin E7) detonation, the Navy will have four Lookouts and two small boats (two Lookouts positioned in each of the two boats). In addition, when aircraft are used, the pilot or member of the aircrew will serve as an additional Lookout. All divers placing the charges on mines will support the Lookouts while performing their regular duties. The divers will report all marine mammal and sea turtle sightings to their supporting small boat or Range Safety Officer.

5.3.1.2.2.6 Gunnery Exercises – Small- and Medium-Caliber Using a Surface Target

The Navy is proposing to continue using the number of Lookouts currently implemented for this activity. The Navy will have one Lookout on the vessel or aircraft conducting small- or medium-caliber gunnery exercises against a surface target.

5.3.1.2.2.7 Gunnery Exercises – Large-Caliber Using a Surface Target

The Navy is proposing to continue using the number of Lookouts currently implemented for this activity. The Navy will have one Lookout on the ship conducting large-caliber gunnery exercises against a surface target.

5.3.1.2.2.8 Missile Exercises (Including Rockets) up to 250 Pound Net Explosive Weight Using a Surface Target

The Navy is proposing to continue using the number of Lookouts currently implemented for this activity. When aircraft are conducting missile exercises up to 250 lb. net explosive weight against a surface target, the Navy will have one Lookout positioned in an aircraft.

5.3.1.2.2.9 Missile Exercises Using 251–500 Pound Net Explosive Weight Using a Surface Target

Lookout measures do not currently exist for missile exercises using 251–500 lb. net explosive weight. The Navy is proposing to add this measure. When aircraft are conducting missile exercises using 251–500 lb. net explosive weight against a surface target, the Navy will have one Lookout positioned in an aircraft.

5.3.1.2.2.10 Bombing Exercises

The Navy is proposing to continue using the number of Lookouts currently implemented for this activity. The Navy will have one Lookout positioned in an aircraft conducting bombing exercises.

5.3.1.2.2.11 Torpedo (Explosive) Testing

The Navy is proposing to continue using the number of Lookouts currently implemented for this activity. The Navy will have one Lookout positioned in an aircraft during torpedo (explosive) testing.

5.3.1.2.2.12 Sinking Exercises

The Navy is proposing to continue using the number of Lookouts currently implemented for this activity. The Navy will have two Lookouts (one positioned in an aircraft and one on a vessel) during sinking exercises.

5.3.1.2.2.13 At-Sea Explosive Testing

Lookout measures do not currently exist for at-sea explosive testing. The Navy is proposing to add this measure. The Navy will have a minimum of one Lookout on each vessel supporting at-sea explosive testing.

5.3.1.2.2.14 Elevated Causeway System – Pile Driving

The Navy is proposing to continue using the number of Lookouts currently implemented for this activity. The Navy will have one Lookout positioned on the platform (which could include the shore, an elevated causeway, or on a small boat) that will maximize the potential for sightings during pile driving and pile removal.

5.3.1.2.2.15 Weapons Firing Noise During Gunnery Exercises – Large-Caliber

The Navy is proposing to continue using the number of Lookouts currently implemented for this activity. The Navy will have one Lookout on the ship conducting explosive and non-explosive large-caliber gunnery exercises. This may be the same Lookout described in Section 5.3.1.2.2.7 (Gunnery Exercises – Large-Caliber Using a Surface Target) or Section 5.3.1.2.3.3 (Non-Explosive Practice Munitions – Small-, Medium-, and Large-Caliber Gunnery Exercises Using a Surface Target) when the large-caliber gunnery exercise is conducted from a ship against a surface target.

5.3.1.2.3 Physical Disturbance and Strike

5.3.1.2.3.1 Vessels

The Navy is proposing to clarify the mitigation measures currently implemented for this activity (including full power propulsion testing). While underway, vessels will have a minimum of one Lookout.

5.3.1.2.3.2 Towed In-Water Devices

The Navy is proposing to continue using the number of Lookouts currently implemented for activities using towed in-water devices (e.g., towed mine neutralization). The Navy will have one Lookout during activities using towed in-water devices when towed from a manned platform.

5.3.1.2.3.3 Non-Explosive Practice Munitions – Small-, Medium-, and Large-Caliber Gunnery Exercises Using a Surface Target

The Navy is proposing to continue using the number of Lookouts currently implemented for these activities. The Navy will have one Lookout during activities involving non-explosive practice munitions (e.g., small-, medium-, and large-caliber gunnery exercises) against a surface target.

5.3.1.2.3.4 Non-Explosive Practice Munitions – Bombing Exercises

The Navy is proposing to continue using the number of Lookouts currently implemented for these activities. The Navy will have one Lookout positioned in an aircraft during non-explosive bombing exercises.

5.3.1.2.3.5 Non-Explosive Practice Munitions – Missile Exercises (Including Rockets) Using a Surface Target

The Navy is proposing to continue using the number of Lookouts currently implemented for these activities. When aircraft are conducting non-explosive missile exercises (including exercises using rockets) against a surface target, the Navy will have one Lookout positioned in an aircraft.

5.3.1.2.4 Effectiveness Assessment for Lookouts

Personnel standing watch in accordance with Navy standard operating procedures have multiple job responsibilities. While on duty, these standard watch personnel often conduct marine species observation in addition to their primary job duties (e.g., aiding in the navigation of a vessel). By having one or more Lookouts dedicated solely to observing the air and surface of the water during certain training and testing activities, the Navy increases the likelihood that marine species will be detected. It is also important to note that a number of training and testing activities involve multiple vessels and aircraft, thereby increasing the cumulative number of Lookouts or watch personnel that could potentially be present during a given activity.

Although using Lookouts is expected to increase the likelihood that marine species will be detected at the surface of the water, it is unlikely that using Lookouts will be able to help avoid impacts on all species entirely due to the inherent limitations of sighting marine mammals and sea turtles, as discussed in the sections below. Refer to Section 3.4.3.1.10 (Implementing Mitigation to Reduce Sound Exposures) for a quantitative discussion on the Navy's effectiveness assessment for Lookouts during sound-producing activities.

Pursuant to Phase I (e.g., Hawaii Range Complex EIS/OEIS) and in cooperation with NMFS, the Navy has undertaken monitoring efforts to track compliance with take authorizations, help evaluate the effectiveness of implemented mitigation measures, and gain a better understanding of the impacts of the Navy activities on marine resources. In 2010, the Navy initiated a study designed to evaluate the effectiveness of the Navy Lookout team. The University of St. Andrews, Scotland, under contract to the U.S. Navy, developed an initial data collection protocol for use during the study. Between 2010 and 2012, trained Navy marine mammal observers collected data during nine field trials as part of a "proof of concept" phase. The goal of the proof of concept phase was to develop a statistically valid protocol for quantitatively analyzing the effectiveness of Lookouts during Navy training exercises. Field trials were conducted in the Hawaii Range Complex, Southern California Range Complex, and Jacksonville Range Complex onboard one frigate, one cruiser, and seven destroyers. A preliminary analysis of the proof of concept data is ongoing. The Navy is also working to finalize the data collection process for use during the next phase of the study. While data was collected as part of this proof of concept phase, that data is not fairly comparable as protocols were being changed and assessed, nor is that data statistically significant. Therefore, it is improper to use this data to draw any conclusions on the effectiveness of Navy Lookouts.

5.3.1.2.4.1 Detection Probabilities of Marine Mammals in the Study Area

Until the results of the Navy's Lookout effectiveness study are available, the Navy must rely on the best available science to determine detection probabilities of marine mammals by Navy Lookouts. To do so, the Navy has compiled the results of available literature on line-transect analyses, which are typically used to estimate cetacean abundance. In line-transect analyses, the factors affecting the detection of an animal or group of animals directly on the transect line may be probabilistically quantified as g(0). As a reference, a g(0) value of 1 indicates that animals on the transect line are always detected. Table 5.3-1 provides detection probabilities for cetacean species based largely on g(0) values derived from shipboard and aerial surveys in the Study Area, which vary widely based on g(0) derivation factors (e.g., species, sighting platforms, group size, and sea state conditions). Refer to Section 3.4.3.1.10 (Implementing Mitigation to Reduce Sound Exposures) for additional background on g(0) and a discussion of how the Navy used g(0) to quantitatively assess the effectiveness of Lookouts during sound-producing activities.

Table 5.3-1: Sightability Based on Average g(0) Values for Marine Mammal Species in the Study Area

Species/Stocks	Family	Vessel Sightability	Aircraft Sightability
Baird's Beaked Whale	Ziphiidae	0.96	0.18
Blainville's Beaked Whale [1]	Ziphiidae	0.40	0.074
Blue Whale, Fin Whale; Sei Whale	Balaenopteridae	0.921	0.407
Bottlenose Dolphin, Fraser's Dolphin [2]	Delphinidae	0.808	0.96
Bryde's Whale [3]	Balaenopteridae	0.91	0.407
Cuvier's Beaked Whale	Ziphiidae	0.23	0.074

Table 5.3-1: Sightability Based on Average g(0) Values for Marine Mammal Species in the Study Area (continued)

Species/Stocks	Family	Vessel Sightability	Aircraft Sightability
Dall's Porpoise	Phocoenidae	0.822	0.221
Dwarf Sperm Whale, Pygmy Sperm Whale, *Kogia* spp. [1]	Kogiidae	0.35	0.074
False Killer Whale, Melon-headed Whale [2]	Delphinidae	0.76	0.96
Gray Whale	Eschichtiidae	0.921	0.482
Humpback Whale	Balaenopteridae	0.921	0.495
Killer Whale	Delphinidae	0.91	0.96
Long-Beaked Common Dolphin, Short-Beaked Common Dolphin	Delphinidae	0.97	0.99
Longman's Beaked Whale, Pygmy Killer Whale [1]	Ziphiidae, Delphinidae	0.76	0.074
Mesoplodon spp.	Ziphiidae	0.34	0.11
Minke Whale	Balaenopteridae	0.856	0.386
Northern Right Whale Dolphin	Delphinidae	0.856	0.96
Pacific White-Sided Dolphin	Delphinidae	0.856	0.96
Pantropical Spotted/Risso's/Rough Toothed/Spinner/Striped Dolphin [2]	Delphinidae	0.76	0.96
Short-finned Pilot Whale [2]	Delphinidae	0.76	0.96
Sperm Whale	Physeteridae	0.87	0.495

[1] For species having no data, the g(0) for Cuvier's aircraft value (where g(0) = 0.074) was used[1].
[2] This species aircraft sightability is an estimate for all delphinids.
[3] This species aircraft sightability is an estimate for blue and fin whales.
Notes: Values reported are averaged based on the data cited for the U.S. Atlantic coast, U.S. west coast, and Hawaii. Some g(0) values in the table above are estimates of perception bias only, some are estimates of availability bias only, and some reflect both, depending on the species and data that are currently available. Based on the Navy's analysis of: Barlow 1995; Barlow 2003; Barlow and Forney 2007; Barlow et al. 1997; Barlow and Gerrodette 1996; Barlow and Sexton 1996; Barlow and Taylor 2005; Blaylock et al. 1995; Carretta et al. 2000; Forney 2007; Forney et al. 1995; Hain et al. 1999; Mobley et al. 2001; Palka 1995a; Palka 1995b, 2005a, b, 2006.

Several variables that play into how easily a marine mammal may be detected by a dedicated observer are directly related to the animal, including its external appearance and size; surface, diving and social behavior; and life history. The following is a generalized discussion of the behavior and external appearance of the marine mammals with the potential to occur in the Study Area as these characters relate to the detectability of each species. The species are grouped loosely based on either taxonomic relatedness or commonalities in size and behavior, and include large whales, cryptic species delphinids, beluga whales, and pinnipeds. Not all statements may hold true for all species in a grouping and exceptions are mentioned where applicable. The information presented in this section may be found in Jefferson et al. (2008) and sources within unless otherwise noted.

Large Whales

Species of large whales found in the Study Area include all the baleen whales and the sperm whale. Baleen whales are generally large, with adults ranging in size from 30 to 89 ft. (9 to 27 m), often making them immediately detectable. Many species of baleen whales have a prominent blow ranging from 10 ft. (3 m) to as much as 39 ft. (12 m) above the surface. However, there are at least two species (Bryde's whale and common minke whale) that often have no visible blow. Baleen whales tend to travel singly or in small groups ranging from pairs to groups of five. The exception to this is the fin whale, which is known to travel in pods of seven or more individuals. All species of baleen whales are known to form larger-scale aggregations in areas of high localized productivity or on breeding grounds. Baleen whales may or may not fluke at the surface before they dive; some species fluke regularly (e.g., the humpback whale), some fluke variably (e.g., the blue whale and fin whale) and some rarely fluke (e.g., the sei whale, common minke whale, and Bryde's whale). Baleen whales may remain at the surface for extended periods of time as they forage or socialize. Humpback whales are known to corral prey at the surface. Dive behavior varies amongst species. Many species will dive and remain at depth for as long as 30 minutes (min.). Some will adjust their diving behavior according to the presence of vessels (e.g., the humpback whale and fin whale). Sei whales are known to sink just below the surface and remain there between breaths.

Sperm whales also belong to the large whales, with adult males reaching as much as 50 ft. (18 m) in total length. Sperm whales at the surface would likely be easy to detect. They have a prominent, 16 ft. (5 m) blow, and may remain at the surface for long periods of time. They are known to raft (i.e., loll at the surface) and to form surface-active groups when socializing. Sperm whales may travel or congregate in large groups of as many as 50 individuals. Although sperm whales engage in conspicuous surface behavior such as fluking, breaching, and tail-slapping, they are long, deep divers and may remain submerged for over 1 hour.

Cryptic Species

Cryptic and deep-diving species are those that do not surface for long periods of time and are often difficult to see when they surface, which ultimately limits the ability of observers to detect them even in good sighting conditions (Barlow et al. 2006). Cryptic species include beaked whales (family Ziphiidae), dwarf and pygmy sperm whales (*Kogia* species), and harbor porpoises. Beaked whales are difficult to detect at sea. In the Study Area, beaked whales may occur in a variety of group sizes, ranging from single individuals to groups of as many as 22 individuals (MacLeod and D'Amico 2006). Beaked whale diving behavior in general consists of long, deep dives that may last for nearly 90 min. followed by a series of shallower dives and intermittent surfacings (Tyack et al. 2006, Baird et al. 2008). Some individuals remain at the surface for an extended period of time (perhaps 1 hour or more) or make shorter dives (MacLeod and D'Amico, 2006). Detection of beaked whales is further complicated because beaked whales often dive and surface in a synchronous pattern and they travel below the surface of the water (MacLeod and D'Amico 2006).

Dwarf and pygmy sperm whales (referred to broadly as *Kogia* species) are small cetaceans (10–13 ft. [3–4 m] adult length) that are not commonly seen. *Kogia* species are some of the most commonly stranded species in some areas, which suggests that sightings are not indicative of their overall abundance. This supports the idea that they are cryptic, perhaps engaging in inconspicuous surface behavior or actively avoiding vessels. When *Kogia* species are sighted, they are typically seen in groups of no more than five to six individuals. They have no visible blow, do not fluke when they dive, and are known to log (i.e., lie motionless) at the surface. When they do dive, they often will sink out of sight with no prominent behavioral display.

Harbor porpoises are difficult to detect in all but the best of conditions (i.e., no swell, no whitecaps). Harbor porpoises travel singly or in small groups of less than six individuals, but may aggregate into groups of several hundred. They are inconspicuous at the surface, rarely lifting their heads above the surface and often lying motionless. They are small and may actively avoid vessels.

Delphinids

Delphinids are some of the most likely species to be detected at sea by observers. Many species of delphinids engage in very conspicuous surface behavior, including leaping, spinning, bow riding, and traveling along the surface in large groups. Delphinid group sizes may range from 10 to 10,000 individuals, depending on the species and the geographic region. Species such as pilot whales, rough-toothed dolphins, white-beaked dolphins, white-sided dolphins, bottlenose dolphins, stenellid dolphins, common dolphins, and Fraser's dolphins are known to either actively approach and investigate vessels, or bow ride along moving vessels. Fraser's dolphins and common dolphins form huge groups that travel quickly along the surface, churning up the water and making them visible from a great distance. Delphinids may dive for as little as 1 min. to more than 30 min., depending on the species.

Pinnipeds

Pinnipeds (seals and sea lions) are more difficult to detect at sea than cetaceans. Pinnipeds are much smaller, often solitary and generally do not engage in conspicuous surface behavior. There is not a lot of information regarding pinniped behavior at sea. Pinnipeds have a low profile, no dorsal appendage and small body size in comparison with most cetaceans, which limits accurate visual detection to sea states of less than 2 on the Beaufort scale (Carretta et al. 2000). Some species, such as harbor seals, are known to approach and observe human activities on land or on stationary vessels. Harbor seals and gray seals are solitary at sea. Harp seals appear to be an exception, traveling in large groups at the surface and churning up whitewater like dolphins. Gray seals are known to rest vertically at the surface with only the head exposed. Gray seals may dive for as long as 30 min. and hooded seals for up to 60 min.

5.3.1.2.4.2 Detection Probabilities of Sea Turtles in the Study Area

Sea turtles spend a majority of their time below the surface and are difficult to sight from a vessel until the animal is at close range (Hazel et al. 2007). Sea turtles often spend over 90 percent of their time underwater and are not visible more than 6.5 ft. (2 m) below the surface (Mansfield 2006). Sea turtles are generally much smaller than cetaceans, so while shipboard surveys designed for sighting marine mammals are adequate for detecting large sea turtles (e.g., adult leatherbacks), they are usually not adequate for detecting the smaller sized turtles (e.g., juveniles and Kemp's ridleys). Juvenile sea turtles may be especially difficult to detect. Aerial detection may be more effective in spotting sea turtles on the surface, particularly in calm seas and clear water, but it is possible that the smallest age classes are not detected even in good conditions (Marsh and Saalfeld 1989). Visual detection of sea turtles, especially small turtles, is further complicated by their startle behavior in the presence of vessels. Turtles on the surface may dive below the surface of the water in the presence of a vessel before it is detected by shipboard or aerial observers (Kenney 2005). The detection probability of sea turtles is generally lower than that of cetaceans. The use of Lookouts for visual detection of sea turtles is likely effective only at close range, and is thought to be less effective for small individuals than large individuals.

5.3.1.2.4.3 Summary of Lookout Effectiveness

Due to the various detection probabilities, levels of Lookout experience, and variability of sighting conditions, Lookouts will not always be effective at avoiding impacts on all species. However, Lookouts are expected to increase the overall likelihood that certain marine mammal species and some sea turtles will be detected at the surface of the water, when compared to the likelihood that these same species would be detected if Lookouts are not used. The Navy believes the continued use of Lookouts contributes to helping reduce potential impacts on these species from training and testing activities.

5.3.1.2.5 Operational Assessment for Lookouts

As written, implementation of the mitigation measures recommended in Section 5.3.1.2 (Lookouts) has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activities, and Navy policy. The number of Lookouts recommended for each measure often represents the maximum Lookout capacity based on limited resources (e.g., space and manning restrictions).

5.3.2 MITIGATION ZONE PROCEDURAL MEASURES

Safety zones described in Section 5.1 (Standard Operating Procedures) are zones designed for human safety, whereas this section will introduce mitigation zones. A mitigation zone is designed solely for the purpose of reducing potential impacts on marine mammals and sea turtles from training and testing activities. Mitigation zones are measured as the radius from a source. Unique to each activity category, each radius represents a distance that the Navy will visually observe to help reduce injury to marine species. Visual detections of applicable marine species will be communicated immediately to the appropriate watch station for information dissemination and appropriate action. If the presence of marine mammals is detected acoustically, Lookouts posted in aircraft and on vessels will increase the vigilance of their visual surveillance. As a reference, aerial surveys are typically made by flying at 1,500 ft. altitude or lower at the slowest safe speed.

Many of the proposed activities have mitigation measures that are currently being implemented, as required by previous environmental documents or consultations. Most of the current Phase I (e.g., Hawaii Range Complex EIS/OEIS) mitigation zones for activities that involve the use of impulsive and non-impulsive sources were originally designed to reduce the potential for onset of temporary threshold shift (TTS). For the HSTT EIS/OEIS, the Navy updated the acoustic propagation modeling to incorporate updated hearing threshold metrics (i.e., upper and lower frequency limits), updated density data for marine mammals, and factors such as an animal's likely presence at various depths. An explanation of the acoustic propagation modeling process can be found in the *Determination of Acoustic Effects on Marine Mammals and Sea Turtles for the Hawaii-Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* technical report (Marine Species Modeling Team 2013).

As a result of the updates to the acoustic propagation modeling, in some cases the ranges to onset of TTS effects are much larger than those output by previous Phase I models. Due to the ineffectiveness and unacceptable operational impacts associated with mitigating these large areas, the Navy is unable to mitigate for onset of TTS for every activity. In this HSTT analysis, the Navy developed each recommended mitigation zone to avoid or reduce the potential for onset of the lowest level of injury, permanent threshold shift (PTS), out to the predicted maximum range. In some cases where the ranges to effects are smaller than previous models estimated, the mitigation zones were adjusted accordingly to provide consistency across the measures. Mitigating to the predicted maximum range to PTS consequently also mitigates to the predicted maximum range to onset mortality (1 percent mortality), onset slight lung injury, and onset slight gastrointestinal tract injury, since the maximum range to effects for these criteria are shorter than for PTS. Furthermore, in most cases, the predicted maximum range to PTS also consequently covers the predicted average range to TTS. Table 5.3-2 summarizes the predicted average range to TTS, average range to PTS, maximum range to PTS, and recommended mitigation zone for each activity category, based on the Navy's acoustic propagation modeling results.

The activity-specific mitigation zones are based on the longest range for all the functional hearing groups (based on the hearing threshold metrics described in Section 3.4, Marine Mammals, and Section 3.5, Sea Turtles). The mitigation zone for a majority of activities is driven by either the high-frequency cetacean or the sea turtle functional hearing groups. Therefore, the mitigation zones are even more protective for the remaining functional hearing groups (i.e., low-frequency cetaceans, mid-frequency cetaceans, and pinnipeds), and likely cover a larger portion of the potential range to onset of TTS.

In some instances, the Navy recommends mitigation zones that are larger or smaller than the predicted maximum range to PTS based on the effectiveness and operational assessments. The recommended mitigation zones and their associated assessments are provided throughout the remainder of this section. The recommended measures are either currently implemented, modifications of current measures, or new measures.

For some activities specified throughout the remainder of this section, Lookouts may be required to observe for concentrations of detached floating vegetation (*Sargassum* or kelp paddies), which are indicators of potential marine mammal and sea turtle presence, within the mitigation zone. Those specified activities will not commence if the floating vegetation (*Sargassum* or kelp paddies) is observed within the mitigation zone prior to the initial start of the activity. If floating vegetation is observed prior to the initial start of the activity, the activity will be relocated to an area where no floating vegetation is observed. Training and testing will not cease as a result of indicators entering the mitigation zone after activities have commenced. This measure is intended only for floating vegetation detached from the seafloor.

Table 5.3-2: Predicted Range to Effects and Recommended Mitigation Zones

Activity Category	Representative Source (Bin) [1]	Predicted Average (Longest) Range to TTS	Predicted Average (Longest) Range to PTS	Predicted Maximum Range to PTS	Recommended Mitigation Zone
Non-Impulsive Sound					
Low-Frequency and Hull-Mounted Mid-Frequency Active Sonar	SQS-53 ASW hull-mounted sonar (MF1)	3,821 yd. (3.5 km) for one ping	100 yd. (91 m) for one ping	Not Applicable	6 dB power down at 1,000 yd. (914 m); 4 dB power down at 500 yd. (457 m); and shutdown at 200 yd. (183 m)
	Low-frequency sonar (LF4 and LF5) [2]	3,821 yd. (3.5 km) for one ping	100 yd. (91 m) for one ping	Not Applicable	200 yd. (183 m) [2]
High-Frequency and Non-Hull Mounted Mid-Frequency Active Sonar	AQS-22 ASW dipping sonar (MF4)	230 yd. (210 m) for one ping	20 yd. (18 m) for one ping	Not applicable	200 yd. (183 m)
Explosive and Impulsive Sound					
Improved Extended Echo Ranging Sonobuoys	Explosive sonobuoy (E4)	434 yd. (397 m)	156 yd. (143 m)	563 yd. (515 m)	600 yd. (549 m)
Explosive Sonobuoys using 0.6–2.5 lb. NEW	Explosive sonobuoy (E3)	290 yd. (265 m)	113 yd. (103 m)	309 yd. (283 m)	350 yd. (320 m)
Anti-Swimmer Grenades	Up to 0.5 lb. NEW (E2)	190 yd. (174 m)	83 yd. (76 m)	182 yd. (167 m)	200 yd. (183 m)
Mine Countermeasure and Neutralization Activities Using Positive Control Firing Devices	NEW dependent (see Table 5.3-3)				
Mine Neutralization Diver-Placed Mines Using Time-Delay Firing Devices	Up to 29 lb. NEW (E7)	647 yd. (592 m)	232 yd. (212 m)	469 yd. (429 m)	1,000 yd. (915 m)
Gunnery Exercises – Small- and Medium-Caliber Using a Surface Target	40 mm projectile (E2)	190 yd. (174 m)	83 yd. (76 m)	182 yd. (167 m)	200 yd. (183 m)
Gunnery Exercises – Large-Caliber Using a Surface Target	5 in. projectiles (E5 at the surface [3])	453 yd. (414 m)	186 yd. (170 m)	526 yd. (481 m)	600 yd. (549 m)

[1] This table does not provide an inclusive list of source bins; bins presented here represent the source bin with the largest range to effects within the given activity category.
[2] The representative source bin and mitigation zone applies to sources that cannot be powered down (e.g., bins LF4 and LF5).
[3] The representative source bin E5 has different range to effects depending on the depth of activity occurrence (at the surface or at various depths).
Notes: ASW = anti-submarine warfare, in. = inches, lb. = pounds, m = meters, NEW = net explosive weight, PTS = permanent threshold shift, TTS = temporary threshold shift, yd. = yards

Table 5.3-2: Predicted Range to Effects and Recommended Mitigation Zones (continued)

Activity Category	Representative Source (Bin) [1]	Predicted Average (Longest) Range to TTS	Predicted Average (Longest) Range to PTS	Predicted Maximum Range to PTS	Recommended Mitigation Zone
Missile Exercises (Including Rockets) up to 250 lb. NEW Using a Surface Target	Maverick missile (E9)	949 yd. (868 m)	398 yd. (364 m)	699 yd. (639 m)	900 yd. (823 m)
Missile Exercises from 251 lb. to 500 lb. NEW Using a Surface Target	Harpoon missile (E10)	1,832 yd. (1.7 km)	731 yd. (668 m)	1,883 yd. (1.7 km)	2,000 yd. (1.8 km)
Bombing Exercises	MK-84 2,000 lb. bomb (E12)	2,513 yd. (2.3 km)	991 yd. (906 m)	2,474 yd. (2.3 km)	2,500 yd. (2.3 km) [2]
Torpedo (Explosive) Testing	MK-48 torpedo (E11)	1,632 yd. (1.5 km)	697 yd. (637 m)	2,021 yd. (1.8 km)	2,100 yd. (1.9 km)
Sinking Exercises	Various sources up to the MK-84 2,000 lb. bomb (E12)	2,513 yd. (2.3 km)	991 yd. (906 m)	2,474 yd. (2.3 km)	2.5 nm [2]
At-Sea Explosive Testing	Various sources less than 10 lb. NEW (E5 at various depths [3])	525 yd. (480 m)	204 yd. (187 m)	649 yd. (593 m)	1,600 yd. (1.4 km) [2]
Elevated Causeway System – Pile Driving	24 in. steel impact hammer	1,094 yd. (1.0 km)	51 yd. (46 m)	51 yd. (46 m)	60 yd. (55 m)

[1] This table does not provide an inclusive list of source bins; bins presented here represent the source bin with the largest range to effects within the given activity category.
[2] Recommended mitigation zones are larger than the modeled injury zones to account for multiple types of sources or charges being used.
[3] The representative source bin E5 has different range to effects depending on the depth of activity occurrence (at the surface or at various depths).
Notes: ASW = anti-submarine warfare, in. = inches, km = kilometers, lb. = pounds, m = meters, NEW = net explosive weight, PTS = permanent threshold shift, TTS = temporary threshold shift, yd. = yards

Table 5.3-3: Predicted Range to Effects and Mitigation Zone Radius for Mine Countermeasure And Neutralization Activities Using Positive Control Firing Devices

Charge Size Net Explosive Weight (Bins)	General Mine Countermeasure and Neutralization Activities Using Positive Control Firing Devices [1]				Mine Countermeasure and Neutralization Activities Using Diver-Placed Charges Under Positive Control [2]			
	Predicted Average Range to TTS	Predicted Average Range to PTS	Predicted Maximum Range to PTS	Recommended Mitigation Zone	Predicted Average Range to TTS	Predicted Average Range to PTS	Predicted Maximum Range to PTS	Recommended Mitigation Zone
2.6–5 lb. (E4)	434 yd. (397 m)	197 yd. (180 m)	563 yd. (515 m)	600 yd. (549 m)	545 yd. (498 m)	169 yd. (155 m)	301 yd. (275 m)	350 yd. (320 m)
6–10 lb. (E5)	525 yd. (480 m)	204 yd. (187 m)	649 yd. (593 m)	800 yd. (732 m)	587 yd. (537 m)	203 yd. (185 m)	464 yd. (424 m)	500 yd. (457 m)
11–20 lb. (E6)	766 yd. (700 m)	288 yd. (263 m)	648 yd. (593 m)	800 yd. (732 m)	647 yd. (592 m)	232 yd. (212 m)	469 yd. (429 m)	500 yd. (457 m)
21–60 lb. (E7) [3]	1,670 yd. (1.5 km)	581 yd. (531 m)	964 yd. (882 m)	1,200 yd. (1.1 km)	1,532 yd. (1.4 km)	473 yd. (432 m)	789 yd. (721 m)	800 yd. (732 m)
61–100 lb. (E8) [4]	878 yd. (802 m)	383 yd. (351 m)	996 yd. (911 m)	1,600 yd. (1.4 km)	969 yd. (886 m)	438 yd. (400 m)	850 yd. (777 m)	850 yd. (777 m)
251–500 lb. (E10)	1,832 yd. (1.7 km)	731 yd. (668 m)	1,883 yd. (1.7 km)	2,000 yd. (1.8 km)				700 yd. (640 m) [5]
501–650 lb. (E11)	1,632 yd. (1.5 km)	697 yd. (637 m)	2,021 yd. (1.8 km)	2,100 yd. (1.9 km)				Not Applicable

[1] These mitigation zones are applicable to all mine countermeasure and neutralization activities conducted in all locations specified in Tables 2.8-1 through 2.8-5.
[2] These mitigation zones are only applicable to mine countermeasure and neutralization activities involving the use of diver-placed charges. These activities are conducted in shallow water and the mitigation zones are based only on the functional hearing groups with species that occur in these areas (mid-frequency cetaceans and sea turtles).
[3] The E7 bin was only modeled in shallow-water locations so there is no difference for the diver-placed charges category.
[4] The E8 bin was only modeled for surface explosions, so some of the ranges are shorter than for sources modeled in the E7 bin which occur at depth.
[5] This mitigation zone for the E10 charge applies only to very shallow water detonations and is based on empirical data as described in Section 5.3.2.1.2.4 (Mine Countermeasure and Neutralization Activities Using Positive Control Firing Devices).
Notes: km = kilometers, lb. = pounds, m = meters, PTS = permanent threshold shift, TTS = temporary threshold shift, yd. = yards

5.3.2.1 Acoustic Stressors

5.3.2.1.1 Non-Impulsive Sound

5.3.2.1.1.1 Low-Frequency and Hull-Mounted Mid-Frequency Active Sonar

Recommended Mitigation and Comparison to Current Mitigation

Mitigation measures do not currently exist for low-frequency active sonar sources analyzed in this Final EIS/OEIS, or new platforms or systems. The Navy is proposing to (1) add mitigation measures for low-frequency active sonar, (2) continue implementing the current measures for mid-frequency active sonar, and (3) clarify the conditions needed to recommence an activity after a sighting. The recommended measures are provided below.

Training and testing activities that involve the use of low-frequency and hull-mounted mid-frequency active sonar (including pierside) will use Lookouts for visual observation from a ship immediately before and during the activity. Active sonar transmission will not begin if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. With the exception of certain low-frequency sources that are not able to be powered down during the activity (e.g., low-frequency sources within bins LF4 and LF5), mitigation will involve powering down the sonar by 6 dB when a marine mammal or sea turtle is sighted within 1,000 yd. (914 m), and by an additional 4 dB when sighted within 500 yd. (457 m) from the source, for a total reduction of 10 dB. If the source can be turned off during the activity, active transmission will cease if a marine mammal or sea turtle (low-frequency sources only) is sighted within 200 yd. (183 m). Active transmission will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, (3) the mitigation zone has been clear from any additional sightings for a period of 30 min., (4) the ship has transited more than 2,000 yd. (1.8 kilometers [km]) beyond the location of the last sighting, or (5) the ship concludes that dolphins are deliberately closing in on the ship to ride the ship's bow wave (and there are no other marine mammal sightings within the mitigation zone). Active transmission may resume when dolphins are bow riding because they are out of the main transmission axis of the active sonar while in the shallow-wave area of the bow.

If the source is not able to be powered down during the activity (e.g., low-frequency sources within bins LF4 and LF5), mitigation will involve ceasing active transmission if a marine mammal or sea turtle is sighted within 200 yd. (183 m). Active transmission will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, (3) the mitigation zone has been clear from any additional sightings for a period of 30 min., or (4) the ship has transited more than 400 yd. (366 m) beyond the location of the last sighting.

Effectiveness and Operational Assessments

See the introduction of Section 5.3.2 (Mitigation Zone Procedural Measures) for a general discussion of mitigation zones, how they are implemented, and the potential impacts they are designed to reduce. As shown in Table 5.3-2, the predicted average range to onset of PTS for low-frequency and hull- mounted mid-frequency active sonar sources is 100 yd. (91 m) for one ping. This range was determined by the high-frequency cetacean functional hearing group. The distance for all other marine mammal functional hearing groups is less than 80 yd. (73 m) for one ping, so the mitigation zone will provide further protection from injury (PTS) for these species. Therefore, implementation of the 200 yd. (183 m) shutdown zone will reduce the potential for exposure to higher levels of energy that would result in injury (PTS) and large threshold shifts that are recoverable (i.e., TTS) when individuals are sighted. Implementation of the 500 yd. (457 m) and 1,000 yd. (914 m) sonar power reductions will further reduce the potential for injury (PTS) and larger threshold shifts that would result in recovery (i.e., TTS) to occur when individual marine mammals are sighted within these zones, especially in cases where the ship and animal are approaching each other.

The mitigation zones the Navy has developed are within a range for which Lookouts can reasonably be expected to maintain situational awareness and visually observe during most conditions. Since the predicted average range to onset of TTS is 3,821 yd. (3.5 km), the entire predicted range to TTS is not reasonably observable. By establishing mitigation zones that can be realistically maintained from ships, Lookouts will be more effective at sighting individual animals. By keeping Lookouts focused within the ranges where exposure to higher levels of energy is possible, the effectiveness at reducing potential impacts on marine mammals and sea turtles will increase. As discussed in Section 5.3.1.2.4 (Effectiveness Assessment for Lookouts), the likelihood of sighting individual animals, particularly sea turtles and some species of small or cryptic marine mammals, decreases at long distances. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies]) will further help avoid impacts on marine mammals and sea turtles. Observations for sea turtles are required only during low-frequency active sonar activities because hull-mounted mid-frequency active sonar are not within the primary sea turtle hearing range.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. A 30 min. wait period more than covers the average dive times of most marine mammal species but may not be sufficient for some deep-diving marine mammal species or for sea turtles. However, the analysis in Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources) shows that injury to deep-diving marine mammals (e.g., sperm whales and beaked whales) is not expected to occur. Requiring additional delay beyond 30 min. would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would eliminate opportunities to detect submarines, objects, or other exercise targets as would be required in a real world combat situation, reduce the sonar operator's situational awareness of the environment where the training or testing is occurring, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measure described above because (1) it is likely to result in avoidance or reduction of exposure to high levels of energy to marine mammals and sea turtles, and; (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.1.1.2 High-Frequency and Non-Hull Mounted Mid-Frequency Active Sonar

Recommended Mitigation and Comparison to Current Mitigation

Mitigation measures do not currently exist for all high-frequency and non-hull mounted mid-frequency active sonar activities (i.e., new sources or sources not previously analyzed). The Navy is proposing to (1) continue implementing the current mitigation measures for activities currently being executed, such as dipping sonar activities, (2) extend the implementation of its current mitigation to all other activities in this category, and (3) clarify the conditions needed to recommence an activity after a sighting. The recommended measures are provided below.

Mitigation will include visual observation from a vessel or aircraft (with the exception of platforms operating at high altitudes) immediately before and during active transmission within a mitigation zone of 200 yd. (183 m) from the active sonar source. For activities involving helicopter-deployed dipping sonar, visual observation will commence 10 min. before the first deployment of active dipping sonar. Helicopter dipping and sonobuoy deployment will not begin if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. If the source can be turned off during the activity, active transmission will cease if a marine mammal or sea turtle (for MF8, MF9, MF10, and MF12 only) is sighted within the mitigation zone. Active transmission will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, (3) the mitigation zone has been clear from any additional sightings for a period of 10 min. for an aircraft-deployed source, (4) the mitigation zone has been clear from any additional sightings for a period of 30 min. for a vessel-deployed source, (5) the vessel or aircraft has repositioned itself more than 400 yd. (366 m) away from the location of the last sighting, or (6) the vessel concludes that dolphins are deliberately closing in to ride the vessel's bow wave (and there are no other marine mammal sightings within the mitigation zone).

Effectiveness and Operational Assessments

See the introduction of Section 5.3.2 (Mitigation Zone Procedural Measures) for a general discussion of mitigation zones, how they are implemented, and the potential impacts they are designed to reduce. As shown in Table 5.3-2, the predicted average range to onset of PTS for high-frequency and non-hull mounted mid-frequency active sonar sources is 20 yd. (18 m) for one ping. This range was determined by the high-frequency cetacean functional hearing group. The predicted average range to onset of TTS across all functional hearing groups is 230 yd. (210 m) for one ping. Implementation of the 200 yd. (183 m) mitigation zone will reduce the potential for exposure to higher levels of energy that would result in injury (PTS) and larger threshold shifts that would result in recovery (i.e., TTS) when individuals are sighted. Lookouts often visually observe either close aboard a vessel or from directly above the source by aircraft (i.e., helicopters). Exceptions include when sonobuoys are deployed and when sources are deployed from high altitude aircraft. When sonobuoys are used, the sonobuoy field may be dispersed over a large distance. As discussed in Section 5.3.1.2.4 (Effectiveness Assessment for Lookouts), the likelihood of sighting individual animals, particularly sea turtles and some species of small or cryptic marine mammals decreases at long distances. This measure should be effective at reducing risks to all marine mammals and sea turtles that are available to be observed within the mitigation zone. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies]) will further help avoid impacts on marine mammals and sea turtles. Observations for sea turtles are required only during non-hull mounted mid-frequency active sonar activities within bins MF8, MF9, MF10, and MF12 because high-frequency active sonar and other bins of mid-frequency sonar are not within the primary sea turtle hearing range.

The post-sighting wait periods are designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. The 30 min. wait period for vessel-deployed sources more than covers the average dive times of most marine mammal species but may not be sufficient for some deep-diving species. However, the analysis in Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources) shows that injury to deep-diving marine mammals (e.g., sperm whales and beaked whales) is not expected to occur, with the exception of *Kogia* species. Requiring additional delay beyond 30 min. for vessel-deployed sources would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would eliminate opportunities to detect submarines, objects, or other exercise targets and would be required during a real world combat situation and reduce the sonar operator's situational awareness of the environment where the training or testing is occurring, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The 10 min. wait period for aircraft-deployed sources covers a portion of the average marine mammal and sea turtle dive times but may not be sufficient to cover the average dive times of all species. The 10 min. wait period for aircraft-deployed sources is based on fuel restrictions for the types of aircraft involved in this activity (e.g., helicopters). Requiring additional delay beyond 10 min. for these sources would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would result in an unacceptable increased risk to personnel safety or would require aircraft to depart the activity location to refuel, which would eliminate opportunities to detect submarines, objects, or other exercise targets as would be required during a real world combat situation and reduce the sonar operator's situational awareness of the environment where the training or testing is occurring, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measure described above because (1) it is likely to result in avoidance or reduction of exposure to high levels of energy to marine mammals; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.1.2 Explosives and Impulsive Sound

5.3.2.1.2.1 Improved Extended Echo Ranging Sonobuoys

Recommended Mitigation and Comparison to Current Mitigation

The Navy is proposing to (1) modify the mitigation measures currently implemented for this activity by reducing the marine mammal and sea turtle mitigation zone from 1,000 yd. (914 m) to 600 yd. (549 m), (2) clarify the conditions needed to recommence an activity after a sighting, and (3) adopt the marine mammal and sea turtle mitigation zone size for floating vegetation for ease of implementation. The recommended measures are provided below.

Mitigation will include pre-exercise aerial observation and passive acoustic monitoring, which will begin 30 min. before the first source/receiver pair detonation and continue throughout the duration of the exercise within a mitigation zone of 600 yd. (549 m) around an Improved Extended Echo Ranging sonobuoy. The pre-exercise aerial observation will include the time it takes to deploy the sonobuoy pattern (deployment is conducted by aircraft dropping sonobuoys in the water). Improved Extended Echo Ranging sonobuoys will not be deployed if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone around the intended deployment location. Explosive detonations will cease if a marine mammal or sea turtle is sighted within the mitigation zone. Detonations will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, or (3) the mitigation zone has been clear from any additional sightings for a period of 30 min.

Passive acoustic monitoring would be conducted with Navy assets, such as sonobuoys, already participating in the activity. These assets would only detect vocalizing marine mammals within the frequency bands monitored by Navy personnel. Passive acoustic detections would not provide range or bearing to detected animals, and therefore cannot provide locations of these animals. Passive acoustic detections would be reported to Lookouts posted in aircraft and on vessels in order to increase vigilance of their visual observation.

Effectiveness and Operational Assessments

See the introduction of Section 5.3.2 (Mitigation Zone Procedural Measures) for a general discussion of mitigation zones, how they are implemented, and the potential impacts they are designed to reduce. As shown in Table 5.3-2, the predicted maximum range to onset of PTS for Improved Extended Echo Ranging sonobuoys is 563 yd. (515 m). This range was determined by the high-frequency cetacean functional hearing group. The remaining functional hearing groups had a shorter range to onset of PTS, so the mitigation zone will provide further protection for these species. The predicted average range to onset of TTS across all functional hearing groups is 434 yd. (397 m). Implementation of the 600 yd. (549 m) mitigation zone will reduce the potential for exposure to higher levels of energy that would result in injury and larger threshold shifts that would result in recovery (i.e., TTS) when individuals are sighted. The sonobuoy field may be dispersed over a large distance. As discussed in Section 5.3.1.2.4 (Effectiveness Assessment for Lookouts), the likelihood of sighting individual animals, particularly sea turtles and some species of small or cryptic marine mammals, decreases at long distances. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies]) will further help avoid impacts on marine mammals and sea turtles.

The decrease in mitigation zone size will result in no mitigation for exposure to lower levels of potential onset of TTS; however, it will allow for a more focused survey effort over a smaller survey distance, and will consequently increase the likelihood of avoidance of injury and larger threshold shifts that would result in recovery (i.e., TTS) to marine mammals and sea turtles.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. A 30 min. wait period more than covers the average dive times of most marine mammal species but may not be sufficient for some deep-diving marine mammal species or for sea turtles. However, the analysis in Section 3.4.3.2.2 (Impacts from Explosives) shows that injury to deep-diving marine mammals (e.g., sperm whales and beaked whales) is not expected to occur. Requiring additional delay beyond 30 min. for aircraft-deployed Improved Extended Echo Ranging sonobuoys would modify the activity in a way that it would no longer meet its intended objective. The 30 min. wait period represents the maximum wait period acceptable for the type of aircraft involved in this activity (e.g., maritime patrol aircraft) based on fuel restrictions. Any additional delay would result in an unacceptable increased risk to personnel safety, require aircraft to depart the activity location to refuel, eliminate opportunities to detect submarines as would be required in a real world combat situation, and reduce the aircrew's situational awareness of the environment where the activity is occurring, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measure described above because: (1) it is likely to result in avoidance or reduction of exposure to high levels of energy to marine mammals and sea turtles; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.1.2.2 Explosive Sonobuoys Using 0.6–2.5 Pound Net Explosive Weight

Recommended Mitigation and Comparison to Current Mitigation

Mitigation measures do not currently exist for this activity. The Navy is proposing to add the recommended measures provided below.

Mitigation will include pre-exercise aerial monitoring during deployment of the field of sonobuoy pairs (typically up to 20 min.) and continue throughout the duration of the exercise within a mitigation zone of 350 yd. (320 m) around an explosive sonobuoy. Explosive sonobuoys will not be deployed if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone (around the intended deployment location). Explosive detonations will cease if a marine mammal or sea turtle is sighted within the mitigation zone. Detonations will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, or (3) the mitigation zone has been clear from any additional sightings for a period of 10 min.

Passive acoustic monitoring will also be conducted with Navy assets, such as sonobuoys, already participating in the activity. These assets would only detect vocalizing marine mammals within the frequency bands monitored by Navy personnel. Passive acoustic detections would not provide range or bearing to detected animals, and therefore cannot provide locations of these animals. Passive acoustic detections would be reported to Lookouts posted in aircraft in order to increase vigilance of their visual observation.

Effectiveness and Operational Assessments

See the introduction of Section 5.3.2 (Mitigation Zone Procedural Measures) for a general discussion of mitigation zones, how they are implemented, and the potential impacts they are designed to reduce. As shown in Table 5.3-2, the predicted maximum range to onset of PTS for explosive sonobuoys using 0.6–2.5 lb. net explosive weight is 309 yd. (283 m). This range was determined by the high-frequency cetacean functional hearing group. The remaining functional hearing groups had a shorter predicted range to onset of PTS, so the mitigation zone will provide further protection for these species. The predicted average range to onset of TTS across all functional hearing groups is 290 yd. (265 m). Implementation of the 350 yd. (320 m) mitigation zone will reduce the potential for exposure to higher levels of energy that would result in injury and large threshold shifts that are recoverable (i.e., TTS) when individuals are sighted. The sonobuoy field may be dispersed over a large distance. As discussed in Section 5.3.1.2.4 (Effectiveness Assessment for Lookouts), the likelihood of sighting individual animals, particularly sea turtles and some species of small or cryptic marine mammals, decreases at long distances.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. A 10 min. wait period covers a portion of the average marine mammal and sea turtle dive times but may not be sufficient to cover the average dive times of all species. The 10 min. wait period for aircraft-deployed sources is based on fuel restrictions for the types of aircraft involved in this activity (e.g., helicopters). Requiring additional delay beyond 10 min. for these sources would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would result in an unacceptable increased risk to personnel safety or would require aircraft to depart the activity location to refuel, which would eliminate opportunities to detect and track submarines or other exercise targets as would be required in a real world combat situation, reduce the sonar operator's situational awareness of the environment where the training or testing is occurring, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measure described above because (1) it is likely to result in avoidance or reduction of exposure to high levels of energy to marine mammals and sea turtles; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.1.2.3 Anti-Swimmer Grenades

Recommended Mitigation and Comparison to Current Mitigation

The Navy is proposing to (1) continue implementing the current mitigation measures for this activity and (2) clarify the conditions needed to recommence an activity after a sighting. The recommended measures are provided below.

Mitigation will include visual observation from a small boat immediately before and during the exercise within a mitigation zone of 200 yd. (183 m) around an anti-swimmer grenade. The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. Explosive detonations will cease if a marine mammal or sea turtle is sighted within the mitigation zone. Detonations will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, (3) the mitigation zone has been clear from any additional sightings for a period of 30 min., or (4) the activity has been repositioned more than 400 yd. (366 m) away from the location of the last sighting.

Effectiveness and Operational Assessments

See the introduction of Section 5.3.2 (Mitigation Zone Procedural Measures) for a general discussion of mitigation zones, how they are implemented, and the potential impacts they are designed to reduce. As shown in Table 5.3-2, the predicted maximum range to onset of PTS for anti-swimmer grenades is 182 yd. (167 m). This range was determined by the high-frequency cetacean functional hearing group. The remaining functional hearing groups had a shorter predicted range to onset of PTS, so the mitigation zone will provide further protection for these species. The predicted average range to onset of TTS across all functional hearing groups is 190 yd. (174 m). Implementation of the 200 yd. (183 m) mitigation zone will reduce the potential for exposure to higher levels of energy that would result in injury and larger threshold shifts that would result in recovery (i.e., TTS) when individuals are sighted. Since the Lookout is visually observing close aboard the boat, this measure should be effective at reducing the risk to all marine mammals and sea turtles that are available to be observed. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies]) will further help avoid impacts on marine mammals and sea turtles.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. A 30 min. wait period more than covers the average dive times of most marine mammal species but may not be sufficient for some deep-diving marine mammal species or for sea turtles. However, the analysis in Section 3.4.3.2.2 (Impacts from Explosives) shows that injury to deep-diving marine mammals (e.g., sperm whales and beaked whales) is not expected to occur. Requiring additional delay beyond 30 min. would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would eliminate opportunities for maritime security forces to detect, respond, to, and defend against enemy scuba divers as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measure described above because (1) it is likely to result in avoidance or reduction of exposure to high levels of energy to marine mammals and sea turtles; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.1.2.4 Mine Countermeasure and Neutralization Activities Using Positive Control Firing Devices

Recommended Mitigation and Comparison to Current Mitigation

As background, mine countermeasure and neutralization activities can be divided into two main categories: (1) general activities that can be conducted from a variety of platforms and locations, and (2) activities involving the use of diver-placed charges that typically occur close to shore. When either of these activities are conducted using a positive control firing device, the detonation is controlled by the personnel conducting the activity and is not authorized until the area is clear at the time of detonation. Refer to Section 5.3.3.2.2 (Shallow Coral Reefs, Hardbottom Habitat, Artificial Reefs, and Shipwrecks) for information on mitigation designed to avoid or reduce potential impacts from military expended materials within shallow coral reef, live hardbottom, artificial reef, and shipwreck mitigation areas.

For general mine countermeasure and neutralization activities, the Navy is proposing to (1) modify the currently implemented mitigation measures to account for additional categories of net explosive weights and to align with the modeled explosive bins, (2) clarify the conditions needed to recommence an activity after a sighting, and (3) add a requirement to observe for floating vegetation. For comparison, the currently implemented mitigation zone for general mine countermeasure and neutralization is 700 yd. (640 m) when using up to a 20 lb. net explosive weight charge. The recommended general mine countermeasure and neutralization measures are provided below and summarized in Table 5.3-3.

The Navy is proposing to use the mitigation zones outlined in Table 5.3-3 during general mine countermeasure activities using positive control firing devices. General mine countermeasure and neutralization activity mitigation will include visual observation from small boats or aircraft beginning 10 min. before, during, and 10 min. after (when helicopters are involved in the activity) or 30 min. before, during, and 30 min. after (when helicopters are not involved in the activity) the completion of the exercise within the mitigation zones around the detonation site. For activities involving explosives in bin E11 (501-650 lb. net explosive weight), aerial observation of the mitigation zone will be conducted.

The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. Explosive detonations will cease if a marine mammal, sea turtle, flock of seabirds, or individual foraging seabird is sighted within the mitigation zone. Detonations will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, or (3) the mitigation zone has been clear from any additional sightings for a period of 10 min. when helicopters are involved in the activity, or (4) the mitigation zone has been clear from any additional sightings for a period of 30 min. when helicopters are not involved in the activity.

For activities involving positive control diver-placed charges, the Navy is proposing to (1) modify the currently implemented mitigation measures for activities involving up to a 29 lb. or 251–500 lb. net explosive weight detonation, (2) add mitigation to account for additional categories of net explosive weights and to align with the modeled explosive bins, (3) clarify the conditions needed to recommence an activity after a sighting, and (4) add a requirement to observe for floating vegetation. For comparison, the currently implemented mitigation zone for up to 29 lb. net explosive weight charges is 700 yd. (640 m). Mitigation measures for activities involving diver-placed charges under positive control do not currently exist for 30–249 lb. net explosive weight detonations. The recommended measures for activities involving positive control diver-placed activities are provided below.

The Navy is proposing to use the mitigation zones outlined in Table 5.3-3 during activities involving positive control diver-placed charges. Visual observation will be conducted by either two small boats, or by one small boat in combination with either one helicopter or one appropriate elevated shore-based platform. Boats will position themselves near the mid-point of the mitigation zone radius (but always outside the detonation plume radius and human safety zone) and travel in a circular pattern around the detonation location.

When using two boats, each boat will be positioned on opposite sides of the detonation location, separated by 180 degrees. If used, helicopters will travel in a circular pattern around the detonation location. The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. Explosive detonations will cease if a marine mammal, sea turtle, flock of seabirds, or an individual foraging seabird is sighted in the water portion of the mitigation zone (i.e., not on shore). Lookouts will be trained to survey the mitigation zone for seabirds prior to and after the detonation event. During activities conducted in shallow water, a shore-based observer will use binoculars to survey the mitigation zone to detect any seabirds prior to and after each detonation. Detonations will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, or (3) the mitigation zone has been clear from any additional sightings for a period of 30 min. (10 min. for applicable helicopter activities).

Immediately following the detonation, visual monitoring (using binoculars) will be conducted to survey the mitigation zone for at least 30 min. The Navy will report all injured or dead seabirds sighted during the post-detonation observations to the appropriate Navy Region Environmental Director, Navy Pacific Fleet Environmental Office, and local base wildlife biologist.

For training exercises that include the use of multiple detonations, the second (or third, etc.) detonation will occur either immediately after the preceding detonation (i.e., within 10 seconds of the preceding detonation), or after 30 min. have passed. This measure is intended to reduce the potential impacts to any piscivorous (fish-eating) birds, including least terns and pelicans, that forage in ocean waters or are attracted by stunned fish within the sphere of influence of the detonation.

Effectiveness and Operational Assessments

See the introduction of Section 5.3.2 (Mitigation Zone Procedural Measures) for a general discussion of mitigation zones, how they are implemented, and the potential impacts they are designed to reduce. The predicted range to effects shown in Table 5.3-3 for general mine countermeasure and neutralization activities using positive control firing devices were determined by the high-frequency cetacean functional hearing group. The remaining functional hearing groups had shorter ranges to onset of PTS, so the mitigation zones will provide further protection for these species. Implementation of the mitigation zones outlined in Table 5.3-3 will reduce the potential for exposure to higher levels of energy that would result in injury and larger threshold shifts that would result in recovery (i.e., TTS) when individuals are sighted.

As described in Section 5.3.1 (Lookout Procedural Measures), Lookouts positioned in aircraft or small boats may be responsible for tasks in addition to observing the air or surface of the water. For example, a Lookout for this activity may also be responsible for navigation or assistance with mine countermeasure and neutralization deployment. The decrease in mitigation zone size for activities using diver-placed charges will result in no mitigation for exposure to lower levels of potential onset of TTS;

however, it will allow for a more focused survey effort over a smaller area, and will consequently increase the likelihood of avoidance of injury and larger threshold shifts that would result in recovery (i.e., TTS) to marine mammals. Having a Lookout observe a mitigation zone that is too large could potentially increase the safety risk due to an increased level of distraction from normal job duties. Observation of an area beyond what the Navy is proposing to implement would not be likely to result in avoidance or reduction of injury to marine mammals or sea turtles because the effort spent observing those more distant areas would inevitably be minimal.

As described in Section 5.3.1.2.4 (Effectiveness Assessment for Lookouts), the ability of a Lookout to detect an animal can vary greatly based on what observing platform is being used. For large ranges, aerial observation is more effective. In addition, when observing from a small boat, sea turtle and cryptic marine mammal species can be very difficult to detect beyond a few meters. However, this measure should be effective at reducing potential impacts for individuals that are sighted.

Mine neutralization activities involving diver-placed charges occur primarily close to shore and in shallow water (concentrated in the SSTC and San Clemente Island). The range to effects shown in Table 5.3-3 for mine neutralization activities involving diver-placed charges under positive control were determined by the sea turtle functional hearing group. The mid-frequency hearing group had shorter ranges to onset of PTS, so the mitigation zones will provide further protection for these species. However, mitigation would be implemented for any species observed within the mitigation zone.

In particular for activities involving positive control diver-placed charges, the Navy is recommending different mitigation zones depending on the depth of the water in which the detonation takes place. The Navy used the Reflection and Refraction in a Multilayered Ocean/Ocean Bottoms with Shear Wave Effects model to predict the pressure-wave propagation for underwater detonations in deep and shallow water. Due to the complicated nature of propagation in very shallow water (less than 24 ft. [7 m]), as well as substantial differences between very shallow water sites, the Navy determined the most accurate estimates of underwater sound propagation in two specific areas would result from empirical data developed from explosives testing in these two areas. In order to establish accurate mitigation zones for determining physiological effects on marine mammals, measured waveform propagation data was collected at the actual very shallow water locations at San Clemente Island and the Silver Strand Training Complex, and were used to determine the zone of influence and mitigation zone for very shallow water detonations training and testing at these sites.

Implementation of the mitigation zones outlined in Table 5.3-3 will reduce the potential for exposure to higher levels of energy that would result in injury and larger threshold shifts that would result in recovery (i.e., TTS) when individuals are sighted. The decrease in mitigation zone size for activities using diver-placed charges (up to 29 lb. net explosive weight) will result in no mitigation for exposure to lower levels of potential onset of TTS; however, it will allow for a more focused survey effort over a smaller area, and will consequently increase the likelihood of avoidance of injury and larger threshold shifts that would result in recovery (i.e., TTS) to marine mammals.

During activities using diver-placed charges, Lookouts are visually observing from small boats, helicopters, or shore-based platforms. As discussed above, aerial observation (and observations from shore-based platforms with high vantage points) is more effective than observation from a small boat. Since small boats do not have a very elevated observing platform, the distance over which animals can be observed is much shorter. Sea turtles and cryptic marine mammal species would be very difficult to detect further than a few meters away from the boat.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. A 30 min. wait period more than covers the average dive times of most marine mammal species but may not be sufficient for some deep-diving marine mammal species or for sea turtles. However, the analysis in Section 3.4.3.2.2 (Impacts from Explosives) shows that injury to deep-diving marine mammals (e.g., sperm whales and beaked whales) is not expected to occur. Requiring additional delay beyond 30 min. (when helicopters are not involved in the activity) would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would eliminate opportunities to detect, identify, evaluate, and neutralize mines as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The 10 min. wait period (when helicopters are involved in the activity) covers a portion of the average marine mammal and sea turtle dive times but may not be sufficient to cover the average dive times of all species. The 10 min. wait period is based on helicopter fuel restrictions. Requiring additional delay beyond 10 min. for these sources would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would result in an unacceptable increased risk to personnel safety or would require aircraft to depart the activity location to refuel, which would eliminate opportunities to detect, identify, evaluate, and neutralize mines, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measure described above because (1) it is likely to result in avoidance or reduction of injury to most marine mammal species or seabirds; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.1.2.5 Mine Neutralization Using Diver-Placed Time-Delay Firing Devices

Recommended Mitigation and Comparison to Current Mitigation

As background, when mine neutralization activities using diver-placed charges (up to a 29 lb. net explosive weight) are conducted with a time-delay firing device, the detonation is fused with a specified time-delay by the personnel conducting the activity and is not authorized until the area is clear at the time the fuse is initiated. During these activities, the detonation cannot be terminated once the fuse is initiated due to human safety concerns. Refer to Section 5.3.2.1.2.4 (Mine Countermeasure and Neutralization Activities Using Positive Control Firing Devices) for a general discussion of mitigation measures applicable to mine neutralization activities using diver-placed mines. This section will specify unique mitigation zones and observation methods for diver-placed mine activities that use time-delay firing devices. Refer to Section 5.3.3.2.2 (Shallow Coral Reefs, Hardbottom Habitat, Artificial Reefs, and Shipwrecks) for information on mitigation designed to avoid or reduce potential impacts from military expended materials within shallow coral reef, live hardbottom, artificial reef, and shipwreck mitigation areas.

The Navy is proposing to (1) modify the mitigation zones and observation requirements currently implemented for mine countermeasure and neutralization activities using diver-placed time-delay firing devices, (2) clarify the conditions needed to recommence an activity after a sighting, and (3) add a requirement to observe for floating vegetation. For comparison, the current mitigation zones are based on size of charge and length of time-delay, ranging from a 1,000 yd. (914 m) mitigation zone for a 5 lb. net explosive weight charge using a 5 min. time-delay to a 1,500 yd. (1,372 m) mitigation zone for a 29 lb. net explosive weight charge using a 10 min. time-delay. The current requirement is for six

Lookouts in three boats (two in each boat) for larger than 1,400 yd. (1,280 m) and four Lookouts in two small boats to be used for observation in mitigation zones that are less than 1,400 yd. (1,280 m). The recommended measures for activities involving diver-placed time-delay firing devices are provided below.

The Navy recommends one mitigation zone for all net explosive weights and lengths of time-delay. Mine neutralization activities involving diver-placed charges will not include time-delay longer than 10 min. Mitigation will include visual surveillance from small boats commencing 30 min. before, during, and until 30 min. after the completion of the exercise within a mitigation zone of 1,000 yd. (915 m) around the detonation site. During activities using time-delay firing devices involving up to a 29 lb. net explosive weight charge, visual observation will take place using two small boats. In addition, when aircraft are involved (e.g., during deployment of divers), the pilot or member of the aircrew will serve as an additional Lookout. The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. The fuse initiation will cease if a marine mammal, sea turtle, flock of seabirds, or individual foraging seabird is sighted within the water portion of the mitigation zone (i.e., not on shore). Fuse initiation will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, or (3) the mitigation zone has been clear from any additional sightings for a period of 30 min.

Survey boats will position themselves near the mid-point of the mitigation zone radius (but always outside the detonation plume radius/human safety zone) and travel in a circular pattern around the detonation location. One Lookout from each boat will look inward toward the detonation site and the other Lookout will look outward away from the detonation site. Each boat will be positioned on opposite sides of the detonation location, separated by 180 degrees. If available for use, helicopters will travel in a circular pattern around the detonation location. Lookouts will be trained to survey the mitigation zone for seabirds prior to and after the detonation event. During activities conducted in shallow water, a shore-based observer will use binoculars to survey the mitigation zone to detect any seabirds prior to and after each detonation.

Immediately following the detonation, visual monitoring (using binoculars) will be conducted to survey the mitigation zone for at least 30 min. The Navy will report all injured or dead seabirds sighted during the post-detonation observations to the appropriate Navy Region Environmental Director, Navy Pacific Fleet Environmental Office, and local base wildlife biologist.

For training exercises that include the use of multiple detonations, the second (or third, etc.) detonation will occur either immediately after the preceding detonation (i.e., within 10 seconds of the preceding detonation), or after 30 min. have passed. This measure is intended to reduce the potential impacts to any piscivorous (fish-eating) birds, including least terns and pelicans, that forage in ocean waters or are attracted by stunned fish within the sphere of influence of the detonation.

Effectiveness and Operational Assessments

See the introduction of Section 5.3.2 (Mitigation Zone Procedural Measures) for a general discussion of mitigation zones, how they are implemented, and the potential impacts they are designed to reduce. As shown in Table 5.3-2, the predicted maximum range to onset of PTS for mine neutralization diver-placed mines using time-delay firing devices is 469 yd. (429 m). This range was determined by the high-frequency cetacean functional hearing group. The remaining functional hearing groups had a shorter predicted range to onset of PTS, so the mitigation zone will provide further protection for these species. The predicted average range to onset of TTS across all functional hearing groups is 647 yd. (592 m). The time-delay firing device mitigation zone was determined by including additional distance on top of the predicted maximum range to onset of PTS to account for a portion of the time that a marine mammal or sea turtle could enter the mitigation zone during the time-delay. Implementation of the 1,000 yd. (915 m) mitigation zone will reduce the potential for exposure to higher levels of energy that would result in injury and larger threshold shifts that would result in recovery (i.e., TTS) when individuals are sighted.

A 1,000 yd. (915 m) mitigation zone represents the maximum distance that the Lookouts on small boats can adequately observe given the number of personnel that will be involved. As discussed in Section 5.3.1.2.2.5 (Mine Neutralization Activities Using Diver-Placed Time-Delay Firing Devices), the use of more than two small boats for observation during this activity presents an unacceptable impact on readiness due to limited personnel resources. Since small boats do not have an elevated observing platform, the distance over which animals can be observed is much shorter. Sea turtles and cryptic marine mammal species would be very difficult to detect further that a few meters away from the boat. Sighting a sea turtle is only likely if a helicopter is participating in the activity. In addition, even with the extended mitigation zone to account for as much of the time-delay as possible, there is still a remote chance that animals may swim into the area after the charge is already set. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies]) will further help avoid impacts on marine mammals and sea turtles.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. A 30 min. wait period more than covers the average dive times of most marine mammal species but may not be sufficient for some deep-diving marine mammal species or for sea turtles. However, the analysis in Section 3.4.3.2.2 (Impacts from Explosives) shows that injury to deep-diving marine mammals (e.g., sperm whales and beaked whales) is not expected to occur. The 30 min. wait period covers a portion of the average marine mammal and sea turtle dive times but may not be sufficient to cover the average dive times of all species. Requiring additional delay beyond 30 min. would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would eliminate opportunities to detect, identify, evaluate, and neutralize mines as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measures described above because (1) they are likely to result in avoidance or reduction of injury to most marine mammal species; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.1.2.6 Gunnery Exercises – Small- and Medium-Caliber Using a Surface Target

Recommended Mitigation and Comparison to Current Mitigation

The Navy is proposing to (1) continue implementing the current mitigation measures for this activity, (2) clarify the conditions needed to recommence an activity after a sighting, and (3) add a requirement to visually observe for kelp paddies. Refer to Section 5.3.3.2.2 (Shallow Coral Reefs, Hardbottom Habitat, Artificial Reefs, and Shipwrecks) for information on mitigation designed to avoid or reduce potential impacts from military expended materials within shallow coral reef mitigation areas. The recommended measures are provided below.

Mitigation will include visual observation from a vessel or aircraft immediately before and during the exercise within a mitigation zone of 200 yd. (183 m) around the intended impact location. Vessels will observe the mitigation zone from the firing position. When aircraft are firing, the aircrew will maintain visual watch of the mitigation zone during the activity. The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. Firing will cease if a marine mammal or sea turtle is sighted within the mitigation zone. Firing will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, (3) the mitigation zone has been clear from any additional sightings for a period of 10 min. for a firing aircraft, (4) the mitigation zone has been clear from any additional sightings for a period of 30 min. for a firing vessel, and (5) the intended target location has been repositioned more than 400 yd. (366 m) away from the location of the last sighting.

Effectiveness and Operational Assessments

See the introduction of Section 5.3.2 (Mitigation Zone Procedural Measures) for a general discussion of mitigation zones, how they are implemented, and the potential impacts they are designed to reduce. As shown in Table 5.3-3, the predicted maximum range to onset of PTS for small- and medium-caliber gunnery is 182 yd. (167 m). This range was determined by the high-frequency cetacean functional hearing group. The remaining functional hearing groups had a shorter predicted range to onset of PTS, so the mitigation zone will provide further protection for these species. The average range to onset of TTS across all functional hearing groups is 190 yd. (174 m). Implementation of the 200 yd. (183 m) mitigation zone will reduce the potential for exposure to higher levels of energy that would result in injury and larger threshold shifts that would result in recovery (i.e., TTS) when individuals are sighted.

Small- and medium-caliber gunnery exercises involve the participating vessel or aircraft firing munitions at a target location that may be up to 4,000 yd. (3.7 km) away, although typically much closer than this. Therefore, it is necessary for the Lookout to be able to visually observe the mitigation zone from varying distances. Large vessel or aircraft platforms would provide a more effective observation platform for Lookouts than small boats. However, as discussed in Section 5.3.1.2.4 (Effectiveness Assessment for Lookouts), it is highly unlikely that anything but a whale blow or large pod of dolphins will be seen at distances closer to 4,000 yd. (3.7 km). However, this measure is likely effective at reducing the risk of injury to marine mammals that may be observed from the typical target distances. This measure may be ineffective at reducing the risk of injury to sea turtles at large target distances; however, it does reduce the risk for those individuals that may be observed at closer distances. In addition, it is more likely that sea turtles will be observed when exercises involve aircraft versus vessels. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies]) will further help avoid impacts on marine mammals and sea turtles.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. The 30 min. wait period for a firing vessel more than covers the average dive times of most marine mammal species but may not be sufficient for some deep-diving marine mammal species or for sea turtles. However, the analysis in Section 3.4.3.2.2 (Impacts from Explosives) shows that injury to deep-diving marine mammals (e.g., sperm whales and beaked whales) is not expected to occur. Requiring additional delay beyond 30 min. for a firing vessel would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would reduce the gun crews' abilities to engage surface targets and practice defensive marksmanship as would be required in a real world combat situation and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The 10 min. wait period for a firing aircraft covers a portion of the average marine mammal and sea turtle dive times but may not be sufficient to cover the average dive times of all species. The 10 min. wait period is based on fuel restrictions for the types of aircraft involved in this activity (e.g., helicopters). Requiring additional delay beyond 10 min. for these sources would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would result in an unacceptable increased risk to personnel safety or would require aircraft to depart the activity location to refuel, which would eliminate opportunities and reduce the gun crews' abilities to engage surface targets and practice defensive marksmanship as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measure described above because (1) it is likely to result in avoidance or reduction of exposure to high levels of energy to some marine mammal species; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.1.2.7 Gunnery Exercises – Large-Caliber Using a Surface Target

Recommended Mitigation and Comparison to Current Mitigation

The Navy is proposing to (1) continue using the currently implemented mitigation zone for this activity, (2) clarify the conditions needed to recommence an activity after a sighting, (3) add a requirement to visually observe for kelp paddies, and (4) modify the seafloor habitat mitigation area. Refer to Section 5.3.3.2.2 (Shallow Coral Reefs, Hardbottom Habitat, Artificial Reefs, and Shipwrecks) for information on mitigation designed to avoid or reduce potential impacts from military expended materials within shallow coral reef mitigation areas. The recommended measures are provided below.

Mitigation will include visual observation from a ship immediately before and during the exercise within a mitigation zone of 600 yd. (549 m) around the intended impact location. Ships will observe the mitigation zone from the firing position. The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. Firing will cease if a marine mammal or sea turtle is sighted within the mitigation zone. Firing will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, or (3) the mitigation zone has been clear from any additional sightings for a period of 30 min.

Effectiveness and Operational Assessments

See the introduction of Section 5.3.2 (Mitigation Zone Procedural Measures) for a general discussion of mitigation zones, how they are implemented, and the potential effects they are designed to reduce. As shown in Table 5.3-3, the predicted maximum range to onset of PTS for large-caliber gunnery is 526 yd. (481 m). This range was determined by the high-frequency cetacean functional hearing group. The remaining functional hearing groups had a shorter predicted range to onset of PTS, so the mitigation zone will provide further protection for these species. The average predicted range to onset of TTS across all functional hearing groups is 453 yd. (414 m). Implementation of the 600 yd. (549 m) mitigation zone will reduce the potential for exposure to higher levels of energy that would result in injury and larger threshold shifts that would result in recovery (i.e., TTS) when individuals are sighted. Per the

Navy's current reporting requirements, any injured or dead marine mammals or sea turtles will be reported as appropriate.

Large-caliber gunnery exercises involve the participating ship firing munitions at a target location from ranges up to 6 nautical miles (nm) away. Therefore it is necessary for the Lookout to be able to visually observe the mitigation zone from this distance. Although the Lookout will observe for all marine mammals or sea turtles in the area, as discussed in Section 5.3.1.2.4 (Effectiveness Assessment for Lookouts), it is highly unlikely that anything but a whale blow or large pod of dolphins will be seen. Although this measure is likely ineffective at reducing the risk of injury to sea turtles and some species of marine mammals, it does reduce the risk for those individuals that may be observed. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies]) will further help avoid impacts on marine mammals and sea turtles.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. A 30 min. wait period more than covers the average dive times of most marine mammal species but may not be sufficient for some deep-diving marine mammal species or for sea turtles. However, the analysis in Section 3.4.3.2.2 (Impacts from Explosives) shows that injury to deep-diving marine mammals (e.g., sperm whales and beaked whales) is not expected to occur. Requiring additional delay beyond 30 min. would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would reduce the gun crews' abilities to engage surface targets and practice defensive marksmanship as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measure described above because: (1) it is likely to result in avoidance or reduction of exposure to high levels of energy to some marine mammal species; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.1.2.8 Missile Exercises (Including Rockets) up to 250 Pound Net Explosive Weight Using a Surface Target

Recommended Mitigation and Comparison to Current Mitigation

The Navy is proposing to (1) modify the mitigation measures currently implemented for this activity by reducing the mitigation zone from 1,800 yd. (1.6 km) to 900 yd. (823 m), (2) clarify the conditions needed to recommence an activity after a sighting, (3) adopt the marine mammal and sea turtle mitigation zone size for floating vegetation for ease of implementation**,** and (4) modify the platform of observation to eliminate the requirement to observe when ships are firing. Refer to Section 5.3.3.2.2 (Shallow Coral Reefs, Hardbottom Habitat, Artificial Reefs, and Shipwrecks) for information on mitigation designed to avoid or reduce potential impacts from military expended materials within shallow coral reef mitigation areas. The recommended measures are provided below.

When aircraft are firing, mitigation will include visual observation by the aircrew or supporting aircraft prior to commencement of the activity within a mitigation zone of 900 yd. (823 m) around the deployed target. The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. Firing will cease if a marine mammal or sea turtle is sighted within the mitigation zone. Firing will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, or (3) the mitigation zone has been clear from any additional sightings for a period of 10 min. or 30 min. (depending on aircraft type).

Effectiveness and Operational Assessments

See the introduction of Section 5.3.2 (Mitigation Zone Procedural Measures) for a general discussion of mitigation zones, how they are implemented, and the potential impacts they are designed to reduce. As shown in Table 5.3-2, the predicted maximum range to onset of PTS for a missile exercise (including rockets) up to 250 lb. net explosive weight (bin E9) is 699 yd. (639 m). This range was determined by the sea turtle functional hearing group. The marine mammal functional hearing groups had a shorter predicted range to onset of PTS, so the mitigation zone will provide further protection for these species. The average predicted range to onset of TTS across all functional hearing groups is 949 yd. (868 m). Implementation of the 900 yd. (823 m) mitigation zone will reduce the potential for exposure to higher levels of energy that would result in injury and larger threshold shifts that would result in recovery (i.e., TTS) when individuals are sighted. The decrease in mitigation zone size will result in no mitigation for exposure to lower levels of potential onset of TTS; however, it will allow for a more focused survey effort over a smaller survey distance, and will consequently increase the likelihood of avoidance of injury and larger threshold shifts that would result in recovery (i.e., TTS) to marine mammals and sea turtles.

Missile exercises involve the participating ship or aircraft firing munitions at a target location typically up to 15 nm away and infrequently include ranges up to 75 nm away. When an aircraft is firing, the aircraft can travel close to the intended impact area so that it can be visually observed. Because that type of observation is not possible for a ship, visual observation is not suitable for activities that involve a ship-fired missile. Even with aircraft firing, there is a chance that animals could enter the impact area after the visual observations have been completed and the activity has commenced. Therefore, this measure is not effective at reducing the risk of injury to animals once the firing activity has begun; however, it does reduce the risk for those individuals that may be observed prior to commencement of the activity when aircraft are firing. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies]) will further help avoid impacts on marine mammals and sea turtles.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. The 30 min. wait period more than covers the average dive times of most marine mammal species but may not be sufficient for some deep-diving marine mammal species or for sea turtles. The 30 min. wait period represents the maximum wait period acceptable for certain types of aircraft involved in this activity (e.g., maritime patrol aircraft) based on their specific fuel restrictions. Requiring additional delay beyond 30 min. for these platforms would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would result in an unacceptable increased risk to personnel safety or would require aircraft to depart the activity location to refuel, which would reduce the aircrews' abilities to approach surface targets and launch missiles as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The 10 min. wait period covers a portion of the average marine mammal and sea turtle dive times but may not be sufficient to cover the average dive times of all species. The 10 min. wait period is based on the specific fuel restrictions for the other types of aircraft involved in this activity (e.g., helicopters).

Requiring additional delay beyond 10 min. for these platforms would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would result in an unacceptable increased risk to personnel safety or would require aircraft to depart the activity location to refuel, which would reduce the aircrews' abilities to approach surface targets and launch missiles as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measure described above because (1) it is likely to result in avoidance or reduction of exposure to high levels of energy to marine mammals and sea turtles; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.1.2.9 Missile Exercises 251–500 Pound Net Explosive Weight Using a Surface Target

Recommended Mitigation and Comparison to Current Mitigation

Mitigation measures do not currently exist for this activity. Refer to Section 5.3.3.2.2 (Shallow Coral Reefs, Hardbottom Habitat, Artificial Reefs, and Shipwrecks) for information on mitigation designed to avoid or reduce potential impacts from military expended materials within shallow coral reef mitigation areas. The recommended measures are provided below.

When aircraft are firing, mitigation will include visual observation by the aircrew or supporting aircraft prior to commencement of the activity within a mitigation zone of 2,000 yd. (1.8 km) around the intended impact location. The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. Firing will cease if a marine mammal or sea turtle is sighted within the mitigation zone. Firing will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, or (3) the mitigation zone has been clear from any additional sightings for a period of 10 min. or 30 min. (depending on aircraft type).

Effectiveness and Operational Assessments

See the introduction of Section 5.3.2 (Mitigation Zone Procedural Measures) for a general discussion of mitigation zones, how they are implemented, and the potential impacts they are designed to reduce. As shown in Table 5.3-3, the predicted maximum range to onset of PTS for a missile exercise using 251–500 lb. net explosive weight (bin E10) is 1,883 yd. (1.7 km). This range was determined by the sea turtle functional hearing group. The marine mammal functional hearing groups had a shorter predicted range to onset of PTS, so the mitigation zone will provide further protection for these species. The predicted average range to onset of TTS across all functional hearing groups is 1,832 yd. (1.7 km). Implementation of the 2,000 yd. (1.8 km) mitigation zone will reduce the potential for exposure to higher levels of energy that would result in injury and larger threshold shifts that would result in recovery (i.e., TTS) when individuals are sighted.

Missile exercises involve the participating ship or aircraft firing munitions at a target location typically up to 15 nm away and infrequently include ranges up to 75 nm away. When an aircraft is firing, the aircraft can travel close to the intended impact area so that it can be visually observed. Because that type of observation is not possible for a ship, visual observation is not suitable for activities that involve a ship-fired missile. Even with aircraft firing, there is a chance that animals could enter the impact area after the visual observations have been completed and the activity has commenced. Therefore, this measure is not effective at reducing the risk of injury to animals once the firing activity has begun; however, it does reduce the risk for those individuals that may be observed prior to commencement of the activity when aircraft are firing. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies]) will further help avoid impacts on marine mammals and sea turtles.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. The 30 min. wait period more than covers the average dive times of most marine mammal species but may not be sufficient for some deep-diving marine mammal species or for sea turtles. The 30 min. wait period represents the maximum wait period acceptable for certain types of aircraft involved in this activity (e.g., maritime patrol aircraft) based on their specific fuel restrictions. Requiring additional delay beyond 30 min. for these platforms would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would result in an unacceptable increased risk to personnel safety or would require aircraft to depart the activity location to refuel, which would reduce the aircrews' abilities to approach surface targets and launch missiles as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The 10 min. wait period covers a portion of the average marine mammal and sea turtle dive times but may not be sufficient to cover the average dive times of all species. The 10 min. wait period is based on the specific fuel restrictions for the other types of aircraft involved in this activity (e.g., helicopters). Requiring additional delay beyond 10 min. for these platforms would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would result in an unacceptable increased risk to personnel safety or would require aircraft to depart the activity location to refuel, which would reduce the aircrews' abilities to approach surface targets and launch missiles as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measure described above because (1) it is likely to result in avoidance or reduction of exposure to high levels of energy to marine mammals and sea turtles; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.1.2.10 Bombing Exercises

Recommended Mitigation and Comparison to Current Mitigation

The Navy is proposing to (1) modify the mitigation measures currently implemented for this activity by increasing the mitigation zone from 1,000 yd. (914 m) to 2,500 yd. (2.3 km), (2) clarify the conditions needed to recommence an activity after a sighting, (3) add a requirement to visually observe for kelp paddies, and (4) adopt the marine mammal and sea turtle mitigation zone size for floating vegetation for ease of implementation. Refer to Section 5.3.3.2.2 (Shallow Coral Reefs, Hardbottom Habitat, Artificial Reefs, and Shipwrecks) for information on mitigation designed to avoid or reduce potential impacts from military expended materials within shallow coral reef mitigation areas. The recommended measures are provided below.

Mitigation will include visual observation from the aircraft immediately before the exercise and during target approach within a mitigation zone of 2,500 yd. (2.3 km) around the intended impact location. The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. Bombing will cease if a marine mammal or sea turtle is sighted within the mitigation zone. Bombing will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, or (3) the mitigation zone has been clear from any additional sightings for a period of 10 min.

Effectiveness and Operational Assessments

See the introduction of Section 5.3.2 (Mitigation Zone Procedural Measures) for a general discussion of mitigation zones, how they are implemented, and the potential impacts they are designed to reduce. As shown in Table 5.3-2, the predicted maximum range to onset of PTS for bombing exercises is 2,474 yd. (2.3 km). This range was determined by the sea turtle functional hearing group. The marine mammal functional hearing groups had a shorter predicted range to onset of PTS, so the mitigation zone will provide further protection for these species. For example, the predicted maximum range to onset of PTS to mid-frequency of cetaceans is less than 500 yd. (457 m). The predicted average range to onset of TTS across all functional hearing groups is 2,513 yd. (2.3 km). Implementation of the 2,500 yd. (2.3 km) mitigation zone will reduce the potential for exposure to higher levels of energy that would result in injury and larger threshold shifts that would result in recovery (i.e., TTS) when individuals are sighted.

The predicted maximum range to onset mortality across all functional hearing groups is less than 250 yd. (229 m). Therefore, this measure will be effective at reducing potential mortality to all marine mammals and sea turtles when individuals are sighted. As discussed in Section 5.3.1.2.4 (Effectiveness Assessment for Lookouts), it is highly unlikely that anything but a whale blow or large pod of dolphins will be seen at distances closer to 2,500 yd. (2.3 km) near the perimeter of the mitigation zone. However, this measure is likely effective at reducing the risk of injury to marine mammals and sea turtles that may be observed from the smaller distances within the mitigation zone. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies]) will further help avoid impacts on marine mammals and sea turtles.

As described in Section 5.3.1 (Lookout Procedural Measures), Lookouts positioned in aircraft may be responsible for tasks in addition to observing the air or surface of the water. For example, a Lookout for this activity may also be responsible for navigation of the aircraft. Having a Lookout observe a mitigation zone that is too large could potentially increase the safety risk due to an increased level of distraction from normal job duties. Similarly, Lookouts posted in aircraft during bombing activities will, by necessity, focus their attention on the water surface below and surrounding the location of bomb deployment. Due to the nature of this activity (e.g., aircraft maintaining a relatively steady altitude of approximately 1,500 ft. and approaching the intended impact location), Lookouts will be able to observe a larger area during bombing activities than other proposed activities that involve the use of Lookouts positioned in aircraft (e.g., Improved Extended Echo Ranging sonobuoy activities). However, observation of an area beyond what the Navy is proposing to implement for bombing activities is not practical and would not likely result in avoidance or reduction of injury to marine mammals or sea turtles because the effort spent observing those more distant areas would inevitably be minimal.

While the increase in mitigation zone size will not mitigate for exposures to lower levels of potential onset of TTS; it will allow for a more focused survey effort over a larger survey distance, and will consequently increase the likelihood of avoidance of injury and larger threshold shifts that would result in recovery (i.e., TTS) to marine mammals and sea turtles.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. The 10 min. wait period covers a portion of the average marine mammal and sea turtle dive times but may not be sufficient to cover the average dive times of all species. The 10 min. wait period is based on fuel restrictions (factoring in the typical activity locations) for the types of aircraft involved in this activity (e.g., F/A-18). Requiring additional delay beyond 10 min. for these platforms would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would result in an unacceptable increased risk to personnel safety or would require aircraft to depart the activity location to refuel, which would reduce the aircrews' abilities to approach surface targets and deliver bombs as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measure described above because: (1) it is likely to result in avoidance or reduction of exposure to high levels of energy to marine mammals and sea turtles; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.1.2.11 Torpedo (Explosive) Testing

Recommended Mitigation and Comparison to Current Mitigation

The Navy is proposing to (1) modify the mitigation measures currently implemented for this activity by reducing the mitigation zone from 5,063 yd. (4.6 km) to 2,100 yd. (1.9 km), (2) clarify the conditions needed to recommence an activity after a sighting, (3) add a requirement to visually observe for kelp paddies, and (4) remove the requirement to review remotely sensed sea surface temperature maps prior to conducting the activity. The recommended measures are provided below.

Mitigation will include visual observation by aircraft (with the exception of platforms operating at high altitudes) immediately before, during, and after the exercise within a mitigation zone of 2,100 yd. (1.9 km) around the intended impact location. The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. Firing will cease if a marine mammal, sea turtle, or aggregation of jellyfish is sighted within the mitigation zone. Firing will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, or (3) the mitigation zone has been clear from any additional sightings for a period of 10 min. or 30 min. (depending on aircraft type).

In addition to visual observation, passive acoustic monitoring would be conducted with Navy assets, such as passive ships sonar systems or sonobuoys, already participating in the activity. Passive acoustic observation would be accomplished through the use of remote acoustic sensors or expendable sonobuoys, or via passive acoustic sensors on submarines when they participate in the Proposed Action. These assets would only detect vocalizing marine mammals within the frequency bands monitored by Navy personnel. Passive acoustic detections would not provide range or bearing to detected animals, and therefore cannot provide locations of these animals. Passive acoustic detections would be reported to the Lookout posted in the aircraft in order to increase vigilance of the visual observation; and to the person in control of the activity for their consideration in determining when the mitigation zone is determined free of visible marine mammals.

Effectiveness and Operational Assessments

See the introduction of Section 5.3.2 (Mitigation Zone Procedural Measures) for a general discussion of mitigation zones, how they are implemented, and the potential impacts they are designed to reduce. As shown in Table 5.3-2, the predicted maximum range to onset of PTS for explosive torpedoes is 2,021 yd. (1.8 km). This range was determined by the sea turtle functional hearing group. The marine mammal functional hearing groups had a shorter predicted range to onset of PTS, so the mitigation zone will provide further protection for these species. The average predicted range to onset of TTS across all functional hearing groups is 1,632 yd. (1.5 km). Implementation of the 2,100 yd. (1.9 km) mitigation zone will reduce the potential for exposure to higher levels of energy that would result in injury and larger threshold shifts that would result in recovery (i.e., TTS) when individuals are sighted.

The predicted maximum range to onset mortality across all functional hearing groups is less than 600 yd. (549 m). Therefore, this measure will be effective at reducing potential mortality to all marine mammals and sea turtles when individuals are sighted. As discussed in Section 5.3.1.2.4 (Effectiveness Assessment for Lookouts), it is highly unlikely that anything but a whale blow or large pod of dolphins will be seen at distances closer to 2,100 yd. (1.9 km) near the perimeter of the mitigation zone. However, this measure is likely effective at reducing the risk of injury to marine mammals and sea turtles that may be observed from the smaller distances within the mitigation zone.

As described in Section 5.3.1 (Lookout Procedural Measures), Lookouts positioned in aircraft may be responsible for tasks in addition to observing the air or surface of the water. For example, a Lookout for this activity may also be responsible for navigation of the aircraft. Having a Lookout observe a mitigation zone that is too large could potentially increase the safety risk due to an increased level of distraction from normal job duties. Observation of an area beyond what the Navy is proposing to implement for torpedo (explosive) testing activities is not practical and would not likely result in avoidance or reduction of injury to marine mammals or sea turtles because the effort spent observing those more distant areas would inevitably be minimal.

The decrease in mitigation zone size will result in no mitigation for exposure to lower levels of potential onset of TTS; however, it will allow for a more focused survey effort over a smaller survey distance, and will consequently increase the likelihood of avoidance of injury and larger threshold shifts that would result in recovery (i.e., TTS) to marine mammals and sea turtles. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies] and jellyfish aggregations will further help avoid impacts to marine mammals and sea turtles.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. The 30 min. wait period more than covers the average dive times of most marine mammal species but may not be sufficient for some deep-diving marine mammal species or for sea turtles. The 30 min. wait period represents the maximum wait period acceptable for certain types of aircraft involved in this activity (e.g., maritime patrol aircraft) based on their specific fuel restrictions. Requiring additional delay beyond 30 min. for these platforms would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would result in an unacceptable increased risk to personnel safety or would require aircraft to depart the activity location to refuel, which would reduce the aircrews' abilities to approach surface targets and launch torpedoes as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The 10 min. wait period covers a portion of the average marine mammal and sea turtle dive times but may not be sufficient to cover the average dive times of all species. The 10 min. wait period is based on the specific fuel restrictions for the other types of aircraft involved in this activity (e.g., helicopters).

Requiring additional delay beyond 10 min. for these platforms would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would result in an unacceptable increased risk to personnel safety or would require aircraft to depart the activity location to refuel, which would reduce the aircrews' abilities to approach surface targets and launch torpedoes as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The original intent of the measure requiring the review of remotely sensed sea surface temperature maps was to help predict areas in which protected species could occur. However, while the presence of sea surface temperature fronts may indicate suitable habitat for marine species and may sometimes lead observers to pay more attention to an area of the ocean likely to be associated with a marine species, sea surface temperature fronts alone are insufficient to locate and prevent avoidance of marine species during this type of exercise.

The Navy proposes implementing the recommended measure described above because: (1) it is likely to result in avoidance or reduction of exposure to high levels of energy to marine mammals and sea turtles; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.1.2.12 Sinking Exercises

Recommended Mitigation and Comparison to Current Mitigation

The Navy is proposing to (1) modify the mitigation measures currently implemented for this activity by increasing the mitigation zone from 2.0 nm to 2.5 nm, (2) clarify the conditions needed to recommence an activity after a sighting, (3) add a requirement to visually observe for kelp paddies, and (4) adopt the marine mammal and sea turtle mitigation zone size for concentrations of floating vegetation and aggregation of jellyfish for ease of implementation. The recommended measures are provided below.

Mitigation will include visual observation within a mitigation zone of 2.5 nm around the target ship hulk. Sinking exercises will include aerial observation beginning 90 min. before the first firing, visual observations from vessels throughout the duration of the exercise, and both aerial and vessel observation immediately after any planned or unplanned breaks in weapons firing of longer than 2 hours. Prior to conducting the exercise, the Navy will review remotely sensed sea surface temperature and sea surface height maps to aid in deciding where to release the target ship hulk.

The Navy will also monitor using passive acoustics during the exercise. Passive acoustic monitoring would be conducted with Navy assets, such as passive ships sonar systems or sonobuoys, already participating in the activity. These assets would only detect vocalizing marine mammals within the frequency bands monitored by Navy personnel. Passive acoustic detections would not provide range or bearing to detected animals, and therefore cannot provide locations of these animals. Passive acoustic detections would be reported to Lookouts posted in aircraft and on vessels in order to increase vigilance of their visual surveillance. Lookouts will also increase observation vigilance before the use of torpedoes or unguided ordnance with a net explosive weight of 500 lb. or greater, or if the Beaufort sea state is a 4 or above.

The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. The exercise will cease if a marine mammal, sea turtle, or aggregation of jellyfish is sighted within the mitigation zone. The exercise will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, or (3) the mitigation zone has been clear from any additional sightings for a period of 30 min. Upon sinking the vessel, the Navy will conduct post-exercise visual surveillance of the mitigation zone for 2 hours (or until sunset, whichever comes first).

Effectiveness and Operational Assessments

See the introduction of Section 5.3.2 (Mitigation Zone Procedural Measures) for a general discussion of mitigation zones, how they are implemented, and the potential impacts they are designed to reduce. During a sinking exercise, multiple weapons sources may be used (projectiles, missiles, bombs, torpedoes), the largest of which is the 2,000 lb. bomb. The recommended mitigation zone is approximately double the predicted maximum range to onset of PTS of the largest weapon source and is designed to account for multiple detonations during the activity. As shown in Table 5.3-2, the predicted maximum range to onset of PTS for a bombing exercise is 2,474 yd. (2.3 km). This range was determined by the sea turtle functional hearing group. The marine mammal functional hearing groups had a shorter predicted range to onset of PTS, so the mitigation zone will provide further protection for these species. For example, the predicted maximum range to onset of PTS to mid-frequency of cetaceans is less than 500 yd. (457 m). The average range to onset of TTS across all functional hearing groups is 2,513 yd. (2.3 km). Implementation of the 2.5 nm mitigation zone will reduce the potential for exposure to higher levels of energy that would result in injury and larger threshold shifts that would result in recovery (i.e., TTS) when individuals are sighted.

The predicted maximum range to onset mortality across all functional hearing groups is less than 250 yd. (229 m). Therefore, this measure will be effective at reducing potential mortality to all marine mammals and sea turtles when individuals are sighted. As discussed in Section 5.3.1.2.4 (Effectiveness Assessment for Lookouts), it is highly unlikely that anything but a whale blow or large pod of dolphins will be seen at distances closer to 2.5 nm near the perimeter of the mitigation zone. However, this measure is likely effective at reducing the risk of injury to marine mammals and sea turtles that may be observed from the smaller distances within the mitigation zone.

As described in Section 5.3.1 (Lookout Procedural Measures), Lookouts positioned in aircraft or vessels may be responsible for tasks in addition to observing the air or surface of the water. For example, a Lookout for this activity may also be responsible for navigation of the aircraft. Having a Lookout observe a mitigation zone that is too large could potentially increase the safety risk due to an increased level of distraction from normal job duties. Observation of an area beyond what the Navy is proposing to implement for sinking exercises is not practical and would not likely result in avoidance or reduction of injury to marine mammals or sea turtles because the effort spent observing those more distant areas would inevitably be minimal. The decrease in mitigation zone size will result in no mitigation for exposure to lower levels of potential onset of TTS; however, it will allow for a more focused survey effort over a smaller survey distance, and will consequently increase the likelihood of avoidance of injury and larger threshold shifts that would result in recovery (i.e., TTS) to marine mammals and sea turtles. The amount of time it takes for an aircraft to conduct line transects around a detonation point within the currently implemented 2 nm mitigation zone could result in animals entering the mitigation zone at one end while the aircraft completes the survey at the other end of the mitigation zone. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies] and jellyfish aggregations will further help avoid impacts on marine mammals and sea turtles.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. A 30 min. wait period more than covers the average dive times of most marine mammal species but may not be sufficient for some deep-diving marine mammal species or for sea turtles. However, the analysis in Section 3.4.3.2.2 (Impacts from Explosives) shows that injury to deep-diving marine mammals (e.g., sperm whales and beaked whales) is not expected to occur. Requiring additional delay beyond 30 min. would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would reduce the ship and aircrews' abilities to coordinate attack tactics on a seaborne target as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise. Although activities involving certain types of aircraft (e.g., helicopters) typically employ a 10 min. wait period due to fuel restrictions, the Navy is able to make an exception for this particular activity due to the large variation and rotation of assets that could participate in this type of exercise.

The Navy proposes implementing the recommended measure described above because (1) it is likely to result in avoidance or reduction of exposure to high levels of energy to marine mammals and sea turtles; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.1.2.13 At-Sea Explosive Testing

Recommended Mitigation and Comparison to Current Mitigation

Mitigation measures do not currently exist for at-sea explosive testing activities. Refer to Section 5.3.3.2.2 (Shallow Coral Reefs, Hardbottom Habitat, Artificial Reefs, and Shipwrecks) for information on mitigation designed to avoid or reduce potential impacts from military expended materials within shallow coral reef mitigation areas. The Navy is proposing to add the recommended measures provided below.

Mitigation during at-sea explosive testing, such as the sinking of a vessel by a sequential firing of multiple small charges (e.g., explosives in bin E5) for use as an artificial reef, will include visual observation from supporting vessels immediately before and during the activity within a mitigation zone of 1,600 yd. (1.4 km) around the intended impact location. The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. Detonations will cease if a marine mammal or sea turtle is sighted within the mitigation zone. Detonations will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, or (3) the mitigation zone has been clear from any additional sightings for a period of 30 min.

Effectiveness and Operational Assessments

See the introduction of Section 5.3.2 (Mitigation Zone Procedural Measures) for a general discussion of mitigation zones, how they are implemented, and the potential impacts they are designed to reduce. During at-sea explosive testing, multiple weapons sources or charges may be used (projectiles and charges), the largest of which is a 10 lb. net explosive weight charge. The recommended mitigation zone is approximately double the predicted maximum range to onset of PTS of the largest source, and is designed to account for multiple detonations during the activity. As shown in Table 5.3-2, the predicted maximum range to onset of PTS for at-sea explosive testing is 649 yd. (593 m). This range was determined by the high-frequency cetacean functional hearing group. The remaining functional hearing groups had a shorter predicted range to onset of PTS, so the mitigation zone will provide further protection for these species. The average range to onset of TTS across all functional hearing groups is 525 yd. (480 m). Implementation of the 1,600 yd. (1.4 km) mitigation zone will reduce the potential for exposure to higher levels of energy that would result in injury and larger threshold shifts that would result in recovery (i.e., TTS) when individuals are sighted.

The predicted maximum range to onset mortality across all functional hearing groups is less than 60 yd. (55 m). Therefore, this measure will be effective at reducing potential mortality to all marine mammals and sea turtles when individuals are sighted. This measure is likely also effective at reducing the risk of injury to marine mammals and sea turtles within the predicted maximum range to onset of PTS (649 yd. [593 m]). As discussed in Section 5.3.1.2.4 (Effectiveness Assessment for Lookouts), the likelihood of sighting individual animals, particularly sea turtles and some species of small or cryptic marine mammals, from a vessel decreases at long distances; therefore, this measure is likely ineffective at reducing impacts on sea turtles and some species of marine mammals at distances closer to 1,600 yd. (1.5 km) near the perimeter of the mitigation zone. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies]) will further help avoid impacts on marine mammals and sea turtles.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. A 30 min. wait period more than covers the average dive times of most marine mammal species but may not be sufficient for some deep-diving marine mammal species or for sea turtles. However, the analysis in Section 3.4.3.2.2 (Impacts from Explosives) shows that injury to deep-diving marine mammals (e.g., sperm whales and beaked whales) is not expected to occur. Requiring additional delay beyond 30 min. would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would reduce the vessel's ability to determine the pressure generated which is used to test the feasibility of using various net explosive weight sizes for different events, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measure described above because (1) it is likely to result in avoidance or reduction of injury to some species of marine mammals; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.1.2.14 Elevated Causeway System – Pile Driving

Recommended Mitigation and Comparison to Current Mitigation

The Navy is proposing to (1) modify the mitigation measures currently implemented for this activity by increasing the mitigation zone from 50 yd. (46 m) to 60 yd. (55 m), (2) clarify the conditions needed to recommence an activity after a sighting, and (3) add a requirement to visually observe for kelp paddies. The recommended measures are provided below.

Mitigation will include visual observation from a small boat, the elevated causeway, or from shore starting 30 min. prior to and during the exercise within a mitigation zone of 60 yd. (55 m) around the pile driver. The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. Pile driving will cease if a marine mammal or sea turtle is sighted within the mitigation zone. Pile driving will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, or (3) the mitigation zone has been clear from any additional sightings for a period of 30 min.

Effectiveness and Operational Assessments

See the introduction of Section 5.3.2 (Mitigation Zone Procedural Measures) for a general discussion of mitigation zones, how they are implemented, and the potential impacts they are designed to reduce. As shown in Table 5.3-2, the predicted maximum range to onset of PTS for pile-driving exercises is 51 yd. (46 m). This range was determined by the injury threshold of 180 dB root mean square for cetaceans. The predicted average range to onset of TTS is 1,094 yd. (1 km). Implementation of the 60 yd. (55 m) mitigation zone will reduce the potential for exposure to higher levels of energy that would result in injury and larger threshold shifts that would result in recovery (i.e., TTS) when individuals are sighted. Since the mitigation zone is so small, this measure should be effective at reducing the risk to all marine mammals and sea turtles that are available to be observed within the mitigation zone. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies]) will further help avoid impacts on marine mammals and sea turtles.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. A 30 min. wait period more than covers the average dive times of most marine mammal species but may not be sufficient for some deep-diving marine mammal species or for sea turtles. However, the analysis in Section 3.4.3.2.3 (Impacts from Pile Driving) shows that injury to deep-diving marine mammals (e.g., sperm whales and beaked whales) is not expected to occur. Requiring additional delay beyond 30 min. would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would reduce the crew's ability to construct the causeway platform in a manner that would be expected during a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measure described above because (1) it is likely to result in avoidance or reduction of injury to marine mammals and sea turtles; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.1.2.15 Weapons Firing Noise During Gunnery Exercises – Large-Caliber

Recommended Mitigation and Comparison to Current Mitigation

The Navy is proposing to implement the following mitigation measure, which only applies to the firing side of the ship as provided below.

For all explosive and non-explosive large-caliber gunnery exercises conducted from a ship, mitigation will include visual observation immediately before and during the exercise within a mitigation zone of 70 yd. (64 m) within 30 degrees on either side of the gun target line on the firing side. The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. Firing will cease if a marine mammal or sea turtle is sighted within the mitigation zone. Firing will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, (3) the mitigation zone has been clear from any additional sightings for a period of 30 min., or (4) the ship has repositioned itself more than 140 yd. (128 m) away from the location of the last sighting.

Effectiveness Assessment

The mitigation zone is designed to reduce the potential for injury from weapons firing noise during large-caliber gunnery exercises conducted from a ship. The majority of the energy that an animal could be exposed to would occur on the firing side of the vessel and would follow in the direction of fire. It is not operationally feasible to have Lookouts stationed on all sides of the vessel to visually observe for marine mammals and sea turtles due to limited resources (e.g., manning restrictions). Since the Lookout is positioned aboard the firing ship and is visually observing nearby the ship (70 yd. [64 m]), this measure should be effective at reducing the risk to all marine mammals and sea turtles that are available to be observed. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies]) will further help avoid impacts on marine mammals and sea turtles.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. A 30 min. wait period more than covers the average dive times of most marine mammal species but may not be sufficient for sea turtles. However, the analysis in Section 3.4.3.2.5 (Impacts from Weapons Firing, Launch, and Impact Noise) shows that injury to marine mammals is not expected to occur. Requiring additional delay beyond 30 min. would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would reduce the gun crews' abilities to engage surface targets and practice defensive marksmanship as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measure described above because (1) it is likely to result in avoidance or reduction of exposure to high levels of energy to marine mammals and sea turtles; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.2 Physical Disturbance and Strike

5.3.2.2.1 Vessels and In-Water Devices

5.3.2.2.1.1 Vessels

Recommended Mitigation and Comparison to Current Mitigation

The Navy is proposing to continue using the mitigation measures currently implemented. The recommended measures are provided below.

Vessels will avoid approaching marine mammals head on and will maneuver to maintain a mitigation zone of 500 yd. (457 m) around observed whales, and 200 yd. (183 m) around all other marine mammals (except bow riding dolphins), providing it is safe to do so.

Effectiveness and Operational Assessments

Since the Lookout is visually observing within a reasonable distance of the vessel (within 500 yd. [457 m]), this measure should be effective at reducing the risk to marine mammals that are available to be observed. However, as discussed above in Section 5.3.1.2.4 (Effectiveness Assessment for Lookouts), large whales and pods of dolphins are more likely to be seen than other more cryptic species, such as beaked whales.

The Navy proposes implementing the recommended measure described above because: (1) it is likely to result in avoidance or reduction of injury to marine mammals; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.2.1.2 Towed In-Water Devices

Recommended Mitigation and Comparison to Current Mitigation

The Navy is proposing to continue using the mitigation measures currently implemented. The recommended measure is provided below.

The Navy will ensure that towed in-water devices being towed from manned platforms avoid coming within a mitigation zone of 250 yd. (229 m) around any observed marine mammal, providing it is safe to do so.

Effectiveness and Operational Assessments

Since the Lookout is visually observing within a reasonable distance of the vessel (250 yd. [229 m]), this measure should be effective at reducing the risk to marine mammals that are observable. However, as discussed above in Section 5.3.1.2.4 (Effectiveness Assessment for Lookouts), large whales and pods of dolphins are more likely to be seen than other more cryptic species such as beaked whales.

The Navy proposes implementing the recommended measure described above because: (1) it is likely to result in avoidance or reduction of injury to marine mammals; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.2.2 Non-Explosive Practice Munitions

5.3.2.2.2.1 Gunnery Exercises – Small-, Medium-, and Large-Caliber Using a Surface Target

Recommended Mitigation and Comparison to Current Mitigation

The Navy is proposing to (1) continue using the mitigation measures currently implemented for this activity, and (2) clarify the conditions needed to recommence an activity after a sighting. The recommended measures are provided below.

Mitigation will include visual observation immediately before and during the exercise within a mitigation zone of 200 yd. (183 m) around the intended impact location. The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. Firing will cease if a marine mammal or sea turtle is sighted within the mitigation zone. Firing will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, (3) the mitigation zone has been clear from any additional sightings for a period of 10 min. for a firing aircraft, (4) the mitigation zone has been clear from any additional sightings for a period of 30 min. for a firing vessel, or (5) the intended target location has been repositioned more than 400 yd. (366 m) away from the location of the last sighting.

Effectiveness and Operational Assessments

The mitigation zone is designed to reduce the potential for direct strike from a non-explosive projectile. Large-caliber gunnery exercises involve the participating ship firing munitions at a target location from ranges up to 6 nm away. Small- and medium-caliber gunnery exercises involve the participating vessel or aircraft firing munitions at a target location from up to 2 nm away, although typically closer. Therefore it is necessary for the Lookout to be able to visually observe the mitigation zone from these distances. Although the Lookout will observe for all marine mammals or sea turtles in the area, as discussed in Section 5.3.1.2.4 (Effectiveness Assessment for Lookouts), it is highly unlikely that anything but a whale blow or large pod of dolphins will be seen at distances closer to 6 nm (i.e., at the furthest target distance for large-caliber gunnery exercises) or 2 nm (i.e., at the furthest target distance for small- and medium-caliber gunnery exercises). Although this measure is likely ineffective at reducing the risk of injury to sea turtles and some species of marine mammals, it does reduce the risk for those individuals that may be observed. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies]) will further help avoid impacts on marine mammals and sea turtles.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. A 30 min. wait period when vessels are firing more than covers the average dive times of most marine mammal species but may not be for sea turtles. However, the analysis in Section 3.4.3.4.3 (Impacts from Military Expended Materials) shows that injury to marine mammals and sea turtles is not expected to occur. Requiring additional delay beyond 30 min. for a firing vessel would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would reduce the gun crews’ abilities to engage surface targets and practice defensive marksmanship as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The 10 min. wait period for a firing aircraft covers a portion of the average marine mammal and sea turtle dive times but may not be sufficient to cover the average dive times of all species. The 10 min. wait period is based on fuel restrictions for the types of aircraft involved in this activity (e.g., helicopters). Requiring additional delay beyond 10 min. for these sources would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would result in an unacceptable increased risk to personnel safety or would require aircraft to depart the activity location to refuel, which would eliminate opportunities and reduce the gun crews’ abilities to engage surface targets and practice defensive marksmanship as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measure described above because: (1) it is likely to result in avoidance or reduction of injury to some species of marine mammals; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.2.2.2 Bombing Exercises

Recommended Mitigation and Comparison to Current Mitigation

The Navy is proposing to (1) continue using the mitigation measures currently implemented for this activity, and (2) clarify the conditions needed to recommence an activity after a sighting. The recommended measures are provided below.

Mitigation will include visual observation from the aircraft immediately before the exercise and during target approach within a mitigation zone of 1,000 yd. (914 m) around the intended impact location. The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. Bombing will cease if a marine mammal or sea turtle is sighted within the mitigation zone. Bombing will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, or (3) the mitigation zone has been clear from any additional sightings for a period of 10 min.

Effectiveness and Operational Assessments

The mitigation zone is designed to reduce the potential for direct strike from a non-explosive bomb. The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. The 10 min. wait period covers a portion of the average marine mammal and sea turtle dive times but may not be sufficient to cover the average dive times of all species. The 10 min. wait period is based on fuel restrictions for the types of aircraft involved in this activity (e.g., F/A-18). Requiring additional delay beyond 10 min. for these platforms would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would result in an unacceptable increased risk to personnel safety or would require aircraft to depart the activity location to refuel, which would reduce the aircrews' abilities to approach surface targets and deliver bombs as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies]) will further help avoid impacts on marine mammals and sea turtles.

The Navy proposes implementing the recommended measure described above because: (1) it is likely to result in avoidance or reduction of injury to marine mammals or sea turtles; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.2.2.2.3 Missile Exercises (Including Rockets) Using a Surface Target

The Navy is proposing to (1) modify the mitigation measures currently implemented for this activity by reducing the mitigation zone from 1,800 yd. (1.6 km) to 900 yd. (823 m), (2) clarify the conditions needed to recommence an activity after a sighting, (3) adopt the marine mammal and sea turtle mitigation zone size for floating vegetation for ease of implementation**,** and (4) modify the platform of observation to eliminate the requirement to observe when ships are firing. Refer to Section 5.3.3.2.2 (Shallow Coral Reefs, Hardbottom Habitat, Artificial Reefs, and Shipwrecks) for information on mitigation designed to avoid or reduce potential impacts from military expended materials within shallow coral reef mitigation areas. The recommended measures are provided below.

When aircraft are firing, mitigation will include visual observation by the aircrew or supporting aircraft prior to commencement of the activity within a mitigation zone of 900 yd. (823 m) around the deployed target. The exercise will not commence if concentrations of floating vegetation (*Sargassum* or kelp paddies) are observed in the mitigation zone. Firing will cease if a marine mammal or sea turtle is sighted within the mitigation zone. Firing will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, or (3) the mitigation zone has been clear from any additional sightings for a period of 10 min. or 30 min. (depending on aircraft type).

Effectiveness and Operational Assessments

The mitigation zone is designed to reduce the potential for direct strike from a non-explosive projectile. Activities using non-explosive missiles (including rockets) involve the participating ship or aircraft firing munitions at a target location typically up to 15 nm away and infrequently include ranges up to 75 nm away. When an aircraft is firing, the aircraft can travel close to the intended impact area so that it can be visually observed. Because that type of observation is not possible for a ship, visual observation is not suitable for activities that involve a ship-fired missile. Even with aircraft firing, there is a chance that animals could enter the impact area after the visual observations have been completed and the activity has commenced. Observation for indicators of marine mammal and sea turtle presence (e.g., concentrations of floating vegetation [*Sargassum* or kelp paddies]) will further help avoid impacts on marine mammals and sea turtles.

The post-sighting wait period is designed to give any animals that are sighted an opportunity to leave the area before the exercise recommences but will only be employed if one of the other conditions has not already been met. The 30 min. wait period more than covers the average dive times of most marine mammal species but may not be sufficient for some deep-diving marine mammal species or for sea turtles. However, the analysis in Section 3.4.3.4.3 (Impacts from Military Expended Materials) shows that injury to marine mammals and sea turtles is not expected to occur. The 30 min. wait period represents the maximum wait period acceptable for certain types of aircraft involved in this activity (e.g., maritime patrol aircraft) based on their specific fuel restrictions. Requiring additional delay beyond 30 min. for these platforms would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would result in an unacceptable increased risk to personnel safety or would require aircraft to depart the activity location to refuel, which would reduce the aircrews' abilities to approach surface targets and launch missiles as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The 10 min. wait period covers a portion of the average marine mammal and sea turtle dive times but may not be sufficient to cover the average dive times of all species. The 10 min. wait period is based on the specific fuel restrictions for the other types of aircraft involved in this activity (e.g., helicopters). Requiring additional delay beyond 10 min. for these platforms would modify the activity in a way that it would no longer meet its intended objective. Any additional delay would result in an unacceptable increased risk to personnel safety or would require aircraft to depart the activity location to refuel, which would reduce the aircrews' abilities to approach surface targets and launch missiles as would be required in a real world combat situation, and would therefore have an unacceptable impact on the realism and effectiveness of the exercise.

The Navy proposes implementing the recommended measure described above because (1) it is likely to result in avoidance or reduction of injury to marine mammals and sea turtles; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.3 MITIGATION AREAS

The Navy is proposing to implement several mitigation measures within pre-defined habitat areas in the Study Area. For the purposes of this document, the Navy will refer to these areas as "mitigation areas." As described throughout this section, these recommended mitigation areas may be based off endangered species critical habitats, endangered species reproductive areas, or bottom features. The size and location of certain habitat areas, such as the critical habitats, is subject to change over time; however, the Navy's effectiveness and operational assessments and resulting mitigation recommendations are entirely dependent on the mitigation area defined in this document. Therefore, it is important to note that the Navy is recommending implementing mitigation measures only within each area as described in this document. Applying these mitigations to additional or expanded areas could potentially result in an unacceptable impact on readiness.

5.3.3.1 Marine Mammal Habitats

5.3.3.1.1 Humpback Whale

5.3.3.1.1.1 Humpback Whale Cautionary Area

Recommended Mitigation and Comparison to Current Mitigation

To supplement the mitigation measures described in Section 5.3.2 (Mitigation Zone Procedural Measures), the Navy is proposing continuation of mitigation measures within the Hawaiian Islands Humpback Whale National Marine Sanctuary. Humpback whales migrate to the Hawaiian Islands each winter to mate and rear their calves. Data clearly indicate that, historically, high densities of humpback whales have concentrated in certain areas around the Hawaiian Islands. NMFS has reviewed the Navy's data on mid-frequency active sonar training in these dense humpback whale areas since June 2006 and found it to be rare and infrequent. While past data is no guarantee of future activity, it documents a history of low level mid-frequency active sonar activity in dense humpback areas. In order to be successful at operational missions and against the threat of quiet, diesel-electric submarines, the Navy has, for more than 40 years, routinely conducted anti-submarine warfare training in major exercises in the waters off the Hawaiian Islands, including the Hawaiian Islands Humpback Whale National Marine Sanctuary. During this period, no harmful effects to humpback whales attributed to mid-frequency active sonar use have been observed. Coincident with this use of mid-frequency active sonar, abundance estimates reflect an annual increase in the humpback whale stock (Mobley et al. 2001; Mobley 2004).

NMFS and the Navy have explored ways of reducing or avoiding impacts to humpback whales from exposure to mid-frequency active sonar. Factors including how practical the measure is to implement and how the measure could affect training fidelity are considered before implementing the measure. The Navy recognizes the significance of the Hawaiian Islands for humpback whales. The Navy has designated a humpback whale cautionary area (Figure 5.3-1), which consists of a 3.1 mi. (5 km) mitigation zone that has been identified as having one of the highest concentrations of humpback whales during the critical winter months. The Navy has agreed that training exercises in the humpback whale cautionary area will require a much higher level of clearance than is normal practice in planning and conducting mid-frequency active sonar training. Should national security needs require mid-frequency active sonar training and testing in the cautionary area between 15 December and 15 April, it shall be personally authorized by the Commander, U.S. Pacific Fleet. The Commander, U.S. Pacific Fleet shall base such authorization on the unique characteristics of the area from a military readiness perspective, taking into account the importance of the area for humpback whales and the need to reduce adverse impacts on humpback whales from mid-frequency active sonar whenever practicable. Approval at this level for this type of activity is extraordinary. The Commander, U.S. Pacific Fleet is a four-star Admiral and the highest ranking officer in the U.S. Pacific Fleet. This case-by-case authorization cannot be delegated and represents the Navy's commitment to fully consider and balance mission requirements with environmental stewardship. Further, the Commander, U.S. Pacific Fleet will provide specific direction on required mitigation prior to operational units transiting to and training in the cautionary area. This process will ensure the decisions to train in this area are made at the highest level in the Pacific Fleet, heighten awareness of humpback whale activities in the cautionary area, and serve to reemphasize that mitigation measures are to be scrupulously followed. The Navy will provide NMFS with advance notification of any such activities.

Effectiveness and Operational Assessments

Mid-frequency active sonar training will not regularly occur within the humpback whale cautionary area between 15 December and 15 April. This training can occur in this area during this time period only with approval by the Commander, U.S. Pacific Fleet. This approach will reduce potential interactions between humpback whales and U.S. Navy training activities during the critical winter months of highest concentrations of humpback whales.

The Navy proposes implementing the recommended measures described above because (1) they are likely to result in avoidance or reduction of injury to the humpback whale; and (2) they have acceptable operational impacts on the proposed activity with regard to safety, practicability, impact on readiness, and Navy policy.

5.3.3.2 Seafloor Resources

5.3.3.2.1 Marine Habitats and Cultural Resources

5.3.3.2.2 Shallow Coral Reefs, Hardbottom Habitat, Artificial Reefs, and Shipwrecks

Recommended Mitigation and Comparison to Current Mitigation

The Navy is proposing to (1) modify some of the mitigation measures for seafloor habitats and shipwrecks and (2) discontinue the currently implemented measures for medium- and large-caliber gunnery exercises and missile exercises using airborne targets. The recommended measures are provided below.

To aid in the implementation of these measures, the Navy will include maps of surveyed shallow coral reefs, artificial reefs, and shipwrecks, in the Protective Measures Assessment Protocol. For mitigation, the term "surveyed" refers to habitat features where the available data indicate the natural boundary of the feature at a generally constant accuracy. Data that are generalized within large geometric areas (e.g., grid cells) are not included.

The Navy will not conduct precision anchoring within the anchor swing diameter, or explosive mine countermeasure and neutralization activities (except in near-shore areas of San Clemente Island in the SOCAL Range Complex and in the SSTC) within 350 yd. (320 m) of surveyed shallow coral reefs, live hardbottom, artificial reefs, and shipwrecks.

The Navy will not conduct explosive or non-explosive small-, medium-, and large-caliber gunnery exercises using a surface target, explosive missile exercises using a surface target, explosive and non-explosive bombing exercises, or at-sea explosive testing within 350 yd. (320 m) of surveyed shallow coral reefs.

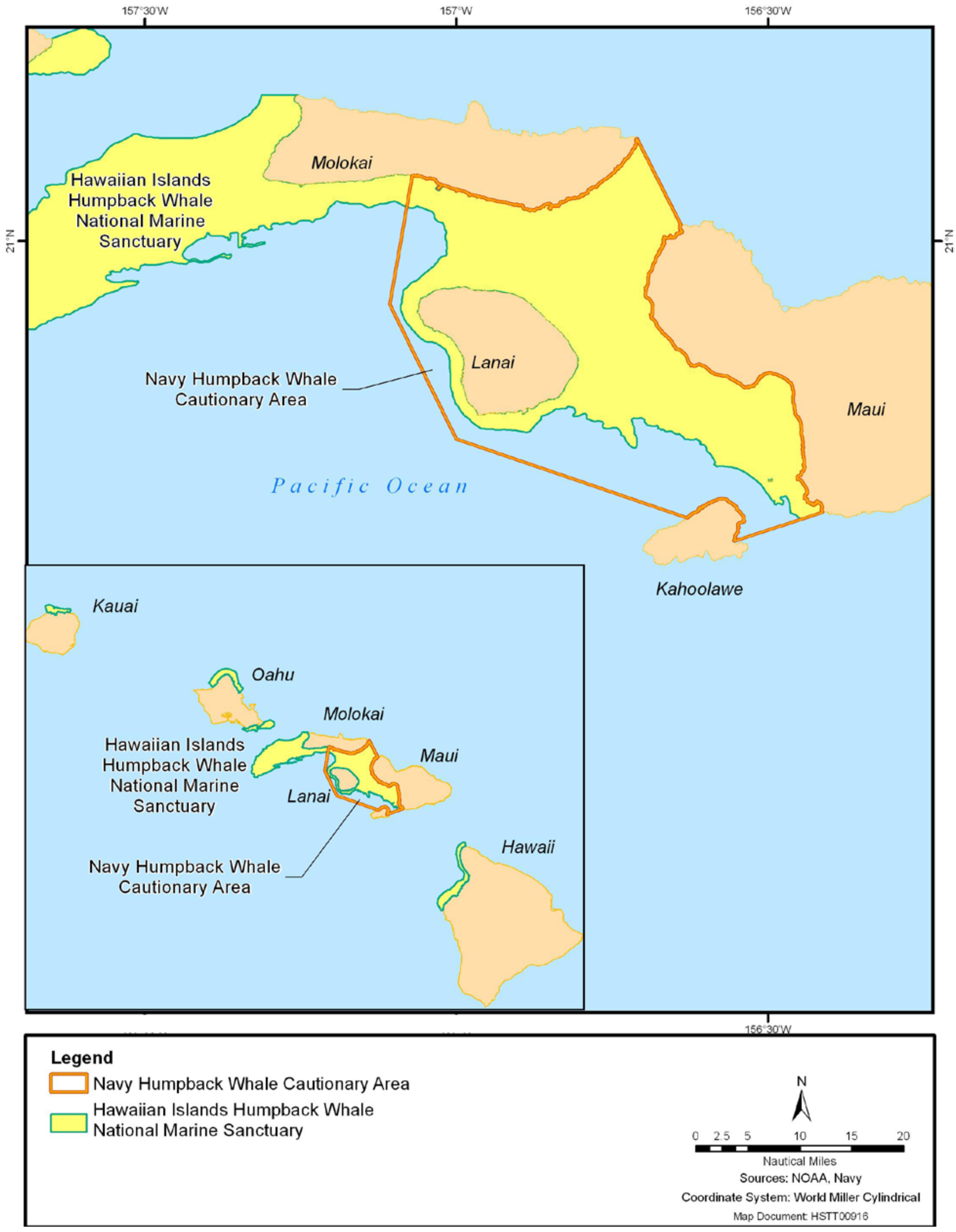


Figure 5.3-1: Navy Humpback Whale Cautionary Area

Effectiveness and Operational Assessments

The Navy's currently implemented seafloor habitats and shipwreck mitigation zones are based off the range to effects for marine mammals or sea turtles, which are driven by hearing thresholds. The Navy's recommended measures are modified to focus on reducing potential physical impacts on seafloor habitats and shipwrecks from explosives and physical strike from military expended materials. The recommended 350 yd. (320 m) mitigation zone is based off the estimated maximum seafloor impact zone for explosions discussed in Section 3.3 (Marine Habitats). The use of non-explosive military expended materials would result in a smaller footprint of potential impact; however, the Navy recommends applying the explosive mitigation zone to all explosive and non-explosive activities as listed above for ease of implementation. This standard mitigation zone will consequently result in an additional protection buffer during the non-explosive activities listed above.

It is not possible to definitively predict or to effectively monitor where the military expended materials from airborne gunnery and missile exercises using aerials targets would be likely to strike seafloor habitats and shipwrecks. The potential debris fall zone can only be predicted within tens of miles for long range events, which can be in excess of 80 nm from the firing location during some missile exercises, and thousands of yards for shorter events, which can occur within several thousand yards of the firing location.

Live hardbottom, shallow water coral reefs, artificial reefs, and shipwrecks fulfill important ecosystem functions. Avoiding or minimizing physical disturbance and strike of these resources will likely reduce the impact on these resources. This measure is only effective with regard to surveyed resources since the Navy needs specific locations to restrict the specified activities. It is not possible for the Navy to avoid these seafloor features when their exact locations are unknown.

The Navy proposes implementing the recommended measures described above because (1) they are likely to result in avoidance or reduction of physical disturbance and strike to seafloor habitats and shipwrecks; and (2) implementation has been analyzed as acceptable with regard to personnel safety, practicality of implementation, impact on effectiveness of the military readiness activity, and Navy policy.

5.3.3.2.3 Cultural Resources

Although effects on underwater cultural resources are not anticipated, the potential for unanticipated discovery of underwater resources always exists. To ensure that previously unidentified submerged cultural resources are adequately protected, the Commander, Naval Region, the Advisory Council on Historic Preservation (Council), and the Hawaii State Historic Preservation Office entered into a Programmatic Agreement in 2003 regarding Navy undertakings in Hawaii. Among the stipulations of the Programmatic Agreement is one focused on unanticipated discoveries: Stipulation XI(A). The Programmatic Agreement stipulates; "If during the performance of an undertaking, historic properties, including submerged archaeological sites and traditional cultural places, are discovered or unanticipated effects are found, or a previously unidentified property which may be eligible for listing on the National Register of Historic Places is discovered, Commander, Naval Region Hawaii will take all reasonable measures to avoid or minimize harm to the property until it concludes consultation with the State Historic Preservation Office and any Native Hawaiian organization, including the Oahu Council of Hawaiian Civic Clubs, which has made known to Commander, Naval Region Hawaii that it attaches religious and cultural significance to the historic property."

Under the existing Programmatic Agreement with the California State Historic Preservation Office, once a currently unidentified site is determined to be eligible for the National Registry of Historic Places, the State Historic Preservation Officer will be consulted to resolve potential adverse effects and identify appropriate treatments stipulated to address identified, unavoidable adverse effects.

5.3.4 Mitigation Measures Considered but Eliminated

A number of mitigation measures were suggested during the public comment periods of previous Navy environmental documents and throughout the development of this Final EIS/OEIS. As a result of the assessment process identified in Section 5.2 (Introduction to Mitigation), the Navy determined that some of the suggested measures would likely be ineffective at reducing environmental impacts, have an unacceptable operational impact based on the operational assessment, or be incompatible with Section 5.2.2 (Overview of Mitigation Approach). The measures that the Navy does not recommended for implementation are discussed in Section 5.3.4.1 (Previously Considered but Eliminated) and Section 5.3.4.2 (Previously Accepted but Now Eliminated). There is a distinction between effective and feasible observation procedures for data collection and measures employed to prevent impacts or otherwise serve as mitigation. The discussion below is in reference to those procedures meant to serve as mitigation measures.

5.3.4.1 Previously Considered but Eliminated

5.3.4.1.1 Reducing Amount of Training and Testing Activities

Reducing training and testing for the purpose of mitigation would result in an unacceptable impact on readiness for the following reasons:

The requirements to train are designed to provide the experience needed to ensure Sailors are properly prepared for operational success. Training requirements have been developed through many years of iteration and are designed to ensure Sailors achieve the levels of readiness needed to properly respond to the many contingencies that may occur during an actual mission. The Proposed Action does not include training beyond levels required for maintaining satisfactory levels of readiness due to the need to efficiently use limited resources (e.g., fuel, personnel, and time). Therefore, any reduction of training would not allow Sailors to achieve satisfactory levels of readiness needed to accomplish their mission.

The requirements to test systems prior to their implementation in military activities are identified in Department of Defense (DoD) Directive 5000.1. This directive states that test and evaluation support is to be integrated throughout the defense acquisition process. The Navy rigorously collected data during the developmental stages of this EIS/OEIS to accurately quantify test activities necessary to meet requirements of DoD Directive 5000.1. These testing requirements are designed to determine whether systems perform as expected and are operationally effective, suitable, survivable, and safe for their intended use. Any reduction of testing activities would not allow the Navy to meet its purpose and need to achieve requirements set forth in DoD Directive 5000.1.

5.3.4.1.2 Replacing Training and Testing with Simulated Activities

Replacing training and testing activities with simulated activities for the purpose of mitigation would result in an unacceptable impact on readiness for the following reasons:

As described in Section 2.5.1.3 (Simulated Training and Testing), the Navy currently uses computer simulation for training and testing whenever possible. Computer simulation can provide familiarity and complement live training; however, it cannot provide the fidelity and level of training necessary to prepare naval forces for deployment.

The Navy is required by law to operationally test major platforms, systems, and components of these platforms and systems in realistic combat conditions before full-scale production can occur. Substituting simulation for live training and testing fails to meet the purpose of and need for the Proposed Action and therefore was eliminated from consideration as a mitigation measure.

5.3.4.1.3 Reducing Sonar Source Levels and Total Number of Hours

Active sonar is only used when required by the mission since it has the potential to alert opposing forces to the sonar platform's presence. Passive sonar and all other sensors are used in concert with active sonar to the maximum extent practicable when available and when required by the mission. Reducing active sonar source levels and the total number of active sonar hours used during training and testing activities for the purpose of mitigation would adversely impact the effectiveness of military readiness activities and increase safety risks to personnel for the following reasons:

Sonar operators need to train as they would operate during real combat situations. Operators of sonar equipment are always cognizant of the environmental variables affecting sound propagation. In this regard, sonar equipment power levels are always set consistent with mission requirements. Reducing sonar source levels for the purpose of mitigation precludes sonar operators from learning to operate the sonar systems with their entire range of capabilities throughout the extremely diverse range of environmental conditions they may encounter. Failure to train with the entire range of capabilities will reduce the effectiveness of the sonar operators should their skills be required during real world events. Not only would they not develop the skills necessary to identify and track submarines at the maximum distances of their systems capabilities, they would not learn how to use their systems' capabilities during the entire range of environmental conditions they may encounter. Likewise, they would not develop the knowledge of how to fully integrate multiple anti-submarine warfare capabilities, including other ships and aircraft into an integrated anti-submarine warfare team.

Failure to train with the entire range of capabilities also compromises training by reducing the ability for a sonar operator to detect, track, and hold an enemy target, mine, or other object, and by reducing the realism of other training scenarios (e.g., navigation training). Particularly during a strike group exercise, sonar operators need to learn to handle real world combat situations (e.g., the ability to manage sonar operations during periods of mutual interference, which can occur when more than one sonar system is operating simultaneously). Training with reduced sonar source levels would ultimately condition Sailors to expect conditions that they would not experience in a real world combat situation, thereby resulting in an unacceptable increased risk to personnel safety and the strike group's ability to achieve mission success. The Navy must test its systems in the same way they would be used for military readiness activities. Reducing sonar source levels during testing would impact the ability to determine whether systems are operationally effective, suitable, survivable, and safe. Ultimately, reducing sonar source levels would reduce training and testing realism. Reducing the total number of sonar hours used during training and testing would prevent the Navy from meeting its military readiness qualification standards.

5.3.4.1.4 Implementing Active Sonar Ramp-Up Procedures during Training

Implementing active sonar ramp-up procedures (slowly increasing the sound in the water to necessary levels) in an attempt to clear the range prior to conducting activities for the purpose of mitigation during training activities would result in an unacceptable impact on readiness and would not necessarily be effective at reducing potential impacts on marine species for the following reason:

Ramp-up procedures would alert opponents to the participants' presence. This would consequently negatively affect the realism of training because the target submarine could detect the searching unit before the searching unit could detect the target submarine, enabling the target submarine to take evasive measures. This is not representative of a real world situation and thereby would impact training realism and effectiveness. Training with reduced realism would alter Sailors' abilities to effectively operate in a real world combat situation, thereby resulting in an unacceptable increased risk to personnel safety and the sonar operator's ability to achieve mission success.

Although ramp-up procedures have been used for some testing activities, effectiveness at avoiding or reducing impacts on marine mammals has not been demonstrated. Until evidence suggests that ramp-up procedures are effective means of avoiding or reducing potential impacts on marine mammals, the Navy is proposing to eliminate the implementation of this measure for testing activities as part of the Proposed Action.

5.3.4.1.5 Reducing Vessel Speed

As described in Section 5.1.1 (Vessel Safety), as a standard operating procedure, Navy personnel are required to use extreme caution and operate at a slow, safe speed consistent with mission and safety. These standard operating procedures are designed to allow a vessel to take proper and effective action to avoid a collision with any sighted object or disturbance (which may include a marine mammal), and to stop within a distance appropriate to the prevailing circumstances and conditions. Implementing widespread reductions in vessel speed throughout the Study Area for the purpose of mitigation would be impractical with regard to military readiness activities, and result in an unacceptable impact on readiness for the following reasons:

Vessel operators need to be able to react to changing tactical situations and evaluate system capabilities in training and testing as they would in actual combat. Widespread speed restrictions would not allow the Navy to properly test vessel capabilities, for example, during full power propulsion testing during sea trials. Training with reduced realism would alter Sailors' abilities to effectively operate in a real world combat situation, thereby resulting in an unacceptable increased risk to personnel safety and the vessel operator's ability to achieve mission success.

5.3.4.1.6 Limiting Access to Training and Testing Locations

Limiting training and testing activities to specific locations for the purpose of mitigation would be impractical with regard to implementation, would adversely impact the effectiveness of military readiness activities, and would increase safety risks to personnel for the following reasons:

As described in Section 2.5.1.1 (Alternative Training and Testing Locations), the ability to use the diverse and multidimensional capabilities of each range complex and testing range results in the Navy's ability to develop and maintain high levels of readiness. Major exercises using integrated warfare components require large areas of the littorals, open ocean, and certain nearshore areas for realistic and safe training. Limiting training and testing (including the use of sonar and other active acoustic sources or explosives) to specific locations (e.g., abyssal waters and surveyed offshore waters) and avoiding areas (e.g., embayments or large areas of the littorals and open ocean) would be impractical to implement with regard to the need to conduct activities in proximity to certain facilities and range complexes. These restrictions would also adversely impact the safety of the training and testing activities by requiring activities to take place in more remote areas where safety support may be limited.

Training and testing activities require continuous access to large areas consisting potentially of thousands of square miles of ocean and air space to provide naval personnel the ability to train with and develop competence and confidence in their capabilities and their entire suite of weapons and sensors. Exercises may change mid-stream based on evaluators' assessments of performance and other conditions including weather or mechanical issues. These may preclude use of a permission scheme for access to water space. Threats to national security are constantly evolving and the Navy requires the ability to adapt training to meet these emerging threats as well as develop and test systems to effectively operate in these environments. Restricting access to limited locations would impact the ability of Navy training and testing to evolve as the threat evolves. Operational units already incorporate requirements for safety of personnel including air space and shipping routes. Safety restrictions may include limits on distance from military air fields during carrier flight operations and air traffic corridors for safety of military and civilian aviation. These types of limitations shape how exercise planners develop and implement training scenarios including those involving defense of aircraft carriers from submarines.

Therefore, limiting access to training and testing locations would reduce realism of training by restricting access to important real world combat situations, such as bathymetric features and varying oceanographic features. As described in Section 5.3.4.1.7 (Avoiding Locations Based on Bathymetry and Environmental Conditions), Sailors must be trained to handle bottom bounce, sound passing through changing currents, eddies, or across changes in ocean temperature, pressure, or salinity. Training in a few specific locations would alter Sailors' abilities to effectively operate in varying real world combat situations, thereby resulting in an unacceptable increased risk to personnel safety and the ability to achieve mission success.

5.3.4.1.7 Avoiding Locations Based on Bathymetry and Environmental Conditions

Avoiding locations for training and testing activities based on bathymetry and environmental conditions for the purpose of mitigation would increase safety risks to personnel and result in an unacceptable impact on readiness for the following reasons:

Areas where training and testing activities are scheduled to occur are carefully chosen to provide safety and allow realism of events. As described in Section 2.5.1.1 (Alternative Training and Testing Locations), the varying environmental conditions of the Study Area (e.g., bathymetry and topography) maximize the training realism and testing effectiveness. Limiting training and testing, including the use of sonar and other active acoustic sources or explosives, to avoid steep or complex bathymetric features (e.g., submarine canyons and large seamounts) and oceanographic features (e.g., surface fronts and variations in sea surface temperatures) would reduce the realism of the military readiness activity. Systems must be tested in a variety of bathymetric and environmental conditions to ensure functionality and accuracy in a variety of environments. Sonar operators need to train as they would operate during real world combat situations. Because real world combat situations include diverse bathymetric and environmental conditions, Sailors must be trained to handle bottom bounce, sound passing through changing currents, eddies, or across changes in ocean temperature, pressure, or salinity. Training with reduced realism would alter Sailors' abilities to effectively operate in a real world combat situation, thereby resulting in an unacceptable increased risk to personnel safety and the sonar operator's ability to achieve mission success.

5.3.4.1.8 Avoiding or Reducing Active Sonar at Night and During Periods of Low Visibility

Avoiding or reducing active sonar at night and during periods of low visibility for the purpose of mitigation would result in an unacceptable impact on readiness for the following reasons:

The Navy must train in the same manner as it will fight. Anti-submarine warfare can require a significant amount of time to develop the "tactical picture," or an understanding of the battle space (e.g., area searched or unsearched, identifying false contacts, and understanding the water conditions). Reducing or securing power in low-visibility conditions would affect a commander's ability to develop this tactical picture and would not provide the needed training realism. Training differently from what would be needed in an actual combat scenario would decrease training effectiveness, reduce the crew's abilities, and introduce an increased safety risk to personnel.

Mid-frequency active sonar training is required year-round in all environments, including night and low-visibility conditions. Training occurs over many hours or days, which requires large teams of personnel working together in shifts around the clock to work through a scenario. Training at night is vital because environmental differences between day and night affect the detection capabilities of sonar. Temperature layers that move up and down in the water column and ambient noise levels can vary significantly between night and day, which affects sound propagation and could affect how sonar systems are operated. Consequently, personnel must train during all hours of the day to ensure they identify and respond to changing environmental conditions, and not doing so would unacceptably decrease training effectiveness and reduce the crews' abilities. Therefore, the Navy cannot operate only in daylight hours or wait for the weather to clear before training.

The Navy must test its systems in the same way they would be used for military readiness activities. Reducing or securing power in adverse weather conditions or at night would impact the ability to determine whether systems are operationally effective, suitable, survivable, and safe. Additionally, some systems have a nighttime testing requirement. Therefore, Navy personnel cannot operate only in daylight hours or wait for the weather to clear before or during all test events.

5.3.4.1.9 Avoiding or Reducing Active Sonar during Strong Surface Ducts

Avoiding or reducing active sonar during strong surface ducts for the purpose of mitigation would increase safety risks to personnel, be impractical with regard to implementation of military readiness activities, and result in an unacceptable impact on readiness for the following reasons:

The Navy must train in the same manner as it will fight. Anti-submarine warfare can require a significant amount of time to develop the "tactical picture," or an understanding of the battle space such as area searched or unsearched, identifying false contacts, understanding the water conditions, etc. Surface ducting is a condition when water conditions (e.g., temperature layers, lack of wave action) result in little sound energy penetrating beyond a narrow layer near the surface of the water. Submarines have long been known to exploit the phenomena associated with surface ducting. Therefore, training in surface ducting conditions is a critical component to military readiness because sonar operators need to learn how sonar transmissions are altered due to surface ducting, how submarines may take advantage of them, and how to operate sonar effectively in this environment. Avoiding or reducing active sonar during surface ducting conditions would affect a commander's ability to develop this tactical picture and would not provide the needed training realism. Diminished realism would reduce a sonar operator's ability to effectively operate in a real world combat situation, thereby resulting in an unacceptable increased risk to personnel safety and the ability to achieve mission success.

Furthermore, avoiding surface ducting would be impractical to implement because ocean conditions contributing to surface ducting change frequently, and surface ducts can be of varying duration. Surface ducting can also lack uniformity and may or may not extend over a large geographic area, making it difficult to determine where to reduce power and for what periods.

5.3.4.1.10 Avoiding Locations Based on Distances from Isobaths or Shorelines

Avoiding locations for training and testing activities within the Study Area based on wide-scale distances from isobaths or the shoreline for the purpose of mitigation would be impractical with regard to implementation of military readiness activities, result in unacceptable impact on readiness, and would not be an effective means of mitigation, and would increase safety risks to personnel for the following reasons:

A measure requiring avoidance of mid-frequency active sonar within 13 nm of the 656 ft. (200 m) isobaths was part of the Rim of the Pacific exercise 2006 authorization by NMFS. This measure, as well as similar measures of like distances, lacks any scientific basis when applied to the context of the Study Area (e.g., bathymetry, sound propagation, and width of channels). There is no scientific analysis indicating this measure is protective and no known basis for these specific metrics. The Rim of the Pacific 2006 exercise mitigation measure precluded active anti-submarine training in the littoral region, which significantly impacted realism and training effectiveness (e.g., protecting ships from submarine threats during amphibious landings). This mitigation procedure had no observable effect on the protection of marine mammals during Rim of the Pacific 2006 exercises, and its value is unclear; however, its adverse effect on realistic training, as with all arbitrary distance from land restrictions, is significant.

Training in shallower water is an essential component to maintaining military readiness. Sound propagates differently in shallower water and operators must learn to train in this environment. Additionally, submarines have become quieter through the use of improved technology and have learned to hide in the higher ambient noise levels of the shallow waters of coastal environments. In real world events, it is highly likely Sailors would be working in, and therefore must train in, these types of areas.

Areas where training and testing activities are scheduled to occur are carefully chosen to provide safety and allow realism of events. The proximity to facilities, range complexes, and testing ranges is essential to the training and testing realism and effectiveness required to train and certify naval forces ready for combat operations. Limiting access to nearshore areas would restrict access to certain training and testing locations and would increase transit time for these activities, which would result in an increased risk to personnel safety, particularly for platforms with fuel restrictions (e.g., aircraft) or for certain activities such as mine countermeasures and neutralization activities using diver-placed mines.

The ability to use the diverse and multi-dimensional capabilities of each range complex and testing range results in the Navy's ability to develop and maintain high levels of readiness. Otherwise limiting training and testing (including the use of sonar and other active acoustic sources or explosives) to avoid arbitrary distances from isobaths or the shoreline would adversely impact the effectiveness of the training and testing. This includes avoiding conducting activities within 12 nm from shore, 25 nm from shore, between shore and the 20 m isobath, and 13 nm out from the 656 ft. (200 m) isobath. Operating in shallow water is essential in order to provide realistic training on real world combat conditions with regard to shallow water sound propagation.

5.3.4.1.11 Avoiding Marine Species Habitats

Navy has recommended measures within several mitigation areas (Section 5.3.3, Mitigation Areas) that have been well-documented as important habitats for particular species and in which implementation of mitigation would not result in unacceptable impacts on readiness. These mitigation areas have been carefully selected on a case-by-case basis through consultation with NMFS and the U.S. Fish and Wildlife

Service. Otherwise avoiding all marine species habitats (e.g., foraging locations, reproductive locations, migration corridors, and locations of modeled takes) for the purpose of mitigation would be impractical with regard to implementation of military readiness activities, would result in unacceptable impact on readiness, and would increase safety risks to personnel for the following reasons:

As described in Section 5.3.4.1.6 (Limiting Access to Training and Testing Locations) and Section 5.3.4.1.7 (Avoiding Locations Based on Bathymetry and Environmental Conditions), areas where training and testing activities are scheduled to occur are carefully chosen to provide safety and allow realism of events, and the varying environmental conditions of these areas maximize the training realism and testing effectiveness. Activity locations inevitably overlap a wide array of marine species habitats, including foraging habitats, reproductive areas, and migration corridors. Otherwise limiting activities to avoid these habitats would adversely impact the effectiveness of the training or testing activity, and would therefore result in an unacceptable increased risk to personnel safety and the ability to achieve mission success.

As described in the *Determination of Acoustic Effects on Marine Mammals and Sea Turtles for the Hawaii-Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* technical report (Marine Species Modeling Team 2013), modeling locations were developed based on historical data and anticipated future needs. The model does not provide information detailed enough to analyze or compare locations based on potential take levels for each activity; therefore, applying the modeling results to inform development of mitigation areas would not be appropriate.

5.3.4.1.12 Avoiding Marine Protected Areas

The Navy recommends conducting special mitigation within areas (Section 5.3.3, Mitigation Areas) that have been well-documented as important habitats for particular species. Otherwise avoiding marine protected areas for the purpose of mitigation would increase safety risks to personnel, be impractical with regard to implementation, and would not be warranted based on the discussions presented in the Chapter 3 (Affected Environment and Environmental Consequences) environmental analyses for biological resources and Section 6.1.2 (Marine Protected Areas).

Areas where training and testing activities are scheduled to occur are carefully chosen to provide safety and allow realism of events. The proximity to facilities, range complexes, and testing ranges is essential to the training and testing realism and effectiveness required to train and certify naval forces ready for combat operations. Limiting access to marine protected areas would restrict access to training and testing locations and would increase transit time, which would result in an increased risk to personnel safety, particularly for platforms with fuel restrictions (e.g., aircraft).

As described in Section 6.1.2 (Marine Protected Areas), due to the nature of most training and testing activities (e.g., requiring deep water), proposed activities are unlikely to occur in the extremely shallow nearshore waters typical of most marine protected areas. Within most marine protected areas, the only activity likely to occur is an aircraft overflight during transit from an airfield to an offshore training or testing location. Exposure of marine protected area resources to aircraft overflights would be brief and is expected to cause only a minor and temporary behavioral reaction due to noise for marine mammals, sea turtles, birds, or fish that may be present in the area. There is potential for birds to be struck by aircraft; however, the Navy implements standard operating procedures that require pilots of Navy aircraft to make every attempt to avoid large flocks of birds in order to reduce the safety risk involved with a potential bird strike. Additional mitigation or avoidance of these marine protection areas would be unnecessary, and limiting passage through the areas would restrict direct access to training and testing locations. Such avoidance would ultimately increase transit time and for platforms with fuel restrictions (e.g., aircraft) would therefore result in an unacceptable increased risk to personnel safety.

For marine protected areas (e.g., gear restricted areas) located further offshore, activities in addition to aircraft overflights may occur. Refer to Section 6.1.2 (Marine Protected Areas) for a more detailed discussion on the activities that are expected to occur within marine protected areas in the Study Area. Ultimately, limiting access to training and testing locations that overlap, are contained within, or are adjacent to marine protected areas would reduce realism of training by restricting access to important real world combat situations, such as bathymetric features and varying oceanographic features. As described in Section 2.5.1.1 (Alternative Training and Testing Locations), the ability to use the diverse and multidimensional capabilities of each range complex and testing range results in the Navy's ability to develop and maintain high levels of readiness. Major exercises using integrated warfare components require large areas of the littorals, open ocean, and certain nearshore areas for realistic and safe training. Limiting training and testing to specific locations and avoiding all marine protected areas would be impractical to implement with regard to the need to conduct activities in proximity to certain facilities, range complexes, and testing ranges. The Navy typically conducts activities in proximity to certain facilities, range complexes, and testing ranges in order to reduce travel time and funding required to conduct training away from a unit's home base. Activities involving the use of helicopters typically occur in proximity to shore or refueling stations due to fuel restrictions and personnel safety. Training and testing location limitations would also adversely impact the safety of the training and testing activities by requiring activities to take place in more remote areas where safety support may be limited. Refer to Section 5.3.4.1.6 (Limiting Access to Training and Testing Locations) for further discussion on the impacts of limiting access to training and testing locations on the Navy's ability to maintain military readiness.

5.3.4.1.13 Increasing Visual and Passive Acoustic Observations

Increasing visual and passive acoustic observations for the purpose of mitigation would be impractical with regard to implementation of military readiness activities and result in unacceptable impact on readiness for the following reasons:

The Navy recommended mitigation measures already represent the maximum level of effort (e.g., numbers of Lookouts and passive sonobuoys) that the Navy can commit to observing mitigation zones given the number of personnel that will be involved and the number and type of assets and resources available. The number of Lookouts that the Navy recommends for each measure often represents the maximum capacity based on limited resources (e.g., space and manning restrictions). For example, platforms such as the Littoral Combat Ship are minimally manned and are therefore physically unable to accommodate more than one Lookout. Furthermore, training and testing activities are carefully planned with regard to personnel duties. Requiring additional Lookouts would either require adding personnel, for which there would be no additional space, or reassigning duties, which would divert Navy personnel from essential tasks required to meet mission objectives.

The Navy will conduct passive acoustic monitoring during several activities with Navy assets, such as sonobuoys, already participating in the activity (e.g., sinking exercises, torpedo [explosive] testing, and improved extended echo ranging sonobuoys). Refer to Section 5.3.2 (Mitigation Zone Procedural Measures) for additional information on the use of passive acoustics during training and testing activities. The Navy does not have the resources to construct and maintain additional passive acoustic monitoring systems for each training and testing activity.

5.3.4.1.14 Increasing the Size of Observed Mitigation Zones

Increasing the size of observed mitigation zones for the purpose of mitigation would be impractical with regard to implementation of military readiness activities and result in unacceptable impact on readiness for the following reasons:

The Navy developed activity-specific mitigation zones based on the Navy's acoustic propagation model. In this HSTT analysis, the Navy developed each recommended mitigation zone to avoid or reduce the potential for onset of the lowest level of injury, PTS, out to the predicted maximum range. Mitigating to the predicted maximum range to PTS consequently also mitigates to the predicted maximum range to onset mortality (1 percent mortality), onset slight lung injury, and onset slight gastrointestinal tract injury, since the maximum range to effects for these criteria are shorter than for PTS. Furthermore, in most cases, the predicted maximum range to PTS also covers the predicted average range to TTS. In some instances, the Navy recommends mitigation zones that are larger or smaller than the predicted maximum range to PTS based on the associated effectiveness and operational assessments presented in Section 5.3.2 (Mitigation Zone Procedural Measures).

The Navy recommended mitigation zones represent the maximum area the Navy can effectively observe based on the platform of observation, number of personnel that will be involved, and the number and type of assets and resources available. As mitigation zone sizes increase, the potential for reducing impacts decreases. For instance, if a mitigation zone increases from 1,000 to 4,000 yd. (914 to 3,658 m), the area that must be observed increases sixteen-fold. The Navy recommended mitigation measures balance the need to reduce potential impacts with the ability to provide effective observations throughout a given mitigation zone. Implementation of mitigation zones is most effective when the zone is appropriately sized to be realistically observed. The Navy does not have the resources to maintain additional Lookouts or observer platforms that would be needed to effectively observe mitigation zones of increased size. Further, as explained above, the number of Lookouts that the Navy recommends for each measure often represents the maximum capacity based on limited resources (e.g., space and manning restrictions). For example, platforms such as the Littoral Combat Ship are minimally manned and are therefore physically unable to accommodate more than one Lookout. Training and testing activities are carefully planned with regard to personnel duties. Requiring observation of mitigation zones of increased size would either require adding personnel, for which there would be no additional space or resources, or reassigning duties, which would divert Navy personnel from essential tasks required to meet mission objectives. For most activities, Lookouts are required to observe for concentrations of detached floating vegetation (*Sargassum* or kelp paddies), which are indicators of potential marine mammal and sea turtle presence, within the mitigation zone to further help reduce the potential for injury to occur.

5.3.4.1.15 Conducting Visual Observations Using Third-Party Observers

With limited exceptions, use of third-party observers (e.g., trained marine species observers) in air or on surface platforms in addition to existing Navy Lookouts for the purposes of mitigation would be impractical with regard to implementation of military readiness activities and result in unacceptable impact on readiness for the following reasons:

Navy personnel are extensively trained in spotting items on or near the water surface. Use of Navy Lookouts ensures immediate implementation of mitigation if marine species are sighted. A critical skill set of effective Navy training is communication. Navy Lookouts are trained to act swiftly and decisively to ensure that appropriate actions are taken. Additionally, multiple training and testing events can occur simultaneously and in various regions throughout the Study Area, and can last for days or weeks at a time. The Navy does not have the resources to maintain third-party observers to accomplish the task for every event.

The use of third-party observers would compromise security for some activities involving active sonar due to the requirement to provide advance notification of specific times and locations of Navy platforms. Reliance on the availability of third-party personnel would impact training and testing flexibility. The presence of other aircraft in the vicinity of naval activities would raise safety concerns for both the commercial observers and naval aircraft. Furthermore, vessels have limited passenger capacity. Training and testing event planning includes careful consideration of this limited capacity in the placement of personnel on ships involved in the event. Inclusion of non-Navy observers onboard these vessels would require that in some cases there would be no additional space for essential Navy personnel required to meet the exercise objectives.

The areas where training events will most likely occur in the Study Area cover approximately 1 million square nautical miles. Contiguous anti-submarine warfare events may cover many hundreds or even thousands of square miles. The number of civilian vessels or aircraft required to monitor the area of these events would be considerable. It is, thus, not feasible to survey or monitor the large exercise areas in the time required. In addition, marine mammals may move into or out of an area, if surveyed before an event, or an animal could move into an area after an event took place. Given that there are no adequate controls to account for these or other possibilities, there is little utility to performing extensive before or after event surveys of large exercise areas as a mitigation measure.

Surveying during an event raises safety issues with multiple, slow civilian aircraft operating in the same airspace as military aircraft engaged in combat training activities. In addition, many of the training and testing events take place far from land, limiting both the time available for civilian aircraft to be in the event area and presenting a concern should aircraft mechanical problems arise. Scheduling civilian vessels or aircraft to coincide with training events would impact training effectiveness, since exercise event timetables cannot be precisely fixed and are instead based on the free-flow development of tactical situations. Waiting for civilian aircraft or vessels to complete surveys, refuel, or be on station would slow the progress of the exercise and impact the effectiveness of the military readiness activity.

5.3.4.1.16 Adopting Mitigation Measures of Foreign Navies

Adopting mitigation measures of foreign navies generally for the purpose of mitigation, such as expanding the mitigation zones to match those used by a particular foreign navy, would be impractical with regard to implementation of military readiness activities and result in unacceptable impact on readiness for the following reasons:

Mitigation measures are carefully customized for and agreed upon by each individual navy based on potential impacts of the activities on marine species and the impacts of the mitigation measures on military readiness. The mitigation measures developed for one navy would not necessarily be effective at reducing potential impacts on marine species by all navies. Similarly, mitigation measures that do not cause an unacceptable impact on one navy may cause an unacceptable impact on another. For example, most other navies do not possess an integrated strike group and do not have integrated training requirements. The Navy’s training is built around the integrated warfare concept and is based on the Navy’s capabilities, the threats faced, the operating environment, and the overall mission. Implementing other navies’ mitigation would be incompatible with U.S. Navy requirements. The U.S. Navy’s recommended mitigation measures have been carefully designed to reduce potential impacts on marine species while not causing an unacceptable impact on readiness.

5.3.4.1.17 Increasing Reporting Requirements

The Navy has extensive reporting requirements, including exercise, testing, and monitoring reporting designed to verify implementation of mitigation, comply with current permits, and improve future environmental assessments (Section 5.5.2, Reporting). Increasing the requirement to report marine species sightings to augment scientific data collection and to further verify the implementation of mitigation measures is unnecessary and would increase safety risks to personnel, be impractical with regard to implementation of military readiness activities, and result in unacceptable impact on readiness for the following reasons:

Vessels, aircraft, and personnel engaged in training and testing events are intensively employed throughout the duration of training and testing activities. Any additional workload assigned that is unrelated to their primary duty would adversely impact personnel safety and the effectiveness of the military readiness activity they are undertaking. Lookouts are not trained to make accurate species-specific identification and would not be able to provide the detailed information that the scientific community would use. Alternatively, the Navy has an integrated comprehensive monitoring program (Section 5.4, Mitigation Summary) that does provide information that is available and useful to the scientific community in annual monitoring reports.

5.3.4.2 Previously Accepted but Now Eliminated

5.3.4.2.1 Implementing Active Sonar Ramp-Up Procedures During Testing

Some testing activities have implemented active sonar ramp-up procedures (slowly increasing the sound in the water to necessary levels) in an attempt to clear the range prior to conduct of activities for the purpose of mitigation. Although ramp-up procedures have been used for some testing activities, the effectiveness at avoiding or reducing impacts on marine mammals has not been demonstrated. Until evidence suggests that ramp-up procedures are an effective means of avoiding or reducing potential impacts on marine mammals, and for reasons discussed in section 5.3.4.1.4 (Implementing Active Sonar Ramp-Up Procedures During Training), the Navy is proposing to eliminate the implementation of this measure for testing activities as part of the Proposed Action.

5.3.4.2.2 Implementing a Mitigation Zone for Missile Exercises with Airborne Targets

Per current mitigation, a mitigation zone of 1,000 yd. (915 m) is observed around the expected expended material field. The Navy is proposing to eliminate the need for a Lookout to maintain a mitigation zone for missile exercises involving airborne targets. Most airborne targets are recoverable aerial drones, and missile impact with the target does not typically occur. Most anti-air missiles used in training are telemetry configured (i.e., they do not have an actual warhead). Impact of a target is unlikely because missiles are designed to detonate (simulated detonation for telemetry missiles) in the vicinity of the target and not as a result of a direct strike on the target. Given the speed of the missile and the target, the high altitudes involved, and the long ranges of missile travel possible, it is not possible to definitively predict or to effectively observe where the missile fragments will fall. The potential expended material fall zone can only be predicted within tens of miles for long range events, which can be in excess of 80 nm from the firing location, and thousands of yards for shorter events, which can occur within several thousand yards from the firing location. Establishment of a mitigation zone for activities involving airborne targets would be ineffective at reducing potential impacts.

Furthermore, the potential risk to any marine mammal or sea turtle from a missile exercise with an airborne target is a direct strike from falling expended material. Based on the extremely low potential for a target strike and associated expended material field to co-occur in space and time with a marine species at or near the surface of the water, the potential for a direct strike is negligible.

5.3.4.2.3 Implementing a Mitigation Zone for Medium and Large-Caliber Gunnery Exercises with Airborne Targets

Per current mitigation, a mitigation zone is observed in the vicinity of the expected military expended materials field. The Navy is proposing to eliminate the need for a Lookout to observe the vicinity of the expected military expended materials for medium- and large-caliber gunnery exercises involving airborne targets. The potential military expended materials fall zone can only be predicted within thousands of yards, which can be up to 7 nm from the firing location. Establishment of a mitigation zone for activities involving airborne targets would be ineffective at reducing potential impacts.

Furthermore, the potential risk to any marine mammal or sea turtle from a gunnery exercise with an airborne target is a direct strike from falling military expended materials. Based on the extremely low potential for military expended materials to co-occur in space and time with a marine species at or near the surface of the water, the potential for a direct strike is negligible.

5.3.4.2.4 Implementing Measures for Laser Test Operations

Visual surveys would be conducted for all testing activities involving laser line scan, light imaging detection, and ranging lasers. Per current standard operating procedures, only trained personnel operate lasers and visual observation of the area is conducted to ensure human safety. The Navy is proposing to discontinue this procedure as a mitigation measure because: (1) it is currently a standard operating procedure conducted for human safety, and (2) the environmental consequences analysis suggests that impacts on resources from laser activities are not expected.

5.4 Mitigation Summary

Table 5.4-1 provides a summary of the Navy's recommended mitigation measures. For reference, currently implemented mitigation measures for each activity category are also summarized in the table. The process for developing each of these measures is detailed in Section 5.2.3 (Assessment Method) and involved: (1) an effectiveness assessment to determine if implementation of the measure will likely result in avoidance or reduction of an impact on a resource, and (2) an operational assessment to determine if implementation of the measures will have acceptable operational impacts on the Proposed Action with regard to personnel safety, practicality of implementation, readiness, and Navy policy. Measures are intended to meet applicable regulatory compliance requirements for NEPA, Executive Order 12114, and Council on Environmental Quality guidance. The Navy recommended mitigation measures were also developed consistent with resource-specific environmental requirements, as follows:

- Measures specifying marine mammals and indicators of marine mammal presence (e.g. floating vegetation [*Sargassum* or kelp paddies], large schools of fish, or flocks of seabirds) as the protection focus are intended to meet MMPA requirements.
- Measures specifying marine mammals, sea turtles, flocks of seabirds, floating vegetation (*Sargassum* or kelp paddies), large schools of fish, jellyfish aggregations, or shallow coral reefs as the protection focus are intended to meet ESA requirements.
- Measures specifying shallow coral reefs, live hardbottom, artificial reefs, or shipwrecks as the protection focus are intended to meet Essential Fish Habitat requirements of the Magnuson-Stevens Fishery Conservation and Management Act.

- Measures specifying shipwrecks is an additional protection focus intended to meet Abandoned Shipwreck Act and National Historic Preservation Act requirements.

The measures presented in Table 5.4-1 are discussed in greater detail in Section 5.3.1 (Lookout Procedural Measures), Section 5.3.2 (Mitigation Zone Procedural Measures), and Section 5.3.3 (Mitigation Areas). As discussed in Section 5.2.2.2 (Protective Measures Assessment Protocol), the final suite of mitigations resulting from the ongoing planning for this Final EIS/OEIS, as well as the regulatory consultation and permitting processes will be integrated into the Protective Measures Assessment Protocol for implementation purposes. Section 5.5 (Monitoring and Reporting) describes the monitoring and reporting efforts the Navy will undertake to investigate the effectiveness of implemented mitigation measures and to better understand the impacts of the Proposed Action on marine resources..

Table 5.4-1: Summary of Recommended Mitigation Measures

Activity Category or Mitigation Area	Recommended Lookout Procedural Measure	Recommended Mitigation Zone and Protection Focus	Current Measure and Protection Focus
Specialized Training	Lookouts will complete the Introduction to the U.S. Navy Afloat Environmental Compliance Training Series and the U.S. Navy Marine Species Awareness Training (or civilian equivalent).	The mitigation zones observed by Lookouts are specified for each Mitigation Zone Procedural Measure below.	Applicable personnel will complete the U.S. Navy Marine Species Awareness Training prior to standing watch or serving as a Lookout.
Low-Frequency and Hull-Mounted Mid-Frequency Active Sonar during Anti-Submarine Warfare and Mine Warfare	2 Lookouts (general) 1 Lookout (minimally manned, moored, or anchored)	Sources that can be powered down: 1,000 yd. (914 m) and 500 yd. (457 m) power downs and 200 yd. (183 m) shutdown for marine mammals (hull-mounted mid-frequency and low-frequency) and sea turtles (low-frequency only). Sources that cannot be powered down: 200 yd. (183 m) shutdown for marine mammals and sea turtles. Both: observation for concentrations of floating vegetation (*Sargassum* or kelp paddies).	Hull-mounted mid-frequency: 1,000 yd. (914 m) and 500 yd. (457 m) power downs and 200 yd. (183 m) shutdown for marine mammals and sea turtles; avoidance of *Sargassum* rafts. Low-frequency: None
High-Frequency and Non-Hull Mounted Mid-Frequency Active Sonar	1 Lookout	200 yd. (183 m) for marine mammals (high-frequency and mid-frequency), sea turtles (bins MF8, MF9, MF10, and MF12 only), and concentrations of floating vegetation (*Sargassum* or kelp paddies).	Non-hull mounted mid-frequency: 200 yd. (183 m) for marine mammals, floating vegetation, and kelp paddies. High-frequency: None
Improved Extended Echo Ranging Sonobuoys	1 Lookout	600 yd. (549 m) for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies). Passive acoustic monitoring conducted with Navy assets participating in the activity.	1,000 yd. (914 m) for marine mammals and sea turtles; 400 yd. (366 m) for floating vegetation and kelp paddies. Passive acoustic monitoring conducted with Navy assets participating in the activity.

Table 5.4-1: Summary of Recommended Mitigation Measures (continued)

Activity Category or Mitigation Area	Recommended Lookout Procedural Measure	Recommended Mitigation Zone and Protection Focus	Current Measure and Protection Focus
Explosive Sonobuoys using 0.6–2.5 lb. NEW	1 Lookout	350 yd. (320 m) for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies). Passive acoustic monitoring conducted with Navy assets participating in the activity.	None
Anti-Swimmer Grenades	1 Lookout	200 yd. (183 m) for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies).	None.
Mine Countermeasures and Mine Neutralization using Positive Control	General: 1 or 2 Lookouts (NEW dependent) Diver-placed: 2 Lookouts Protective Measures Assessment Protocol will contain maps of surveyed shallow coral reefs, and artificial reefs, shipwrecks. Lookouts will survey the mitigation zone for seabirds prior to and after the detonation event.	NEW dependent for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies). SOCAL and HRC (except near-shore areas of San Clemente Island and in the SSTC): 350 yd. (320 m) from surveyed shallow coral reefs, live hardbottom, artificial reefs, and shipwrecks.	General: NEW dependent for marine mammals and sea turtles. Diver-placed: 700 yd. (640 m) for up to 29 lb. or 250–500 lb. charge for marine mammals and turtles. 1,000 ft. (305 m) from surveyed live hardbottom, artificial reefs, and shipwrecks.
Mine Neutralization Activities Using Diver-Placed Time-Delay Firing Devices	4 Lookouts Protective Measures Assessment Protocol will contain maps of surveyed shallow coral reefs, and artificial reefs, shipwrecks. Lookouts will survey the mitigation zone for seabirds prior to and after the detonation event.	Up to 10 min. time-delay using up to 29 lb. NEW: 1,000 yd. (915 m) for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies).	10 min. time-day on 29 lb. NEW: 1,450 yd. (1,326 m) for marine mammals and sea turtles.

Table 5.4-1: Summary of Recommended Mitigation Measures (continued)

Activity Category or Mitigation Area	Recommended Lookout Procedural Measure	Recommended Mitigation Zone and Protection Focus	Current Measure and Protection Focus
Explosive and Non-Explosive Gunnery Exercises – Small- and Medium-Caliber Using a Surface Target	1 Lookout Protective Measures Assessment Protocol will contain maps of surveyed shallow coral reefs.	200 yd. (183 m) for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies). 350 yd. (320 m) for surveyed shallow coral reefs.	200 yd. (183 m) for marine mammals, sea turtles, floating vegetation and surveyed shallow coral reefs.
Explosive and Non-Explosive Gunnery Exercises – Large-Caliber Using a Surface Target	1 Lookout Protective Measures Assessment Protocol will contain maps of surveyed shallow coral reefs.	Explosive: 600 yd. (549 m) for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies). Non-Explosive: 200 yd. (183 m) for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies). Both: 70 yd. (64 m) within 30 degrees on either side of the gun target line on the firing side for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies). Both: 350 yd. (320 m) for surveyed shallow coral reefs.	Explosive: 600 yd. (549 m) for marine mammals, sea turtles, floating vegetation, and surveyed shallow coral reefs. Non-Explosive: 200 yd. (183 m) for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies). Both: 70 yd. (64 m) around entire ship for marine mammals and sea turtles.
Non-Explosive Missile Exercises and Explosive Missile Exercises (Including Rockets) up to 250 lb. NEW Using a Surface Target	1 Lookout Protective Measures Assessment Protocol will contain maps of surveyed shallow coral reefs.	900 yd. (823 m) for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies). 350 yd. (320 m) for surveyed shallow coral reefs.	1,800 yd. (1.6 km) for marine mammals, sea turtles, floating vegetation and kelp paddies.

Table 5.4-1: Summary of Recommended Mitigation Measures (continued)

Activity Category or Mitigation Area	Recommended Lookout Procedural Measure	Recommended Mitigation Zone and Protection Focus	Current Measure and Protection Focus
Explosive Missile Exercises Using 251–500 lb. NEW Using a Surface Target	1 Lookout Protective Measures Assessment Protocol will contain maps of surveyed shallow coral reefs.	2,000 yd. (1.8 km) for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies). 350 yd. (320 m) for surveyed shallow coral reefs.	None.
Explosive and Non-Explosive Bombing Exercises	1 Lookout Protective Measures Assessment Protocol will contain maps of surveyed shallow coral reefs.	Explosive: 2,500 yd. (2.3 km) for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies). Non-Explosive: 1,000 yd. (914 m) for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies). Both: 350 yd. (320 m) for surveyed shallow coral reefs.	Explosive: 1,000 yd. (914 m) for marine mammals, sea turtles, and floating vegetation. Non-Explosive: 1,000 yd. (914 m) for marine mammals, sea turtles, floating vegetation and kelp paddies.
Torpedo (Explosive) Testing	1 Lookout	2,100 yd. (1.9 km) for marine mammals, sea turtles, concentrations of floating vegetation (*Sargassum* or kelp paddies), and jellyfish aggregations. Passive acoustic monitoring conducted with Navy assets participating in the activity.	5,063 yd. (4.6 km) for marine mammals, sea turtles, floating vegetation and jellyfish aggregations
Sinking Exercises	2 Lookouts	2.5 nm for marine mammals, sea turtles, concentrations of floating vegetation (*Sargassum* or kelp paddies), and jellyfish aggregations. Passive acoustic monitoring conducted with Navy assets participating in the activity.	2.0 nm for marine mammals, sea turtles, floating vegetation and jellyfish aggregations.

Table 5.4-1: Summary of Recommended Mitigation Measures (continued)

Activity Category or Mitigation Area	Recommended Lookout Procedural Measure	Recommended Mitigation Zone and Protection Focus	Current Measure and Protection Focus
At-Sea Explosive Testing	1 Lookout Protective Measures Assessment Protocol will contain maps of surveyed shallow coral reefs.	1,600 yd. (1.4 km) for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies). 350 yd. (320 m) for surveyed shallow coral reefs.	None.
Elevated Causeway System – Pile Driving	1 Lookout	60 yd. (55 m) for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies).	50 yd. for marine mammals, sea turtles, and concentrations of floating vegetation (*Sargassum* or kelp paddies).
Vessel Movements	1 Lookout	500 yd. (457 m) for whales. 200 yd. (183 m) for all other marine mammals (except bow riding dolphins).	500 yd. (457 m) for whales. 200 yd. (183 m) for all other marine mammals (except bow riding dolphins).
Towed In-Water Device Use	1 Lookout	250 yd. (229 m) for marine mammals	250 yd. (229 m) for marine mammals.
Humpback Whale Cautionary Area	Activity-specific measures described in the Lookout Procedural Measures and Mitigation Zone Procedural Measures	Mid-frequency active sonar training will not occur within the humpback whale cautionary area between 15 December and 15 April without prior approval by the Commander, U.S. Pacific Fleet.	Mid-frequency active sonar training will not occur within the humpback whale cautionary area between 15 December and 15 April without prior approval by the Commander, U.S. Pacific Fleet.

Table 5.4-1: Summary of Recommended Mitigation Measures (continued)

Activity Category or Mitigation Area	Recommended Lookout Procedural Measure	Recommended Mitigation Zone and Protection Focus	Current Measure and Protection Focus
Shallow Coral Reefs, Hardbottom Habitat, Artificial Reefs, and Shipwrecks	No Lookouts in addition to standard personnel standing watch Protective Measures Assessment Protocol will contain maps of surveyed shallow coral reefs, and artificial reefs, shipwrecks.	No precision anchoring within the anchor swing diameter and no explosive mine countermeasure and neutralization activities (except in near-shore areas of San Clemente Island in the SOCAL Range Complex and in the SSTC) within 350 yd. (320 m) of surveyed shallow coral reefs, live hardbottom, artificial reefs, and shipwrecks. No explosive or non-explosive small-, medium-, and large-caliber gunnery exercises using a surface target, explosive or non-explosive missile exercises using a surface target, explosive and non-explosive bombing exercises, or at-sea explosive testing within 350 yd. (320 m) of surveyed shallow coral reefs.	Varying mitigation zone distances based on marine mammal ranges to effects.

Notes: ft. = feet, km = kilometers, lb. = pounds, m = meters, mi. = miles, min. = minutes, NEW = net explosive weight, nm = nautical miles, yd. = yards

5.5 Monitoring and Reporting

5.5.1 Approach to Monitoring

The Navy is committed to demonstrating environmental stewardship while executing its National Defense Mission and complying with the suite of federal environmental laws and regulations. As a complement to the Navy's commitment to avoiding and reducing impacts of the Proposed Action through mitigation, the Navy will undertake monitoring efforts to track compliance with take authorizations, help evaluate the effectiveness of implemented mitigation measures, and gain a better understanding of the effects of the Proposed Action on marine resources. Taken together, mitigation and monitoring comprise the Navy's integrated approach for reducing environmental impacts from the Proposed Action. The Navy's overall monitoring approach will seek to leverage and build on existing research efforts whenever possible.

Consistent with the cooperating agency agreement with NMFS, mitigation and monitoring measures presented in this Final EIS/OEIS focus on the requirements for protection and management of marine resources. A well-designed monitoring program can provide important feedback for validating assumptions made in analyses and allow for adaptive management of marine resources. Since monitoring will be required for compliance with the Letters of Authorization issued for the Proposed Action under the MMPA, details of the monitoring program will be developed in coordination with NMFS through the regulatory process. Discussions with resource agencies during the consultation and permitting processes may result in changes to the mitigation as described in this document. Such changes will be reflected in the Records of Decision and consultation documents such as the ESA Biological Opinion.

5.5.1.1 Integrated Comprehensive Monitoring Program

The Integrated Comprehensive Monitoring Program is intended to coordinate monitoring efforts across all regions where the Navy trains and tests and to allocate the most appropriate level and type of effort for each range complex (U.S. Department of the Navy 2010). The current Navy monitoring program is composed of a collection of range-specific monitoring plans, each of which was developed individually as part of MMPA and ESA compliance processes as environmental documentation was completed. These individual plans establish range- or activity-specific monitoring requirements for each range complex, testing range, or activity and are collectively intended to address the Integrated Comprehensive Monitoring Plan top-level goals.

A 2010 Navy-sponsored monitoring meeting in Arlington, Virginia, initiated a process to critically evaluate the current Navy monitoring plans and begin development of revisions and updates to both existing region-specific plans as well as the Integrated Comprehensive Monitoring Plan. Discussions at that meeting as well as the following Navy and NMFS annual adaptive management meeting established a way ahead for continued refinement of the Navy's monitoring program. This process included establishing a Scientific Advisory Group of leading marine mammal scientists with the initial task of developing recommendations that would serve as the basis for a Strategic Plan for Navy monitoring. The Strategic Plan is intended to be a primary component of the Integrated Comprehensive Monitoring Program, provide a "vision" for Navy monitoring across geographic regions, and serve as guidance for determining how to most efficiently and effectively invest the marine species monitoring resources to address Integrated Comprehensive Monitoring Plan top-level goals and satisfy MMPA Letter of Authorization regulatory requirements.

The objective of the Strategic Plan is to continue the evolution of Navy marine species monitoring towards a single integrated program, incorporating Scientific Advisory Group recommendations, and establishing a more transparent framework for soliciting, evaluating, and implementing monitoring work across the range complexes and testing ranges. The Strategic Plan must consider a range of factors in addition to the scientific recommendations including logistic, operational, and funding considerations and will be revised regularly as part of the annual adaptive management process.

The Integrated Comprehensive Monitoring Plan establishes top-level goals that have been developed in coordination with NMFS (U.S. Department of the Navy 2010). The following top-level goals will become more specific with regard to identifying potential projects and monitoring field work through the Strategic Plan process as projects are evaluated and initiated in the Study Area.

- An increase in the understanding of the likely occurrence of marine mammals or ESA-listed marine species in the vicinity of the action (i.e., presence, abundance, distribution, and density of species).
- An increase in the understanding of the nature, scope, or context of the likely exposure of marine mammals and ESA-listed species to any of the potential stressor(s) associated with the action (e.g., tonal and impulsive sound), through better understanding of one or more of the following: (1) the action and the environment in which it occurs (e.g., sound source characterization, propagation, and ambient noise levels); (2) the affected species (e.g., life history or dive patterns); (3) the likely co-occurrence of marine mammals and ESA-listed marine species with the action (in whole or part) associated with specific adverse impacts; or (4) the likely biological or behavioral context of exposure to the stressor for the marine mammal and ESA-listed marine species (e.g., age class of exposed animals or known pupping, calving or feeding areas).
- An increase in the understanding of how individual marine mammals or ESA-listed marine species respond (behaviorally or physiologically) to the specific stressors associated with the action (in specific contexts, where possible, e.g., at what distance or received level).
- An increase in the understanding of how anticipated individual responses, to individual stressors or anticipated combinations of stressors, may impact either: (1) the long-term fitness and survival of an individual; or (2) the population, species, or stock (e.g., through impacts on annual rates of recruitment or survival).
- An increase in the understanding of the effectiveness of mitigation and monitoring measures;
- A better understanding and record of the manner in which the authorized entity complies with the Incidental Take Authorization and Incidental Take Statement.
- An increase in the probability of detecting marine mammals (through improved technology or methods), both specifically within the mitigation zone (thus allowing for more effective implementation of the mitigation) and in general, to better achieve the above goals.
- A reduction in the adverse impact of activities to the least practicable level, as defined in the MMPA.

5.5.1.2 Scientific Advisory Group Recommendations

Navy established the Scientific Advisory Group in 2011 with the initial task of evaluating current Navy monitoring approaches under the Integrated Comprehensive Monitoring Plan and existing MMPA Letters of Authorization and developing objective scientific recommendations that would form the basis for the Strategic Plan. While recommendations were fairly broad and not prescriptive from a range complex perspective, the Scientific Advisory Group did provide specific programmatic recommendations that serve as guiding principles for the continued evolution of the Navy Marine Species Monitoring Program and provide a direction for the Strategic Plan to move this development. Key recommendations include:

- Working within a conceptual framework of knowledge, from basic information on the occurrence of species within each range complex, to more specific matters of exposure, response, and consequences.
- Facilitating collaboration among researchers in each region, with the intent to develop a coherent and synergistic regional monitoring and research effort.
- Striving to move away from a "box-checking" mentality. Monitoring studies should be designed and conducted according to scientific objectives, rather than on merely cataloging effort expended.
- Approach the monitoring program holistically and select projects that offer the best opportunity to advance understanding of the issues, as opposed to establishing range-specific requirements.

5.5.2 Reporting

The Navy is committed to documenting and reporting relevant aspects of training and testing activities to verify implementation of mitigation, comply with current permits, and improve future environmental assessments. Navy reporting initiatives are described below.

5.5.2.1 Exercise, Testing, and Monitoring Reporting

The Navy will submit annual exercise, testing, and monitoring reports to the Office of Protected Resources at NMFS. The exercise reports will describe the level of training and testing conducted during the reporting period, and the monitoring reports will describe both the nature of the monitoring that has been conducted and the actual results of the monitoring. All of the details regarding the content of the annual reports will be coordinated with NMFS through the permitting process. All reports submitted to date can be found on the NMFS Office of Protected Resources webpage.

5.5.2.2 Stranding Response Plan

In coordination with NMFS, the Navy will have a stranding response plan. All of the details regarding the content of the stranding response plan will be coordinated with NMFS through the permitting process.

5.5.2.3 Bird Strike Reporting

The Navy will report all damaging and non-damaging bird strikes to the Naval Safety Center.

5.5.2.4 Marine Mammal Incident Reporting

If any injury or death of a marine mammal is observed during training or testing activities, the Navy will immediately halt the activity and report the incident, including dead for injured animals, to NMFS or the United States Fish and Wildlife Service, as appropriate.

This Page Intentionally Left Blank

REFERENCES

Baird, A.H., V.R. Cumbo, W. Leggat, and M. Rodriguez-Lanetty. (2007). Fidelity and flexibility in coral symbioses. Marine Ecology Progress Series. Vol. 347:307-309.

Baird, R., D.L. Webster, G.S. Schorr, D.J. McSweeney. (2008). Diel Variation in Beaked Whale Diving Behavior. Monterey, California; Naval Post Graduate School.

Barlow, J. (2010). Cetacean abundance in the California Current estimated from a 2008 ship-based line-transect survey. NOAA Technical Memorandum NMFS-SWFSC-456. National Oceanic and Atmospheric Administration.

Barlow, J. and K. A. Forney. (2007). "Abundance and population density of cetaceans in the California Current ecosystem." Fishery Bulletin 105: 509-526.

Barlow, J., Ferguson, M. C., Perrin, W. F., Ballance, L., Gerrodette, T., Joyce, G. (2006). Abundance and densities of beaked and bottlenose whales (family Ziphiidae). *Journal of Cetacean Research and Management, 7*(3), 263-270.

Carretta, J. V., Lowry, M. S., Stinchcomb, C. E., Lynne, M. S. & Cosgrove, R. E. (2000). Distribution and abundance of marine mammals at San Clemente Island and surrounding offshore waters: Results from aerial and ground surveys in 1998 and 1999 [Administrative Report]. (LJ-00-02, pp. 43). La Jolla, CA: NOAA: Southwest Fisheries Science Center.

Hazel, J., Lawler, I. R., Marsh, H. & Robson, S. (2007). Vessel speed increases collision risk for the green turtle Chelonia mydas. *Endangered Species Research, 3*, 105-113.

Jefferson, T. A., Webber, M. A. & Pitman, R. L. (2008). *Marine Mammals of the World: A Comprehensive Guide to their Identification* (pp. 573). London, UK: Elsevier.

Kenney, R. D. (2005). Personal communication via email between Dr. Robert Kenney, University of Rhode Island, and Mr. William Barnhill, Geo-Marine, Inc. W. Barnhill and GeoMarine Inc., Plano, Texas.

Laake, J.L., Calambokidis, J., Osmek, S.D., and Rugh, D.J. (1997). Probability of detecting harbor porpoise from aerial surveys: estimating g(0). J. Wildl. Manage. 61:63-75.

MacLeod, C. D. & D'Amico, A. (2006). A review of beaked whale behaviour and ecology in relation to assessing and mitigating impacts of anthropogenic noise. *Journal of Cetacean Research and Management, 7*(3), 211-222.

Mansfield, K. L. (2006). *Sources of Mortality, Movements and Behavior of Sea Turtles in Virginia.* The College of William and Mary.

Marine Species Modeling Team. (2013). Determination of Acoustic Effects on Marine Mammals and Sea Turtles for the Hawaii-Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement. Naval Undersea Warfare Command Division, Newport.

Marsh, H. and Saalfeld, W. K. (1989). Aerial Surveys of Sea Turtles in the Northern Great Barrier Reef Marine Park. Australia Wildlife Research 16, 239-249.

Mobley, J. Jr., Spitz, S. and Grotefendt, R. (2001). Abundance of Humpback Whales in Hawaiian Waters: Results of 1993-2000 Aerial Surveys. Hawaiina Islands Humpback Whale National Marine Sanctuary

Office of National Marine Sanctuaries National Oceanic and Atmospheric Administration U.S. Department of Commerce and the Department of Land and Natural Resources State of Hawaii, 1-17.

Mobley, J. R. (2004). Results of Marine Mammal Surveys on U.S. Navy Underwater Ranges in Hawaii and Bahamas: 27.

Tyack, P. L. Johnson, M. Aguilar Soto, N. Sturlese, A. Madsen, P. T. (2006). Extreme Diving of Beaked Whales. The Journal of Experimental Biology 209, 4238-4253. USFWS (2001a). Green sea turtle (Chelonia mydas) fact sheet.

U.S. Department of the Navy. (2010). Navy Integrated Comprehensive Monitoring Plan. [Final Report 2010]. 73.

6 Additional Regulatory Considerations

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

This Page Intentionally Left Blank

6 ADDITIONAL REGULATORY CONSIDERATIONS

In accordance with the Council on Environmental Quality regulations for implementing the National Environmental Policy Act (NEPA), federal agencies shall, to the fullest extent possible, integrate the requirements of NEPA with other planning and environmental review procedures required by law or by agency practice so that all such procedures run concurrently rather than consecutively. This chapter summarizes environmental compliance for the Proposed Action, consistency with other federal, state, and local plans, policies, and regulations not considered in Chapter 3 (Affected Environment and Environmental Consequences); the relationship between short-term impacts; and the maintenance and enhancement of long-term productivity in the affected environment; irreversible and irretrievable commitments of resources, and energy conservation.

6.1 CONSISTENCY WITH OTHER APPLICABLE FEDERAL, STATE, AND LOCAL PLANS, POLICIES, AND REGULATIONS

Implementation of the Proposed Action for the Hawaii-Southern California Training and Testing (HSTT) Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS), would comply with applicable federal, state, and local laws, regulations, and executive orders. The Navy is consulting with and will continue to consult with regulatory agencies, as appropriate, during the NEPA process and prior to implementation of the Proposed Action to ensure that requirements are met. Table 6.1-1 summarizes environmental compliance requirements that that were considered in preparing this EIS/OEIS (including those that may be secondary considerations in the resource evaluations) not considered in Chapter 3 (Affected Environment and Environmental Consequences). Section 3.0.1 (Regulatory Framework) provides brief excerpts of the primary federal statutes, executive orders, international standards, and guidance that form the regulatory framework for the resource evaluations. Documentation of consultation and coordination with regulatory agencies is provided in Appendix C. Formal Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA) consultation began following the Draft EIS/OEIS release and has been completed. Because consultation is currently ongoing, not all consultation documentation is included in Appendix C or the website at this time, but all compliance will be completed prior to the signing of the Record of Decision for the Proposed Action.

Table 6.1-1: Summary of Environmental Compliance for the Proposed Action

Laws, Executive Orders, International Standards, and Guidance	Status of Compliance
Laws	
Abandoned Shipwreck Act (43 United States Code [U.S.C.] §§ 2101-2106)	The 1987 Abandoned Shipwreck Act establishes requirements for educational and recreational access to abandoned shipwrecks; the protection of such resources through the establishment of underwater parks and protected areas; the development of specific guidelines for management and protection in consultation with various stakeholders; defines the jurisdiction and responsibility of federal and state agencies; and explicitly states that the law of salvage and the law of finds do not apply. Under the Act, the Department of the Interior and National Park Service issued guidelines in 2007 to help states manage shipwrecks in their waters. The Act defines the federal government's title to any abandoned shipwreck that meets criteria for inclusion in the National Register of Historic Places within state submerged lands, with the stipulation that the federal government transfer the title of the shipwreck to the state whose submerged lands contain the shipwreck. For abandoned shipwrecks in United States (U.S.) Territorial Waters, the federal government asserts title to the resource. See Section 3.10 (Cultural Resources) for assessment and conclusion that the Proposed Action is consistent with the Act.
Act to Prevent Pollution from Ships (33 U.S.C. §1901 et seq.)	Requirements associated with the Act to Prevent Pollution from Ships are implemented by the Navy Environmental Readiness Program Manual and related Navy guidance documents governing waste management, pollution prevention, and recycling. At sea, the Navy complies with these regulations and operates in a manner that minimizes or eliminates any adverse affects to the marine environment.
Antiquities Act (16 U.S.C. § 431)	The Proposed Action is consistent with the Act's objectives for protection of archaeological and historical sites and objects, preservation of cultural resources, and the public's access to them. See Section 3.10 (Cultural Resources) for the assessment.
Coastal Zone Management Act (16 U.S.C. §1451 et seq.)	The Navy has undergone the federal consistency determination process with the California and Hawaii Coastal Zone Management Act (CZMA) offices. See Section 6.1.1 (Coastal Zone Management Act Compliance) for further details.
Historic Sites Act (16 U.S.C. §§ 461-467)	The Proposed Action is consistent with the national policy for the preservation of historic sites, buildings, and objects of national significance. See Chapter 3.10 (Cultural Resources) for assessment.
National Fishery Enhancement Act (33 U.S.C. § 2101 et seq.)	The Proposed Action is consistent with regulations administered by National Marine and Fisheries Service (NMFS) and U.S. Army Corps of Engineers concerning artificial reefs in the navigable waters of the United States. See Section 3.9 (Fish) for the assessment.
National Marine Sanctuaries Act (16 U.S.C. § 1431 et seq.)	Two National Marine Sanctuaries administered by National Oceanic and Atmospheric Administration Office of National Marine Sanctuaries lie within the Study Area. These are discussed further in Section 6.1.2 (Marine Protected Areas).
Rivers and Harbors Act (33 U.S.C. § 401 et seq.)	Under the Rivers and Harbors Act, a permit is required when construction is proposed in navigable waterways. The Navy will acquire Army Corps of Engineer permits where applicable.
Submerged Lands Act of 1953 (43 U.S.C. §§ 1301-1315)	The Proposed Action is consistent with regulations concerning the Submerged Lands Act.

Table 6.1-1: Summary of Environmental Compliance for the Proposed Action (continued)

Laws, Executive Orders, International Standards, and Guidance	Status of Compliance
Laws	
Sunken Military Craft Act (Public Law 108-375, 10 U.S.C. § 113 Note and 118 Stat. 2094-2098)	The Proposed Action would have no adverse effects on sunken U.S. military ships and aircraft within the Study Area. If a site is determined to be eligible for the National Register of Historic Places, the State Historic Preservation Officer would be consulted to address potential effects. See Section 3.10 (Cultural Resources) for the assessment.
California Coastal National Monument Designation (Presidential Proclamation, January 11, 2000)	The proclamation designates all non-major U.S.-owned lands (rocks, islands, etc.) along the coast of California from mean high tide out to a distance of 12 nm as national monuments. The Southern California Range Complex includes resources designated as part of the California Coastal National Monument area. The Navy and the Bureau of Land Management have agreed on the terms of a Memorandum of Understanding dated 5 November 2007 regarding Navy activities in the vicinity of monument resources. Implementation of the Proposed Action would be consistent with the Memorandum of Understanding and would not affect monument resources.
California Marine Life Protection Act and Marine Managed Areas Improvement Act (California Fish and Game Code §§ 2850-2863)	California Marine Life Protection Act requires California Department of Fish and Game to confer with the Navy regarding issues related to Navy activities that may affect Marine Managed Areas.
Military Munitions Rule	The Military Munitions Rule identifies when conventional and chemical military munitions are considered solid waste under the Resource Conservation and Recovery Act (42 U.S.C. § 6901 et seq.). Military munitions are not considered solid waste based on two conditions stated at 40 Code of Federal Regulations (C.F.R.) § 266.202(a)(1)(i-iii). These two conditions are when munitions are used for their intended purpose and when unused munitions or a component of are subject to materials recovery activities. These two conditions cover the uses of munitions included in the Proposed Action; therefore, the Resource Conservation and Recovery Act does not apply.
Executive Orders	
Executive Order 11990*, Protection of Wetlands*	Implementation of the Proposed Action would not affect wetlands as defined in Executive Order 11990.
Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*	Because all of the proposed activities occur in the ocean where there are no minority or low-income populations present, there are no disproportionately high and adverse human health or environmental impacts from the Proposed Action on minority populations or low-income populations. See Section 3.0.5.2 (Resources and Issues Eliminated from Further Consideration) for the assessment.
Executive Order 12962*, Recreational Fisheries*	The Proposed Action would not affect federal agencies' ability to fulfill certain duties with regard to promoting the health and access of the public to recreational fishing areas. See Section 3.11 (Socioeconomics) for the assessment.
Executive Order 13045*, Protection of Children from Environmental Health Risks and Safety Risks*	Because all of the proposed activities occur in the ocean where there are no child populations present, the Proposed Action would not lead to disproportionate risks to children that result from environmental health risks or safety risks. See Section 3.0.5.2 (Resources and Issues Eliminated from Further Consideration) for the assessment.

Table 6.1-1: Summary of Environmental Compliance for the Proposed Action (continued)

Laws, Executive Orders, International Standards, and Guidance	Status of Compliance
Executive Orders	
Executive Order 13089, *Coral Reef Protection*	The Navy has prepared this EIS/OEIS in accordance with requirements that federal agencies whose actions affect U.S. coral reef ecosystems shall provide for implementation of measures needed to research, monitor, manage, and restore them, including reducing impacts from pollution and sedimentation. See Section 3.8 (Marine Invertebrates) for assessment.
Executive Order 13112, *Invasive Species*	The Proposed Action would not increase the number of or introduce new invasive species nor require the Navy to take measures to avoid introduction and spread of those species. Naval vessels are exempt from 33 C.F.R. 151 Subpart D, Ballast Water Management for Control of Nonindigenous Species in Waters of the United States.
Executive Order 13158, *Marine Protected Areas*	The Navy has prepared this EIS/OEIS in accordance with requirements for the protection of existing national system marine protected areas. See Section 6.1.2 (Marine Protected Areas) for more information.
Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*	The Proposed Action is consistent with the integrated strategy toward sustainability in the federal government and to making reduction of greenhouse gas emissions a priority for federal agencies.
Executive Order 13547, *Stewardship of the Ocean, Our Coasts, and the Great Lakes*	The Proposed Action is consistent with the comprehensive national policy for the Stewardship of the Ocean, Our Coasts, and the Great Lakes.
International Standards	
International Convention for the Prevention of Pollution from Ships	This standard prohibits certain discharges of oil, garbage, and other substances from vessels. The convention and its annexes are implemented by national legislation, including the Act to Prevent Pollution from Ships (33 U.S.C. §§ 1901 to 1915) and the Federal Water Pollution Control Act (33 U.S.C. §§ 1321 to 1322). The Proposed Action does not include vessel operation and discharge from ships; however, the Navy vessels operating in the Study Area would comply with the discharge requirements established in this program, minimizing or eliminating potential impacts from discharges from ships.

Note: nm = nautical mile(s)

6.1.1 Coastal Zone Management Act Compliance

The Coastal Zone Management Act of 1972 (16 United States Code [U.S.C.] § 1451, et seq.) encourages coastal states to be proactive in managing coastal zone uses and resources. The Act established a voluntary coastal planning program under which participating states submit a Coastal Management Plan to the National Oceanographic and Atmospheric Administration for approval. Under the Act, federal actions that have an effect on a coastal use or resource are required to be consistent, to the maximum extent practicable, with the enforceable policies of federally approved Coastal Management Plans.

The Coastal Zone Management Act defines the coastal zone as extending “to the outer limit of State title and ownership under the Submerged Lands Act” (i.e., 3 nautical miles [nm] or 9 nm from the shoreline, depending on the location). The extent of the coastal zone inland varies from state to state, but the shoreward extent is not relevant to this Proposed Action.

A Consistency Determination, or a Negative Determination, may be submitted for review of federal agency activities. A federal agency submits a consistency determination when it determines that its activity may have either a direct or an indirect effect on a state coastal use or resource. In accordance with 15 Code of Federal Regulations (C.F.R.) § 930.39, the consistency determination will include a brief statement indicating whether the proposed activity will be undertaken in a manner consistent to the maximum extent practicable with the enforceable policies of the management program. The consistency determination should be based on evaluation of the relevant enforceable policies of the management program. In accordance with 15 C.F.R. §930.35, "if a Federal agency determines that there will not be coastal effects, then the Federal agency shall provide the State agencies with a negative determination for a Federal agency activity: (1) Identified by a State agency on its list, as described in §930.34(b), or through case-by-case monitoring of unlisted activities; or (2) Which is the same as or is similar to activities for which consistency determinations have been prepared in the past; or (3) For which the Federal agency undertook a thorough consistency assessment and developed initial findings on the coastal effects of the activity." Thus, a negative determination must be submitted to a state if the agency determines no coastal effects and one or more of the triggers above is met.

6.1.1.1 California Coastal Management Program

The state of California has an approved Coastal Management Plan, administered by the California Coastal Commission. The California Coastal Act of 1976 (California Public Resources Code, § 30000 et seq.) implements California's Coastal Management Program. The California Coastal Act includes policies to protect and expand public access to shorelines, and to protect, enhance, and restore environmentally sensitive habitats, including intertidal and nearshore waters, wetlands, bays and estuaries, riparian habitat, certain woods and grasslands, streams, lakes, and habitat for rare and endangered plants and animals.

Under the Coastal Zone Management Act, the California Coastal Commission must provide an opportunity for public comment and involvement in the federal coastal consistency determination process.

In January 2013, the Navy (Commander, U.S. Pacific Fleet) submitted a Consistency Determination for activities within the California portion of the Study Area to the California Coastal Commission. In March 2013, the California Coastal Commission notified the Commander, U.S. Pacific Fleet that it objected to the Navy's Consistency Determination based on a lack of sufficient information. In March 2013, Commander, U.S. Pacific Fleet replied to the California Coastal Commission, responding to each specific objection raised in the Commission's March 2013 letter. The Navy used the remainder of the federal consistency review period to attempt to resolve the differences with the California Coastal Commission. Under 15 C.F.R. §930.43, if the Navy concludes that its proposed action is fully consistent with the enforceable policies of the management program, it may proceed with the activity, but must notify the State agency of its decision to proceed before the project commences. HSTT activities are fully consistent with the enforceable polices of the California Coastal Management Program. In the event that Navy is not able to reach an agreement on the consistency of its activities with the California Coastal Commission, the Navy will comply with 15 C.F.R. §930.43(e) and notify the California Coastal Commission if the Navy decides to proceed over California Coastal Commission's objection. The correspondence between the Navy and the California Coastal Commission can be found in Appendix C (Agency Correspondence).

6.1.1.2 Hawaii Coastal Zone Management Program

Hawaii has an approved Coastal Zone Management Program (Chapter 205A, Hawaii Revised Statutes), administered by the Hawaii Office of Planning. The program meets the federal coastal zone management requirements in managing coastal areas and resources, including beaches, fishponds, scenic areas, marinas, wetlands, harbors, recreational areas, historic sites, and marine resources.

Hawaii's Coastal Zone Management Program employs a wide variety of regulatory and non-regulatory techniques to address coastal issues and uphold environmental law. Among them are stewardship, planning, permitting, education, and outreach.

In January 2013, the Navy (Commander, U.S. Pacific Fleet) submitted a Consistency Determination for activities within the Hawaii portion of the Study Area to the State of Hawaii Office of Planning. In March 2013, the Office of Planning conditionally concurred with the Navy's Consistency Determination. The condition placed on the concurrence was that during training and testing activities, the Navy "within the State of Hawaii Coastal Zone Management area shall not harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect endangered or threatened species of aquatic life or wildlife, or cut, collect, uproot, destroy, injure, or possess endangered or threatened species of aquatic life or land plants, or attempt to engage in any such conduct." The Navy responded to the Office of Planning's letter to clarify that the Navy's activities are consistent with the enforceable policies under Hawaii Revised Statutes Chapter 195 (e) and (g) because any take would be incidental to, and not the purpose of, an otherwise lawful activity and confirmed the Navy has consulted with the National Marine and Fisheries Service (NMFS) for take authorizations under the MMPA and ESA. The correspondence between the Navy and the Hawaii Office of Planning can be found in Appendix C (Agency Correspondence).

6.1.2 MARINE PROTECTED AREAS

Many areas of the marine environment have some level of federal, state, or local management or protection. Marine protected areas have conservation or management purposes, defined boundaries, and some legal authority to protect resources. Marine protected areas vary widely in purpose, managing agency, management approaches, level of protection, and restrictions on human uses. They have been designated to achieve objectives ranging from conservation of biodiversity, to preservation of sunken historic vessels, to protection of spawning habitats important to commercial and recreational fisheries. Executive Order (EO) 13158*, Marine Protected Areas,* was created to "strengthen the management, protection, and conservation of existing marine protected areas and establish new or expanded marine protected areas; develop a scientifically based, comprehensive national system of marine protected areas representing diverse U.S. marine ecosystems, and the nation's natural and cultural resources; and avoid causing harm to marine protected areas through federally conducted, approved, or funded activities."

Executive Order 13158 requires each Federal agency whose actions affect the natural or cultural resources that are protected by a national system of marine protected areas to identify such actions, and in taking such actions, avoid harm to those natural and cultural resources. Pursuant to Section 5 of EO 13158, agency requirements apply only to the natural or cultural resources specifically afforded protection by the site as described by the List of National System Marine Protected Areas. For sites that have both a terrestrial and marine area, only the marine portion and its associated protected resources are included on the List of National System Marine Protected Areas and subject to Section 5 of EO 13158. A full list and map of areas accepted in the National System of Marine Protected Areas is available from the National Marine Protected Areas Center.

The National Marine Protected Areas Center, which is federally managed through the National Oceanic and Atmospheric Administration, is tasked with implementing EO 13158. In order to meet the qualifications for the various terms within EO 13158, the National Marine Protected Areas Center developed a Marine Protected Areas Classification system. This system uses six criteria to describe the key features of most marine protected areas, as follows:

1. Primary conservation focus, such as natural heritage, cultural heritage, or sustainable production
2. Level of protection (e.g., no access, no impact, no take, zoned with no-take areas, zoned multiple use, or uniform multiple use)
3. Permanence of protection
4. Constancy of protection
5. Ecological scale of protection
6. Restrictions on extraction

The National Marine Protected Areas Center utilizes these criteria to evaluate marine protected areas for inclusion in the National System of Marine Protected Areas. Implementation of the National System of Marine Protected Areas is managed by the Department of Commerce and the Department of the Interior. Executive Order 13158 requires the Department of Commerce and the Department of the Interior to consult with other federal agencies about the inclusion of sites into the National System of Marine Protected Areas, including the Department of Defense. The National System of Marine Protected Areas includes marine protected areas managed under the following six systems:

National Marine Sanctuary System. Under the National Marine Sanctuaries Act, the National Oceanic and Atmospheric Administration established national marine sanctuaries for marine areas with special conservation, recreational, ecological, historical, cultural, archaeological, scientific, educational, or aesthetic qualities. Within the Study Area there are three National Marine Sanctuary System sites (two national marine sanctuaries [Hawaiian Islands Humpback Whale National Marine Sanctuary, Channel Islands National Marine Sanctuary] and one marine national monument [Papahanaumokuakea Marine National Monument]) all of which are included in the National System of Marine Protected Areas.

Marine National Monuments. Marine national monuments are designated through Presidential Proclamation under the authority of the Antiquities Act of 1906 (16 U.S.C. § 431). Marine national monuments are often co-managed by state, federal, and local governments, in order to preserve diverse habitats and ecosystem functions. Within the Study Area there is one marine national monument, Papahanaumokuakea Marine National Monument, which is also included in the National Marine Sanctuary System and the National System of Marine Protected Areas. In the proclamation designating the Monument, specific language was included that stated: "The prohibitions required by this proclamation shall not apply to activities and exercises of the Armed Forces (including those carried out by the United States Coast Guard) that are consistent with applicable laws."

National Wildlife Refuge System. The U.S. Fish and Wildlife Service manages ocean and Great Lakes refuges for the conservation, management, and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats. There are two national wildlife refuge areas within the Study Area, Johnston Island National Wildlife Refuge and Midway Atoll National Wildlife Refuge, both of which are included in the National System of Marine Protected Areas.

State and Local Marine Protected Areas. State and local governments have established marine protected areas for the management of fisheries, nursery grounds, shellfish beds, recreation, tourism, and other uses; these areas have a diverse array of conservation focuses, from protecting ecological functions, to preserving shipwrecks, to maintaining traditional or cultural interaction with the marine environment. There are 18 state or local marine protected areas within the Study Area that are included in the National System of Marine Protected Areas (see Table 6.1-2). Within the Study Area, there are California Marine Protected Areas not yet included in the National Marine Protected Areas Center inventory: Begg Rock State Marine Reserve, Santa Barbara Island State Marine Reserve, nine separate areas on Catalina Island, Dana Point State Marine Conservation Area, Swami's State Marine Conservation Area, San Diego-Scripps Coastal State Marine Conservation Area, Matlahuayl State Marine Conservation Area, South La Jolla State Marine Conservation Area, South La Jolla State Marine Reserve, and Cabrillo State Marine Reserve.

The Navy has had direct participation in the California Marine Protected Areas process and the establishment of the Marine Protected Areas in the Study Area. The development process includes the recognition of the Navy's ongoing activities within those areas, with a finding that those activities are compatible with the Marine Protected Areas. For the California Marine Protected Areas, California Title 14, Section 632 states: "Nothing in this section expressly or implicitly precludes, restricts or requires modification of current or future uses of the waters identified as marine protected areas, special closures, or the lands or waters adjacent to these designated areas by the Department of Defense, its allies or agents."

National Parks System. The National Park System contains ocean and Great Lakes parks, including some national monuments, administered by the U.S. Department of the Interior National Park Service to conserve the scenery and the natural and historic objects and wildlife contained within. There is one National Parks System site, Channel Islands National Park, within the Study Area that is included in the National System of Marine Protected Areas.

National Estuarine Research Reserve System. National Estuarine Research Reserve System sites protect estuarine land and water and provide essential habitat for wildlife; educational opportunities for student, teachers, and the public; and living laboratories for scientists. There are no National Estuarine Research Reserve System sites within the Study Area.

This EIS/OEIS has been prepared in accordance with requirements for natural or cultural resources protected under the National System of Marine Protected Areas. While several marine protected areas are located within the Study Area and are included in the National System of Marine Protected Areas, it is important to note that the Navy rarely trains or tests in many of these areas. The Navy, when conducting activities within these marine protected areas, abides by the regulations of the individual marine protected area. Table 6.1-2 provides information on the individual marine protected area regulations and the Navy activities that occur in these areas. Additionally, there are two National Marine Sanctuaries within the Study Area that are included in the National System of Marine Protected Areas the (Channel Islands National Marine Sanctuary and the Hawaiian Islands Humpback Whale National Marine Sanctuary) and one marine national monument, the Papahanaumokuakea Marine National Monument. These areas receive protection under EO 13158, the National Marine Sanctuaries Act, or both, and are described in more detail below.

Table 6.1-2: Marine Protected Areas within the Hawaii-Southern California Training and Testing Study Area

Marine Protected Area	Location Within the Study Area	Protection Focus	Regulations Applicable to Navy Activities	Navy Proposed Activities and Potential Impacts
Channel Islands National Marine Sanctuary (CINMS)	California	Ecosystem	Prohibitions "…do not apply to military activities carried out by DoD [Department of Defense] as of the effective date (22 September 1980) of these regulations. (15 C.F.R. § 922.73)" However, if any activities "modified in such a way that requires the preparation of an environmental assessment or environmental impact statement…relevant to a Sanctuary resource or quality" said activity is not considered a pre-existing activity under these regulations. The regulations also state that "all DoD activities must be carried out in a manner that avoids to the maximum extent practicable any adverse impacts on sanctuary resources and qualities." If a DoD activity causes any destruction, loss, or injury to a Sanctuary resource then the "DoD, in coordination with the Director, must promptly prevent and mitigate further damage and must restore or replace the Sanctuary resource or quality in a manner approved by the Director."	For the Hawaii-Southern California Training and Testing (HSTT) Environmental Impact Statement (EIS),[1] the Navy will continue to conduct anti-submarine warfare training in the vicinity of the Santa Barbara Island portion of the sanctuary. Navy activities within the CINMS are specifically identified in Section 3.5.9 of the Channel Islands National Marine Sanctuary Final Management Plan/Final EIS Volume II (National Oceanic and Atmospheric Administration 2008). These Navy activities are exempt from the prohibitions in the Sanctuary. The sanctuary regulations require that all DoD military activities shall be carried out in a manner that avoids to the maximum extent practicable any adverse impacts on sanctuary resources and qualities. The Navy does not propose new, modified, or increased frequency of activities in the CINMS, or activities that are different from those currently conducted in this area. Therefore, proposed activities are consistent with those activities currently conducted in this area, and those described in the Sanctuary's Final Management Plan/Final EIS. These HSTT activities would continue to be exempt from the prohibitions identified in the Sanctuary's regulations. HSTT activities within the Sanctuary would be conducted with an extensive set of mitigations measures (see Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring) and will avoid to the maximum extent practicable any adverse impacts on the Sanctuary resources and qualities.

[1] As described in Section 2.1.2.2, the area around Santa Barbara Island is a part of the Point Mugu Sea Range (PMSR) which is the subject of a separate EIS. For HSTT this area is addressed because it is used as a part of the HSTT activities, specifically anti-submarine warfare. The PMSR overlaps a larger portion of the Channel Islands National Marine Sanctuary—see the PMSR EIS for additional details.

Table 6.1-2: Marine Protected Areas within the Hawaii-Southern California Training and Testing Study Area (continued)

Marine Protected Area	Location Within the Study Area	Protection Focus	Regulations Applicable to Navy Activities	Navy Proposed Activities and Potential Impacts
Channel Islands National Park (CNIP)	California	Ecosystem	This CINP extends one mile around the islands within the Channel Islands National Marine Sanctuary. Within the Study Area, this is a small portion around Santa Barbara Island.	The Navy continues to conduct sonar-related activities in the vicinity of the Santa Barbara Island No other activities are conducted in the vicinity of this area. The Navy complies with all applicable National Park Service regulations within the CINP.
Farnsworth Bank ASBS[2] State Water Quality Protection Area	California	Ecosystem	Waste discharges are prohibited.	The Navy conducts training and testing in all warfare areas, including sonar-related activities outside of, but in the vicinity of, this area. The Navy does not discharge waste in or near this area.
Heisler Park ASBS[2] State Water Quality Protection Area	California	Ecosystem	Waste discharges are prohibited.	The Navy conducts training and testing in all warfare areas, including amphibious activities south of this area in the Camp Pendleton Amphibious Assault Area. The Navy does not discharge waste in or near this area.
La Jolla ASBS[2] State Water Quality Protection Area	California	Ecosystem	Waste discharges are prohibited.	The Navy conducts training and testing in all warfare areas, including mine warfare training activities and underwater communications testing activities just offshore (within 3 nm) of this water quality protection area. The Navy does not discharge any waste in or near this area.
Northwestern Santa Catalina Island ASBS[2] State Water Quality Protection Area	California	Ecosystem	Waste discharges are prohibited.	The Navy conducts training and testing in all warfare areas, including sonar-related activities outside of this, but in the vicinity of this area. The Navy does not discharge waste in or near this area.

[2] ASBS is an Area of Special Biological Significance.

Table 6.1-2: Marine Protected Areas within the Hawaii-Southern California Training and Testing Study Area (continued)

Marine Protected Area	Location Within the Study Area	Protection Focus	Regulations Applicable to Navy Activities	Navy Proposed Activities and Potential Impacts
Robert E. Badham ASBS[2] State Water Quality Protection Area	California	Ecosystem	Waste discharges are prohibited. However, discharges incidental to military training and research, development, test, and evaluation operations are allowed. Discharges incidental to underwater demolition and other in-water explosions are not allowed in the two military closure areas in the vicinity of Wilson Cove and Castle Rock. Discharges must not result in a violation of the water quality objectives, including the protection of the marine aquatic life beneficial use, anywhere in the ASBS.	The Navy conducts training and testing in all warfare areas, including amphibious activities in this area. The Navy does not discharge waste in or near this area. in violation of the site specific regulations.
San Clemente Island ASBS[2] State Water Quality Protection Area	California	Ecosystem	Waste discharges are prohibited. However, discharges incidental to military training and research, development, test, and evaluation operations are allowed. Discharges incidental to underwater demolition and other in-water explosions are not allowed in the two military closure areas in the vicinity of Wilson Cove and Castle Rock. Discharges must not result in a violation of the water quality objectives, including the protection of the marine aquatic life beneficial use, anywhere in the ASBS.	The Navy conducts training and testing in all warfare areas, including amphibious, anti-surface warfare, anti-submarine warfare, electronic warfare, mine warfare, and naval special warfare training and testing activities in this area. The Navy does not discharge waste in or near this area in violation of the site specific regulations.
San Diego-Scripps ASBS[2] State Water Quality Protection Area	California	Ecosystem	Waste discharges are prohibited.	The Navy conducts training and testing in all warfare areas, including mine warfare training activities and underwater communications testing activities just offshore (within 3 nm) of this water quality protection area. The Navy does not discharge any waste in or near this area.
Santa Barbara and Anacapa Islands ASBS[2] State Water Quality Protection Area	California (Santa Barbara Island only)	Ecosystem	Waste discharges are prohibited.	The Navy conducts training and testing in all warfare areas, including sonar-related activities in and near this area. The Navy does not discharge waste in or near this area.

Table 6.1-2: Marine Protected Areas within the Hawaii-Southern California Training and Testing Study Area (continued)

Marine Protected Area	Location Within the Study Area	Protection Focus	Regulations Applicable to Navy Activities	Navy Proposed Activities and Potential Impacts
San Nicolas Island and Begg Rock ASBS[2] State Water Quality Protection Area	California	Ecosystem	Waste discharges are prohibited. However, discharges incidental to military research, development, testing, and evaluation of, and training with, guided missile and other weapons systems, fleet training exercises, small-scale amphibious warfare training, and special warfare training are allowed. Discharges incidental to underwater demolition and other in-water explosions are not allowed. Discharges must not result in a violation of the water quality objectives, including the protection of the marine aquatic life beneficial use, anywhere in the ASBS.	The Navy conducts training and testing in all warfare areas, including sonar-related activities outside of, but in the vicinity of this area, primarily to the southeast. The Navy does not discharge waste in or near this area in violation of the site specific regulations.
Southeast Santa Catalina Island ASBS[2] State Water Quality Protection Area	California	Ecosystem	Waste discharges are prohibited.	The Navy conducts training and testing in all warfare areas, including sonar-related activities outside of this, but in the vicinity of this area. The Navy does not discharge waste in or near this area.
Western Santa Catalina Island ASBS[2] State Water Quality Protection Area	California	Ecosystem	Waste discharges are prohibited.	The Navy conducts training and testing in all warfare areas, including sonar-related activities outside of this, but in the vicinity of this area. The Navy does not discharge waste in or near this area.
Ahihi-Kinau Natural Area Reserve	Hawaii	Ecosystem	Prohibited: anchoring in any manner, injuring or removing any marine organism, damaging or disturbing any geological features, moving or damaging historic or prehistoric remains.	The Navy conducts no activities in this area.
Kalaupapa National Historical Park	Hawaii	Ecosystem	Prohibited: restrictions on commercial and recreational fishing.	The Navy conducts no activities near Kalaupapa National Historical Park.
Hanauma Bay Marine Life Conservation District	Hawaii	Ecosystem	Prohibited: operating any watercraft, injuring or removing any marine organism, damaging or disturbing any geological features.	The Navy conducts no activities in or near Hanauma Bay.

Table 6.1-2: Marine Protected Areas within the Hawaii-Southern California Training and Testing Study Area (continued)

Marine Protected Area	Location Within the Study Area	Protection Focus	Regulations Applicable to Navy Activities	Navy Proposed Activities and Potential Impacts
Kahoolawe Island Reserve	Hawaii	Ecosystem	Prohibited: all entrance into and activities within the reserve (such as boating, fishing and diving) unless specifically authorized by the Island Reserve Commission.	The Navy conducts no activities on or near Kahoolawe Island. Submarines may conduct underwater mine detection activities several nautical miles west of Kahoolawe.
Kaloko-Honokohau National Historical Park	Hawaii	Ecosystem	Prohibited: unpermitted uses of lay nets and aquarium collections.	The Navy conducts no activities near Kaloko-Honokohau National Historical Park.
Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS)	Hawaii	Focal Resource	Prohibitions on activities within the sanctuary, as outlined in the National Marine Sanctuary Program Regulations for the Hawaiian Islands Humpback Whale National Marine Sanctuary (15 C.F.R. § 922.183), do not apply to "…all classes of military activities, internal or external to the Sanctuary, that are being or have been conducted before the effective date of these regulations." (2 June 1997) and as identified in the Final EIS and Management Plan. Additionally, any activity that is "modified in such a way that it is likely to destroy, cause the loss of, or injure a Sanctuary resource in manner significantly greater than was considered in a previous consultation under section 304(d) of the National Marine Sanctuary Act and § 922.187 of this subpart, the modified activity will be treated as a new military activity under paragraph (c) of this section."	For the HSTT EIS activities, the Navy will continue to conduct anti-submarine warfare training and testing, consisting of mid- and high-frequency active sonar use. This type of activity occurs throughout the range complex and overlaps with the boundaries of the sanctuary primarily around the islands of Maui, Lanai, and Molokai. Navy activities within the HIHWNMS are specifically identified in Appendix F of the Final Management Plan/Final EIS Volume II (National Oceanic and Atmospheric Administration 1997). These Navy activities are exempt from the prohibitions in the Sanctuary. The Navy does not propose new, modified, or an increased frequency of activities in the HIHWNMS or activities that are different from those currently conducted in this area. Therefore, proposed activities are consistent with those activities currently conducted in this area and those described in the sanctuary's Final Management Plan/Final EIS. These HSTT activities would continue to be exempt from the prohibitions identified in the Sanctuary's regulations. HSTT activities within the HIHWNMS would be conducted with an extensive set of mitigations measures (see Chapter 5) and will avoid to the maximum extent practicable any adverse impacts on the Sanctuary resources and qualities.

Table 6.1-2: Marine Protected Areas within the Hawaii-Southern California Training and Testing Study Area (continued)

Marine Protected Area	Location Within the Study Area	Protection Focus	Regulations Applicable to Navy Activities	Navy Proposed Activities and Potential Impacts
Johnston Island National Wildlife Refuge	U.S. Territory	Ecosystem	Prohibitions do not apply to activities and exercises of the Armed Forces. Any activities carried forward within the area will be conducted in a manner consistent "so far as is reasonable and practical" with the prohibitions. If an activity causes any destruction, loss, or injury to a resource within the refuge then the DoD will coordinate with the Secretary of the Interior or Commerce, to take appropriate actions respond, mitigate, restore or replace the affected areas.	The Navy conducts no activities in or near the Johnston Island National Wildlife Refuge. Ships may transit in the vicinity of the refuge.
Molokini Shoal Marine Life Conservation District	Hawaii	Ecosystem	Prohibited: injuring or removing any marine organism (except in Subzone B), damaging or disturbing any geological features, moor and anchoring of boats.	The Navy conducts no activities on or near Molokini.
Midway Atoll National Wildlife Refuge	Hawaii	Ecosystem	Same prohibitions as listed under the Papahanaumokuakea Marine National Monument.	The Navy's proposed action includes activities conducted east of Nihoa Island and inside the eastern edge of the monument boundaries. These activities may include: - Anti-air warfare - Anti-surface warfare - Anti-submarine warfare - Electronic warfare
Pupukea Marine Life Conservation District	Hawaii	Ecosystem	Prohibited: injuring or removing any marine organism (outside of species and gear specific regulations), damaging or disturbing any geological features.	The Navy conducts no activities in this area.

Table 6.1-2: Marine Protected Areas within the Hawaii-Southern California Training and Testing Study Area (continued)

Marine Protected Area	Location Within the Study Area	Protection Focus	Regulations Applicable to Navy Activities	Navy Proposed Activities and Potential Impacts
Papahanaumokuakea Marine National Monument and World Heritage Site	Hawaii	Ecosystem	Prohibitions on activities within the Papahanaumokuakea Marine National Monument and World Heritage Site (50 C.F.R. § 404), state that "all activities and exercises of the Armed Forces shall be carried out in a manner that avoids, to the extent practicable and consistent with operational requirements, adverse impacts on Monument resources and qualities." Additionally, these regulations require that "in the event of threatened or actual destruction of, loss of, or injury to a Monument resource or quality resulting from an incident, including but not limited to spill and groundings, caused by a component of the [DoD] or the United States Coast Guard, the cognizant component shall promptly coordinate with the Secretaries for the purpose of taking appropriate actions to respond to and mitigate the harm and, if possible, restore or replace the Monument resource or quality."	The Navy's proposed action includes activities conducted east of Nihoa Island and inside the eastern edge of the monument boundaries. These activities may include: - Anti-air warfare - Anti-surface warfare - Anti-submarine warfare - Electronic warfare
Kealakekua Bay Marine Life Conservation District	Hawaii	Ecosystem	Prohibited: injuring or removing any marine organism (except within Subzone B), damaging or disturbing any geological features, anchoring of boats in Subzone A (may be anchored in Subzone B only in sand).	The Navy conducts no activities in this area.
West Hawaii Regional Fishery Management Area	Hawaii	Focal Resource	Prohibited: unpermitted uses of lay nets and aquarium collections.	The Navy conducts no activities in this area.

6.1.2.1.1 Channel Islands National Marine Sanctuary

The Channel Islands National Marine Sanctuary consists of an area of 1,109 square nautical miles (nm^2) around Anacapa Island, Santa Cruz Island, Santa Rosa Island, San Miguel Island and, Santa Barbara Island to the south (Figure 6.1-1). Only 92 nm^2 of Santa Barbara Island, or about eight percent of the sanctuary, occurs within the Southern California portion of the Study Area.

Key habitats within the sanctuary include kelp forest, surfgrass and eelgrass, intertidal zone, nearshore subtidal, deepwater benthic, and water column habitat. The diversity of habitats onshore and offshore contributes to the high species diversity in the Channel Islands National Marine Sanctuary, with more than 195 species of birds using open water, shore, or island habitats in the area (National Marine Sanctuaries 2009a). At least 33 species of cetaceans have been reported in the Channel Islands National Marine Sanctuary (National Marine Sanctuaries 2009a). Four species of sea turtles have been reported in the region—green, loggerhead, olive ridley, and leatherback—and all four species may be found within the sanctuary at any time of year. At least 492 species of algae and four species of sea grasses make up the marine plants of the sanctuary (National Marine Sanctuaries 2009a). Due to its transitional location between cold and warm water currents and the diversity of bottom habitats, the Channel Islands National Marine Sanctuary supports a variety of invertebrates, including two endangered species (black abalone and the white abalone). Of the 481 species of fish commonly found in the region, many occur in the sanctuary. See Section 3.4 (Marine Mammals), Section 3.5 (Sea Turtles), Section 3.6 (Sea Birds), Section 3.7 (Marine Vegetation), Section 3.8 (Marine Invertebrates), and Section 3.9 (Fish) for additional information on these species.

General regulations for the Channel Islands National Marine Sanctuary prohibit the following (15 C.F.R. § 922.72(a)):

> (1) Exploring for, developing, or producing hydrocarbons within the Sanctuary, except pursuant to leases executed prior to March 30, 1981, and except the laying of pipeline pursuant to exploring for, developing, or producing hydrocarbons.
>
> (2) Exploring for, developing, or producing minerals within the Sanctuary, except producing byproducts incidental to hydrocarbon production allowed by paragraph (a)(1) of this section.
>
> (3)(i) Discharging or depositing from within or into the Sanctuary any material or other matter except:
>
>> (A) Fish, fish parts, or chumming materials (bait) used in or resulting from lawful fishing activity within the Sanctuary, provided that such discharge or deposit is during the conduct of lawful fishing activity within the Sanctuary;
>>
>> (B) For a vessel less than 300 gross registered tons (GRT), or an oceangoing ship without sufficient holding tank capacity to hold sewage while within the Sanctuary, biodegradable effluent generated incidental to vessel use by an operable Type I or II marine sanitation device (U.S. Coast Guard classification) approved in accordance with section 312 of the Federal Water Pollution Control Act, as amended, (FWPCA), 33 U.S.C. 1321 et seq. Vessel operators must lock all marine sanitation devices in a manner that prevents discharge or deposit of untreated sewage;

(C) Biodegradable matter from:

(1) Vessel deck wash down;
(2) Vessel engine cooling water;
(3) Graywater from a vessel less than 300 gross registered tons;
(4) Graywater from an oceangoing ship without sufficient holding tank capacity to hold graywater while within the Sanctuary;

(D) Vessel engine or generator exhaust;

(E) Effluent routinely and necessarily discharged or deposited incidental to hydrocarbon exploration, development, or production allowed by paragraph (a)(1) of this section; or

(F) Discharge allowed under section 312(n) of the FWPCA.

(3)(ii) Discharging or depositing from beyond the boundary of the Sanctuary any material or other matter that subsequently enters the Sanctuary and injures a Sanctuary resource or quality, except those listed in paragraphs (a)(3)(i)(B) through (F) of this section and fish, fish parts, or chumming materials (bait) used in or resulting from lawful fishing activity beyond the boundary of the Sanctuary, provided that such discharge or deposit is during the conduct of lawful fishing activity there.

(4) Drilling into, dredging, or otherwise altering the submerged lands of the Sanctuary; or constructing or placing any structure, material, or other matter on or in the submerged lands of the Sanctuary, except as incidental to and necessary to:

(i) Anchor a vessel;
(ii) Install an authorized navigational aid;
(iii) Conduct lawful fishing activity;
(iv) Lay pipeline pursuant to exploring for, developing, or producing hydrocarbons; or
(v) Explore for, develop, or produce hydrocarbons as allowed by paragraph (a)(1) of this section.

(5) Abandoning any structure, material, or other matter on or in the submerged lands of the Sanctuary.

(6) Except to transport persons or supplies to or from any Island, operating within one nmi of any Island any vessel engaged in the trade of carrying cargo, including, but not limited to, tankers and other bulk carriers and barges, any vessel engaged in the trade of servicing offshore installations, or any vessel of three hundred gross registered tons or more, except fishing or kelp harvesting vessels.

(7) Disturbing a seabird or marine mammal by flying a motorized aircraft at less than 1,000 feet over the waters within one nautical mile of any Island, except to engage in kelp bed surveys or to transport persons or supplies to or from an Island. Failure to maintain a minimum altitude of 1,000 feet above ground level over such waters is presumed to disturb marine mammals or seabirds.

(8) Moving, removing, injuring, or possessing, or attempting to move, remove, injure, or possess a Sanctuary historical resource.

(9) Taking any marine mammal, sea turtle, or seabird within or above the Sanctuary, except as authorized by the Marine Mammal Protection Act, as amended, (MMPA), 16 U.S.C. 1361 et seq., Endangered Species Act, as amended, (ESA), 16 U.S.C. 1531 et seq., Migratory Bird Treaty Act, as amended, (MBTA), 16 U.S.C. 703 et seq., or any regulation, as amended, promulgated under the MMPA, ESA, or MBTA.

(10) Possessing within the Sanctuary (regardless of where taken from, moved, or removed from) any marine mammal, sea turtle, or seabird, except as authorized by the MMPA, ESA, MBTA, or any regulation, as amended, promulgated under the MMPA, ESA, or MBTA.

(11) Marking, defacing, damaging, moving, removing, or tampering with any sign, notice, or placard, whether temporary or permanent, or any monument, stake, post, or other boundary marker related to the Sanctuary.

(12) Introducing or otherwise releasing from within or into the Sanctuary an introduced species, except striped bass (*Morone saxatilis*) released during catch and release fishing activity.

(13) Operating a motorized personal watercraft within waters of the Sanctuary that are coextensive with the Channel Islands National Park, established by 16 U.S.C. 410(ff).

According to the National Marine Sanctuary Program Regulations for the Channel Islands National Marine Sanctuary (15 C.F.R., § 922.73), the prohibitions "…do not apply to military activities carried out by DoD [Department of Defense] as of the effective date of these regulations." However, any activity that is "modified in such a way that requires the preparation of an environmental assessment or environmental impact statement…relevant to a Sanctuary resource or quality" is not considered a pre-existing activity. The National Marine Sanctuary Program Regulations also states "all DoD activities must be carried out in a manner that avoids to the maximum extent practicable any adverse impacts on sanctuary resources and qualities." If a DoD activity causes any destruction, loss or injury to a Sanctuary resource then the "DoD, in coordination with the Director, must promptly prevent and mitigate further damage and must restore or replace the Sanctuary resource or quality in a manner approve by the Director."

The Navy does not propose new or an increase in activities in the Channel Islands National Marine Sanctuary, or activities that are different from those currently conducted in this area. Increases to military activities described in the Proposed Action would not occur in the sanctuary. Therefore, proposed activities are consistent with those activities currently conducted in this area, are consistent with those described in the sanctuary's designation document and in Section 3.5.9 (Department of Defense Activities, pre-existing activities) of the *Final Channel Islands National Marine Sanctuary Management Plan/Final Environmental Impact Statement (FMP/FEIS), Volume II: Environmental Impact Statement* (2008), authored and published by the National Oceanic and Atmospheric Administration, and would continue to be exempt from the prohibitions identified in the Sanctuary's regulations. HSTT activities within the Sanctuary would be conducted with an extensive set of mitigations measures (see Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring) and will avoid to the maximum extent practicable any adverse impacts on the Sanctuary resources and qualities.

To ensure compliance with the National Marine Sanctuary Program Regulations, the Navy considered all proposed training and testing activities to determine which activities may destroy, cause the loss of, or injure sanctuary resources, or result in adverse impacts on sanctuary resources or qualities. The Navy concluded that the proposed activities could fall into the following three categories:

1. The following platforms, sources, or items that are part of Navy activities may be used within the Channel Islands National Marine Sanctuary because they were specifically exempted:

    - Aircraft and Aerial Targets

    Aircraft and aerial targets are expected to cause only a minor and temporary behavioral reaction due to noise for marine mammals, sea turtles, birds, or fish that may be present in the area. However, in addition to behavioral reactions due to noise, seabirds could potentially be struck by aircraft or aerial targets. The Navy implements standard operating procedures that require pilots of Navy aircraft to make every attempt to avoid large flocks of birds in order to reduce the safety risk involved with a potential bird strike. For a more detailed discussion of potential impacts to these resources from the use of aircraft and aerial targets, see the following sections:
        - Section 3.4.3.2.7 (Impacts from Aircraft Noise) for marine mammals
        - Section 3.5.3.1.12 (Impacts from Vessel and Aircraft Noise) for sea turtles
        - Section 3.6.3.1.5 (Impacts from Aircraft and Vessel Noise) and Section 3.6.3.3.1 (Impacts from Aircraft and Aerial Target Strikes) for birds
        - Section 3.9.3.1.2 (Impacts from Sonar and Other Active Sources) for fish

    - Vessels and in-water devices (that do not make contact with seafloor)

    Noise (other than sonar or radiated and induced noise) from vessels and in-water devices is expected to cause only a minor and temporary behavioral reaction for marine mammals, sea turtles, seabirds, or fish that may be present in the area. Marine mammals, sea turtles, seabirds, floating vegetation, and invertebrates could potentially be struck by or collide with vessels. However, the Navy implements mitigation measures to reduce the potential for vessel strikes of marine mammals (Section 5.3.2.2, Physical Disturbance and Strike, and Section 5.3.3.1, Marine Mammal Habitats). In addition, all vessels use extreme caution and proceed at a "safe speed" so they can take proper and effective action to avoid a collision with any sighted object or disturbance and can be stopped within a distance appropriate to the prevailing circumstances and conditions. For a more detailed discussion of potential impacts to these resources from the use of vessels and in-water devices, see the following sections:
        - Section 3.4.3.4.1 (Impacts from Vessel Strike) and Section 3.4.3.4.2 (Impacts from In-Water Devices) for marine mammals
        - Section 3.5.3.3.1 (Impacts from Vessels) and Section 3.5.3.3.2 (Impacts from In-Water Devices) for sea turtles
        - Section 3.6.3.3.2 (Impacts from Vessels and In-Water Devices) for birds
        - Section 3.7.3.2.1 (Impacts from Vessels and In-Water Devices) for vegetation
        - Section 3.8.3.3.1 (Impacts from Vessels and In-Water Devices) for invertebrates
        - Section 3.9.3.3.1 (Impacts from Vessels and In-Water Devices) for fish

    - Explosives detonated in-air, at the surface, or in the water (includes gunnery, bombing, torpedoes, missiles, and mine countermeasures)

Explosives detonated in-air, at the surface, or in the water could impact marine mammals, sea turtles, birds, invertebrates, floating vegetation, or fish that may be present in the area. Impacts are expected to range from temporary behavioral reactions to injury, damage, or death. However, the Navy implements mitigation measures to reduce the potential for impacts from the use of explosives (Section 5.3.1.2.2, Acoustic Stressors—Explosives and Impulsive Sound, and Section 5.3.2.1.2, Explosives and Impulsive Sound). For a more detailed discussion of potential impacts to these resources from the use of explosives detonated in-air, at the surface, or in the water, see the following sections:

- Section 3.4.3.2.2 (Impacts from Explosives) for marine mammals
- Section 3.5.3.1.8 (Impacts from Explosives) for sea turtles
- Section 3.6.3.1.2 (Impacts from Explosives and Swimmer Defense Airguns) for birds
- Section 3.7.3.1.1 (Impacts from Explosives) for vegetation
- Section 3.8.3.1.2 (Impacts from Explosives and Other Impulsive Sources) for invertebrates
- Section 3.9.3.1.3 (Impacts from Explosives and Other Impulsive Acoustic Sources) for fish

- Military expended materials resulting from exempted activities

Military expended materials resulting from exempted activities include fragments from high-explosive munitions, non-explosive practice munitions, and targets. These items could directly strike marine mammals, sea turtles, birds, invertebrates, floating vegetation, or fish that may be present in the area. However, the probability of military expended materials directly striking a marine resource is extremely low. In addition, the Navy implements mitigation measures to reduce the potential for direct strike from non-explosive practice munitions (Section 5.3.1.2.3, Physical Disturbance and Strike, and Section 5.3.2.2.2, Non-Explosive Practice Munitions). In addition to biological resources, military expended materials can land on marine substrates. The Navy implements mitigation measures to reduce the potential for direct strike to shallow coral reefs from non-explosive practice munitions (Section 5.3.3.2, Seafloor Resources). For a more detailed discussion of potential impacts to these resources from the use of non-explosive practice munitions fired in-air or at the surface, see the following sections:

- Section 3.3.3.2.4 (Impacts from Military Expended Materials) for marine habitats
- Section 3.4.3.4.3 (Impacts from Military Expended Materials) for marine mammals
- Section 3.5.3.3.3 (Impacts from Military Expended Materials) for sea turtles
- Section 3.6.3.3.3 (Impacts from Military Expended Materials) for birds
- Section 3.7.3.2.2 (Impacts from Military Expended Materials) for vegetation
- Section 3.8.3.3.2 (Impacts from Military Expended Materials) for invertebrates
- Section 3.9.3.3.2 (Impacts from Military Expended Materials) for fish

2. The following platforms, sources, or items that are part of Navy activities may be used within the Channel Islands National Marine Sanctuary because they (1) are not likely to destroy, cause the loss of, or injure sanctuary resources or qualities; and (2) would not cause <u>significant impacts</u> on sanctuary resources:

- Sonar and other active acoustic sources

Sonar and other active acoustic sources are expected to cause only a minor and temporary behavioral reaction for invertebrates (cephalopods and crustaceans), diving birds, or fish that may be present in the area. No effect is anticipated to corals. Marine mammals and sea turtles could potentially be injured (permanent threshold shifts in hearing) from sonar and other active acoustic sources. However, although marine mammals and sea turtles may occur within the Channel Islands National Marine Sanctuary, there is no evidence to suggest that they would be concentrated in this area; therefore, the likelihood of injury is low. Furthermore, the Navy implements mitigation measures to reduce the potential for marine mammals and sea turtles to be exposed to sonar and other active acoustic sources throughout the entire Study Area (Section 5.3.1.2.1, Acoustic Stressors – Non-Impulsive Sound, and Section 5.3.2.1.1, Non-Impulsive Sound). For a more detailed discussion of potential impacts to these resources from the use of sonar and other active acoustic sources, see the following sections:

  - Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources) for marine mammals
  - Section 3.5.3.1.7 (Impacts from Sonar and Other Active Acoustic Sources) for sea turtles
  - Section 3.6.3.1.1 (Impacts from Sonar and Other Active Acoustic Sources) for birds
  - Section 3.8.3.1.1 (Impacts from Sonar and Other Active Acoustic Sources) for invertebrates
  - Section 3.9.3.1.2 (Impacts from Sonar and Other Active Sources) for fish

- Electromagnetic devices

Electromagnetic devices are expected to cause only a minor and temporary behavioral reaction for marine mammals, sea turtles, birds, invertebrates (arthropods, such as lobsters), or fish that may be present in the area. For a more detailed discussion of potential impacts to these resources from the use of electromagnetic devices, see the following sections:

  - Section 3.4.3.3.1 (Impacts from Electromagnetic Devices) for marine mammals
  - Section 3.5.3.2.1 (Impacts from Electromagnetic Devices) for sea turtles
  - Section 3.6.3.2.1 (Impacts from Electromagnetic Devices) for birds
  - Section 3.8.3.2.1 (Impacts from Electromagnetic Devices) for invertebrates
  - Section 3.9.3.2.1 (Impacts from Electromagnetic Devices) for fish

3. The following platforms, sources, or items that are part of Navy activities, but are not planned to be used within the Channel Islands National Marine Sanctuary (including a 2.7 nm buffer) as part of the Proposed Action:

   - Military expended materials resulting from non-exempted activities
   - Seafloor devices

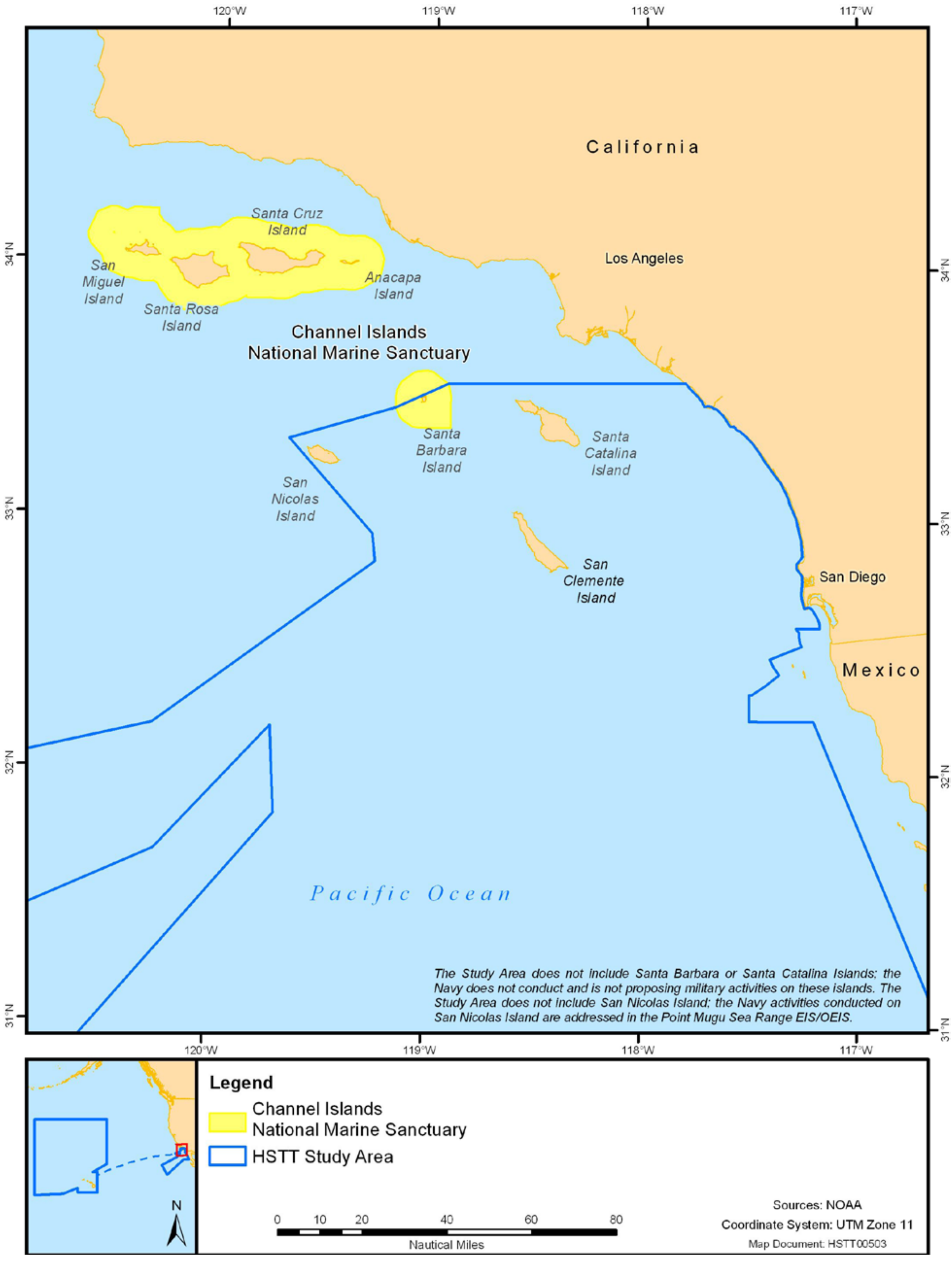


Figure 6.1-1: Channel Islands National Marine Sanctuary

6.1.2.1.2 Hawaiian Islands Humpback Whale National Marine Sanctuary

Scientists estimate that more than 50 percent of the entire North Pacific humpback whale population migrates to Hawaiian waters each winter to mate, calve, and nurse their young. The continued protection of humpback whales and their habitat is crucial to the long-term recovery of this endangered species. In addition to protection under the MMPA and the ESA, the humpback whale is protected in Hawaiian waters by the Hawaiian Islands National Marine Sanctuary Act.

The Hawaiian Islands National Marine Sanctuary Act established the Hawaiian Islands Humpback Whale National Marine Sanctuary. The sanctuary is composed of 1,035 nm^2 of the waters around Maui, Lanai, and Molokai; and smaller areas off the north shore of Kauai, off Hawaii's west coast, and off the north and southeast coasts of Oahu (Figure 6.1-2). The Sanctuary is entirely within the Hawaii portion of the Study Area, constitutes one of the world's most important North Pacific humpback whale (*Megaptera novaeangliae*) habitats, and is a primary region for humpback reproduction in the U.S. (National Marine Sanctuary Program 2002).

The sanctuary boundaries extend from the shoreline to 600 feet (ft.) (183 meters [m]) deep in many areas, encompassing a variety of marine ecosystems, including sea grass beds and coral reefs. Corals and coralline algae are the dominant reef-building organisms in Hawaii's reef ecosystems. Endangered Hawaiian monk seals and sea turtles are found in the sanctuary (Office of National Marine Sanctuaries 2010). Important reef biota include finger coral, cauliflower coral, lobe coral, algae, and marine invertebrates, such as shrimp, lobsters, crabs, and sea urchins. Fish populations on the sanctuary reefs include parrotfish, wrasses, damselfish, surgeon fish, goatfish, jacks, and sharks. See Section 3.4 (Marine Mammals), Section 3.5 (Sea Turtles), Section 3.7 (Marine Vegetation), Section 3.8 (Marine Invertebrates), and Section 3.9 (Fish) for additional information on these species.

A management review process for the Hawaiian Islands Humpback Whale National Marine Sanctuary is underway. A proposal to expand the scope of the sanctuary to conserve other living marine resources was made available to the public for comment between July and October 2010, and public scoping meetings were held in August 2010 (National Oceanic and Atmospheric Administration 2010). According to the National Marine Sanctuary Program Regulations for the Hawaiian Islands Humpback Whale National Marine Sanctuary (15 C.F.R., § 922.184), there are no prohibitions specifically related to military activities.

General regulations for the Hawaiian Islands Humpback Whale National Marine Sanctuary prohibit the following (15 C.F.R. § 922.184(a)):

> (1) Approaching, or causing a vessel or other object to approach, within the Sanctuary, by any means, within 100 yards of any humpback whale except as authorized under the Marine Mammal Protection Act, as amended (MMPA), 16 U.S.C. 1361 et seq., and the Endangered Species Act, as amended (ESA), 16 U.S.C. 1531 et seq.;
>
> (2) Operating any aircraft above the Sanctuary within 1,000 feet of any humpback whale except as necessary for takeoff or landing from an airport or runway, or as authorized under the MMPA and the ESA;
>
> (3) Taking any humpback whale in the Sanctuary except as authorized under the MMPA and the ESA;

(4) Possessing within the Sanctuary (regardless of where taken) any living or dead humpback whale or part thereof taken in violation of the MMPA or the ESA;

(5) Discharging or depositing any material or other matter in the Sanctuary; altering the seabed of the Sanctuary; or discharging or depositing any material or other matter outside the Sanctuary if the discharge or deposit subsequently enters and injures a humpback whale or humpback whale habitat, provided that such activity:

(i) requires a Federal or State permit, license, lease, or other authorization; and

(ii) is conducted:

(A) without such permit, license, lease, or other authorization, or

(B) not in compliance with the terms or conditions of such permit, license, lease, or other authorization.

(6) Interfering with, obstructing, delaying or preventing an investigation, search, seizure or disposition of seized property in connection with enforcement of either of the Acts or any regulations issued under either of the Acts.

According to the National Marine Sanctuary Program Regulations for the Hawaiian Islands Humpback Whale National Marine Sanctuary (15 C.F.R., § 922.183), "…all classes of military activities, internal or external to the Sanctuary, that are being or have been conducted before the effective date of these regulations …[the prohibitions] do not apply to these classes of activities." Additionally, any activity that is "modified in such a way that it is likely to destroy, cause the loss of, or injure a Sanctuary resource in manner significantly greater than was considered in a previous consultation under section 304(d) of the National Marine Sanctuary Act and § 922.187 of this subpart, the modified activity will be treated as a new military activity under paragraph (c) of this section." Navy activities within the Hawaiian Islands Humpback Whale National Marine Sanctuary are specifically identified in Appendix F of the Final Management Plan/Final EIS Volume II (National Oceanic and Atmospheric Administration 1997). These Navy activities are exempt from the prohibitions in the Sanctuary. Within the sanctuary, the Navy conducts primarily anti-submarine warfare training and testing, consisting of mid- and high-frequency active sonar use. This type of training occurs throughout the range complex, but overlaps with the boundaries of the sanctuary only in that portion around the islands of Maui, Lanai, and Molokai. The Navy does not propose new or modified activities in the Hawaiian Islands Humpback Whale National Marine Sanctuary, or activities that are different from those currently conducted in this area. Increases to military activities described in the Proposed Action would not occur in the sanctuary. Therefore, proposed activities are consistent with those activities currently conducted in this area and those described in the sanctuary's Final Management Plan/Final EIS. These HSTT activities would continue to be exempt from the prohibitions identified in the Sanctuary's regulations. HSTT activities within the Hawaiian Islands Humpback Whale National Marine Sanctuary would be conducted with an extensive set of mitigation measures (see Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring) and will avoid to the maximum extent practicable any adverse impacts on the Sanctuary resources and qualities.

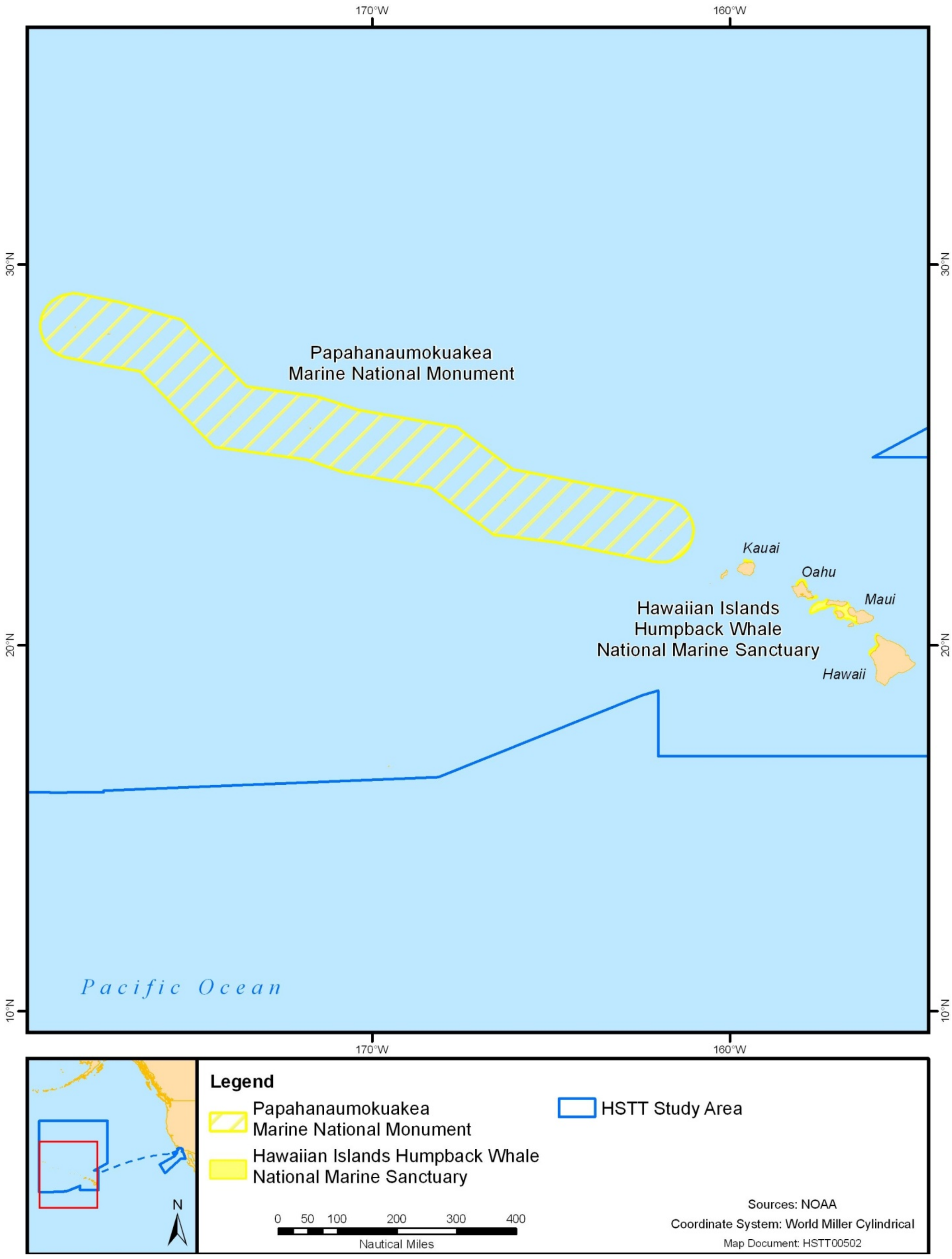


Figure 6.1-2: Papahanaumokuakea Marine National Monument and the Hawaiian Islands Humpback Whale National Marine Sanctuary

The Navy does not propose new or an increase in activities in the Hawaiian Islands Humpback Whale National Marine Sanctuary, or activities that are different from those currently conducted in this area. Therefore, proposed activities are consistent with those activities currently conducted in this area, are consistent with those described in the sanctuary's designation document, and are not being changed or modified in a way that would require consultation. Additionally, the Navy has designated a humpback whale cautionary area within the sanctuary, around an area that has been identified as having one of the highest concentrations of humpback whales during the critical winter months. Should national security needs require MFA sonar training and testing in the cautionary area between 15 December and 15 April, it shall be personally authorized by the Commander, U.S. Pacific Fleet. Further, the Navy will provide specific direction on required mitigation prior to operational units transiting to and training in the cautionary area. The Navy will provide the National Marine Fisheries Service with advance notification of any such activities.

To ensure compliance with the National Marine Sanctuary Program Regulations, the Navy considered all proposed training and testing activities to determine which activities may destroy, cause the loss of, or injure sanctuary resources, or result in adverse impacts on sanctuary resources or qualities. The Navy concluded that the proposed activities could fall into the following three categories:

1. The following platforms, sources, or items that are part of Navy activities may be used within the Hawaiian Islands Humpback Whale National Marine Sanctuary because they were specifically exempted:

   - Aircraft and Aerial Targets

   Aircraft and aerial targets are expected to cause only a minor and temporary behavioral reaction due to noise for marine mammals, sea turtles, birds, or fish that may be present in the area. However, in addition to behavioral reactions due to noise, seabirds could potentially be struck by aircraft or aerial targets. The Navy implements standard operating procedures that require pilots of Navy aircraft to make every attempt to avoid large flocks of birds in order to reduce the safety risk involved with a potential bird strike. For a more detailed discussion of potential impacts to these resources from the use of aircraft and aerial targets, see the following sections:
     - Section 3.4.3.2.7 (Impacts from Aircraft Noise) for marine mammals
     - Section 3.5.3.1.12 (Impacts from Vessel and Aircraft Noise) for sea turtles
     - Section 3.6.3.1.5 (Impacts from Aircraft and Vessel Noise) and Section 3.6.3.3.1 (Impacts from Aircraft and Aerial Target Strikes) for birds
     - Section 3.9.3.1.2 (Impacts from Sonar and Other Active Sources) for fish

   - Vessels and in-water devices (that do not make contact with seafloor)

   Noise (other than sonar or radiated and induced noise) from vessels and in-water devices is expected to cause only a minor and temporary behavioral reaction for marine mammals, sea turtles, seabirds, or fish that may be present in the area. Marine mammals, sea turtles, seabirds, floating vegetation, and invertebrates could potentially be struck by or collide with vessels. However, the Navy implements mitigation measures to reduce the potential for vessel strikes of marine mammals (Section 5.3.2.2, Physical Disturbance and Strike, and Section 5.3.3.1, Marine Mammal Habitats). In addition, all vessels use extreme caution and proceed at a "safe speed" so they can take proper and effective action to avoid a collision with any sighted object or disturbance and can be stopped within a distance appropriate to the prevailing circumstances and conditions. For a more detailed discussion of potential impacts to these resources from the use of vessels and in-water devices, see the following sections:

- o Section 3.4.3.4.1 (Impacts from Vessels) and Section 3.4.3.4.2 (Impacts from In-Water Devices) for marine mammals
- o Section 3.5.3.3.1 (Impacts from Vessels) and Section 3.5.3.3.2 (Impacts from In-Water Devices) for sea turtles
- o Section 3.6.3.3.2 (Impacts from Vessels and In-Water Devices) for birds
- o Section 3.7.3.2.1 (Impacts from Vessels and In-Water Devices) for vegetation
- o Section 3.8.3.3.1 (Impacts from Vessels and In-Water Devices) for invertebrates
- o Section 3.9.3.3.1 (Impacts from Vessels and In-Water Devices) for fish

- Explosives detonated in-air, at the surface, or in the water (includes gunnery, bombing, torpedoes, missiles, and mine countermeasures)

Explosives detonated in-air, at the surface, or in the water could impact marine mammals, sea turtles, birds, invertebrates, floating vegetation, or fish that may be present in the area. Impacts are expected to range from temporary behavioral reactions to injury, damage, or death. However, the Navy implements mitigation measures to reduce the potential for impacts from the use of explosives (Section 5.3.1.2.2, Acoustic Stressors—Explosives and Impulsive Sound, and Section 5.3.2.1.2, Explosives and Impulsive Sound). For a more detailed discussion of potential impacts to these resources from the use of explosives detonated in-air, at the surface, or in the water, see the following sections:

- o Section 3.4.3.2.2 (Impacts from Explosives) for marine mammals
- o Section 3.5.3.1.8 (Impacts from Explosives) for sea turtles
- o Section 3.6.3.1.2 (Impacts from Explosives and Swimmer Defense Airguns) for birds
- o Section 3.7.3.1.1 (Impacts from Explosives) for vegetation
- o Section 3.8.3.1.2 (Impacts from Explosives and Other Impulsive Sources) for invertebrates
- o Section 3.9.3.1.3 (Impacts from Explosives and Other Impulsive Acoustic Sources) for fish

- Military expended materials resulting from exempted activities

Military expended materials resulting from exempted activities include fragments from high-explosive munitions, non-explosive practice munitions, and targets. These items could directly strike marine mammals, sea turtles, birds, invertebrates, floating vegetation, or fish that may be present in the area. However, the probability of military expended materials directly striking a marine resource is extremely low. In addition, the Navy implements mitigation measures to reduce the potential for direct strike from non-explosive practice munitions (Section 5.3.1.2.3, Physical Disturbance and Strike, and Section 5.3.2.2.2, Non-Explosive Practice Munitions). In addition to biological resources, military expended materials can land on marine substrates. The Navy implements mitigation measures to reduce the potential for direct strike to shallow coral reefs from non-explosive practice munitions (Section 5.3.3.2, Seafloor Resources). For a more detailed discussion of potential impacts to these resources from the use of non-explosive practice munitions fired in-air or at the surface, see the following sections:

- o Section 3.3.3.2.4 (Impacts from Military Expended Materials) for marine habitats
- o Section 3.4.3.4.3 (Impacts from Military Expended Materials) for marine mammals
- o Section 3.5.3.3.3 (Impacts from Military Expended Materials) for sea turtles
- o Section 3.6.3.3.3 (Impacts from Military Expended Materials) for birds

- Section 3.7.3.2.2 (Impacts from Military Expended Materials) for vegetation
- Section 3.8.3.3.2 (Impacts from Military Expended Materials) for invertebrates
- Section 3.9.3.3.2 (Impacts from Military Expended Materials) for fish

2. The following platforms, sources, or items that are part of Navy activities may be used within the Hawaiian Islands Humpback Whale National Marine Sanctuary because they (1) are not likely to destroy, cause the loss of, or injure sanctuary resources or qualities; and (2) would not cause significant impacts on sanctuary resources:

   - Sonar and other active acoustic sources

   Sonar and other active acoustic sources are expected to cause only a minor and temporary behavioral reaction for invertebrates (cephalopods and crustaceans), diving birds, or fish that may be present in the area. No effect is anticipated to corals. Marine mammals and sea turtles could potentially be injured (permanent threshold shifts in hearing) from sonar and other active acoustic sources. However, although marine mammals and sea turtles may occur within the Hawaiian Islands Humpback Whale National Marine Sanctuary, there is no evidence to suggest that they would be concentrated in this area; therefore, the likelihood of injury is low. Furthermore, the Navy implements mitigation measures to reduce the potential for marine mammals and sea turtles to be exposed to sonar and other active acoustic sources throughout the entire Study Area (Section 5.3.1.2.1, Acoustic Stressors – Non-Impulsive Sound, and Section 5.3.2.1.1, Non-Impulsive Sound). For a more detailed discussion of potential impacts to these resources from the use of sonar and other active acoustic sources, see the following sections:
     - Section 3.4.3.2.1 (Impacts from Sonar and Other Active Acoustic Sources) for marine mammals
     - Section 3.5.3.1.7 (Impacts from Sonar and Other Active Acoustic Sources) for sea turtles
     - Section 3.6.3.1.1 (Impacts from Sonar and Other Active Acoustic Sources) for birds
     - Section 3.8.3.1.1 (Impacts from Sonar and Other Active Acoustic Sources) for invertebrates
     - Section 3.9.3.1.2 (Impacts from Sonar and Other Active Sources) for fish

   - Electromagnetic devices

   Electromagnetic devices are expected to cause only a minor and temporary behavioral reaction for marine mammals, sea turtles, birds, invertebrates (arthropods, such as lobsters), or fish that may be present in the area. For a more detailed discussion of potential impacts to these resources from the use of electromagnetic devices, see the following sections:
     - Section 3.4.3.3.1 (Impacts from Electromagnetic Devices) for marine mammals
     - Section 3.5.3.2.1 (Impacts from Electromagnetic Devices) for sea turtles
     - Section 3.6.3.2.1 (Impacts from Electromagnetic Devices) for birds
     - Section 3.8.3.2.1 (Impacts from Electromagnetic Devices) for invertebrates
     - Section 3.9.3.2.1 (Impacts from Electromagnetic Devices) for fish

3. The following platforms, sources, or items are part of Navy activities, but are not planned to be used within the Hawaiian Islands Humpback Whale National Marine Sanctuary (including a 2.7 nm buffer) as part of the Proposed Action:

- Military expended materials resulting from non-exempted activities
- Seafloor devices

6.1.2.1.3 Papahanaumokuakea Marine National Monument

Papahanaumokuakea Marine National Monument, established by Presidential Proclamation 8031 in June 2006, is the single largest conservation area in the U.S., encompassing 105,560 nm^2 in a chain of islands, reefs, and banks that extends to the northwest of the main Hawaiian Islands (Figure 6.1-2) (National Marine Sanctuaries 2009b). This monument is entirely within the Hawaii portion of the Study Area. The monument hosts a complex mix of reef, slope, bank, seamount (underwater mountains/volcanoes), abyssal (deep sea), and open ocean environments, and is managed by the monument's advisory council; the Department of Defense is a member of this council. The Papahanaumokuakea Marine National Monument also contains seamounts and approximately 30 submerged banks (U.S. Fish and Wildlife Service et al. 2008). The more than 4,450 square miles (m^2) (11,525 square kilometers) of shallow-water coral reef contains at least 57 coral species, 355 algae species, and 838 invertebrate species, with an exceptionally high number of corals and algae found only in the Hawaiian Islands (National Marine Sanctuaries 2009b). More than 260 fish species inhabit the reefs, with relatively fewer herbivores, such as surgeonfishes, and an abundance of carnivores, such as damselfishes, goatfishes, and scorpionfishes. Predators such as sharks and jacks dominate the reef fish communities. Most of the area is in the open ocean, with oceanic fish species, such as tuna, marlin, and wahoo. See Section 3.7 (Marine Vegetation), Section 3.8 (Marine Invertebrates), and Section 3.9 (Fish) for additional information on species and bathymetry in the Study Area.

The monument's ecosystem supports a range of marine mammals, including the Hawaiian monk seal, the Hawaiian spinner dolphin, and bottlenose dolphins (National Marine Sanctuaries 2009b). The Hawaiian monk seal, which does not exist outside of this area, is the most endangered marine mammal in the U.S. and the only seal that depends on coral reefs. Transient marine mammals in the Papahanaumokuakea Marine National Monument include spotted dolphins and humpback whales. Seasonally or periodically present whales include the sperm, blue, fin, sei, and North Pacific right whales. See Section 3.4 (Marine Mammals) for additional information on these species.

Five species of sea turtles occur in the monument: the loggerhead, olive ridley, leatherback, hawksbill, and green sea turtles (U.S. Fish and Wildlife Service et al. 2008). The Papahanaumokuakea Marine National Monument islands provide important nesting habitat for the threatened green sea turtle, with French Frigate Shoals alone supporting more than 80 percent of the nesting population for all the Hawaiian Islands. See Section 3.5 (Sea Turtles) for additional information on these species.

The regulations implementing the Papahanaumokuakea Marine National Monument (50 C.F.R., § 404), state that "all activities and exercises of the Armed Forces shall be carried out in a manner that avoids, to the extent practicable and consistent with operational requirements, adverse impacts on monument resources and qualities." Additionally, these regulations require that "in the event of threatened or actual destruction of, loss of, or injury to a monument resource or quality resulting from an incident, including but not limited to spill and groundings, caused by a component of the [DoD] or the United States Coast Guard, the cognizant component shall promptly coordinate with the Secretaries for the purpose of taking appropriate actions to respond to and mitigate the harm and, if possible, restore or replace the monument resource or quality." The Navy's proposed action includes activities conducted east of Nihoa Island and just inside the eastern edge of the monument boundaries. These activities may include:

- Anti-air warfare
- Anti-surface warfare
- Anti-submarine warfare
- Electronic warfare

The Navy does not propose new activities in the Papahanaumokuakea Marine National Monument, or activities that are different from those currently conducted in this area. Increases to military activities described in the proposed action would not occur in the monument. Therefore, proposed activities are consistent with those activities currently conducted in this area when the monument was designated, and are not being changed or modified in a way that would require consultation.

6.2 Relationship Between Short-Term Use of the Environment and Maintenance and Enhancement of long-Term Productivity

In accordance with the Council on Environmental Quality regulations (Part 1502), this EIS/OEIS analyzes of the relationship between the short-term impacts on the environment and the effects those impacts may have on the maintenance and enhancement of the long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of particular concern. This means that choosing one option may reduce future flexibility in pursuing other options, or that committing a resource to a certain use may often eliminate the possibility for other uses of that resource. The Navy, in partnership with NMFS, is committed to furthering the understanding of marine resources and developing ways to lessen or eliminate the impacts Navy training and testing activities may have on these resources. For example, the Navy and NMFS collaborate on the Integrated Comprehensive Monitoring Program for marine species to assess the impacts of training activities on marine species and investigate population-level trends in marine species distribution, abundance, and habitat use in various range complexes and geographic locations where Navy training occurs.

The Proposed Action could result in both short- and long-term environmental impacts. However, these are not expected to result in any impacts that would reduce environmental productivity, permanently narrow the range of beneficial uses of the environment, or pose long-term risks to health, safety, or general welfare of the public. The Navy is committed to sustainable military range management, including co-use of the Study Area with the general public and commercial and recreational interests. This commitment to co-use of the Study Area will maintain long-term accessibility of the HSTT EIS/OEIS training and testing areas. Sustainable range management practices are specified in range complex management plans under the Navy's Tactical Training Theater Assessment and Planning Program. Among other benefits, these practices protect and conserve natural and cultural resources and preserve access to training areas for current and future training requirements while addressing potential encroachments that threaten to impact range and training area capabilities.

6.3 Irreversible or Irretrievable Commitment of Resources

The National Environmental Policy Act requires that environmental analysis include identification of "any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented" (42 U.S.C. § 4332). Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy or minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., the disturbance of a cultural site).

For the Proposed Action, most resource commitments would be neither irreversible nor irretrievable. Most impacts would be short term and temporary, or long lasting but within historical or desired conditions. Because there would be no building or facility construction, the consumption of material typically associated with such construction (e.g., concrete, metal, sand, fuel) would not occur. Energy typically associated with construction activities would not be expended and irretrievably lost.

Implementation of the Proposed Action would require fuels used by aircraft and vessels. Since fixed- and rotary-wing aircraft and ship activities could increase relative to the baseline, total fuel use would increase. Therefore, total fuel consumption would increase under the Proposed Action (see Section 6.4), and this nonrenewable resource would be considered irretrievably lost (see Chapter 4, Cumulative Impacts) and the following discussion on the Navy's Climate Change Roadmap).

6.4 ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL OF ALTERNATIVES AND MITIGATION MEASURES

The federal government consumes two percent of the total U.S. energy share (Jean 2010). Of that 2 percent, the DoD consumes 93 percent. The Navy consumes one quarter of the total DoD share. The Navy consumes 1.2 billion to 1.6 billion gallons of fuel each year. The Navy expects a 25 percent increase in fuel consumption in the future because of new ships coming into the fleet and the growth in mission areas (Jean 2010).

Increased training and testing activities within the Study Area would result in an increase in energy demand over the No Action Alternative. The increased energy demand would arise from an increase in fuel consumption, mainly from aircraft and vessels participating in training and testing. Details of fuel consumption by training and testing activities on an annual basis are set forth in the air quality emissions calculation spreadsheets available on the project website. Vessel and aircraft fuel consumption is estimated to increase by 6.9 and 5.8 million gallons per year under Alternative 1 and Alternative 2, respectively, when compared to the No Action Alternative. Conservative assumptions were made in developing the estimates, and therefore the actual amount of fuel consumed during training and testing events may be less than estimated. Nevertheless, the demand for fuel consumption would increase from baseline levels, given the proposed increases in training and testing activities.

Energy requirements would be subject to any established energy conservation practices. The use of energy sources has been minimized wherever possible without compromising safety, training, or testing activities. No additional conservation measures related to direct energy consumption by the proposed activities are identified.

The Navy is committed to improving energy security and environmental stewardship by reducing its reliance on fossil fuels. The Navy is actively developing and participating in energy, environmental, and climate change initiatives that will increase use of alternative energy and help conserve the world's resources for future generations. The Navy Climate Change Roadmap identifies actions the Environmental Readiness Division is taking to implement EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*. The Navy's Task Force Energy is responding to the Secretary of the Navy's Energy Goals through energy security initiatives that reduce the Navy's carbon footprint.

Two Navy programs—the Incentivized Energy Conservation Program and the Naval Sea Systems Command's Fleet Readiness, Research and Development Program—are helping the fleet conserve fuel via improved operating procedures and long-term initiatives. The Incentivized Energy Conservation

Program encourages the operation of ships in the most efficient manner while conducting their mission and supporting the Secretary of the Navy's efforts to reduce total energy consumption on naval ships. The Naval Sea Systems Command's Fleet Readiness, Research, and Development Program includes the High-Efficiency Heating, Ventilating, and Air Conditioning and the Hybrid Electric Drive for DDG-51 class ships, which are improvements to existing shipboard technologies that will both help with fleet readiness and decrease the ships' energy consumption and greenhouse gas emissions. These initiatives are expected to greatly reduce the consumption of fossil fuels (see Section 3.2, Air Quality). Furthermore, to offset the impact of its expected near-term increased fuel demands and achieve its goals to reduce fossil fuel consumption and greenhouse gas emissions, the Navy plans to deploy by 2016 a green strike group (a "great green fleet") composed of nuclear vessels and ships powered by biofuel in local operations and with aircraft flying only with biofuels (Jean 2010).

REFERENCES

Jean, G. V. (2010). Navy's energy reform initiatives raise concerns among shipbuilders. *National Defense Business and Technology Magazine*. Retrieved from http://www.nationaldefensemagazine.org/archive/2010/April/Pages/NavyEnergyReformRaiseConcerns.aspx as accessed on 2011, September 16.

National Marine Sanctuaries. (2009a). Channel Islands National Marine Sanctuary Condition Report 2009. Silver Spring, MD, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries: 60.

National Marine Sanctuaries. (2009b). Papahanaumokuakea Marine National Monument Condition Report 2009. Silver Spring, MD, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries: 54.

National Marine Sanctuary Program. (2002). Hawaiian Islands Humpback Whale National Marine Sanctuary Management Plan, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries: 154.

National Oceanic and Atmospheric Administration. (1997). Hawaiian Islands Humpback Whale National Marine Sanctuary Final Environmental Impact Statement/Management Plan, February 1997.

National Oceanic and Atmospheric Administration. (2008). Channel Islands National Marine Sanctuary Final Management Plan/Final Environmental Impact Statement, Volume II of II, November 2008.

National Oceanic and Atmospheric Administration. (2010). Hawaiian Islands Humpback Whale National Marine Sanctuary Requesting Public Comment Through October 16, 2010, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, National Marine Sanctuary Program.

Office of National Marine Sanctuaries. (2010). Hawaiian Islands Humpback Whale National Marine Sanctuary Condition Report 2010. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries, Silver Spring, MD. 63 pp.

U.S. Department of the Navy. (2007). Environmental Readiness Program Manual OPNAV Instruction 5090.1C. (pp. 836). Prepared by Chief of Naval Operations.

U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, and State of Hawaii Department of Land and Natural Resources. (2008). Papahanaumokuakea Marine National Monument. Management Plan. I: 372.

This Page Intentionally Left Blank

7 List of Preparers

TABLE OF CONTENTS

LIST OF TABLES

There are no tables in this section.

LIST OF FIGURES

There are no figures in this section.

This Page Intentionally Left Blank

7 LIST OF PREPARERS

7.1 GOVERNMENT PREPARERS

Christiana Boerger (Naval Facilities Engineering Command South West), Marine Resource Specialist, Marine Resource Coordinator
M.S., Biology, California State University, Northridge
B.S., Marine Science, University of Hawaii, Hilo

Meghan Byrne (Naval Facilities Engineering Command Pacific), Project Manager
B.S., Environmental Policy and Planning, Virginia Polytechnic Institute and State University

Angela D'Amico (SPAWAR Systems Center Pacific and Naval Mine and ASW Command), Scientist
M.A., Physical Oceanography, College of William and Mary, Virginia
B.S., Mathematics, St. Thomas Aquinas College, New York

Meredith Fagan (Naval Facilities Engineering Command Pacific), Natural Resources Management Specialist, Marine Resource Coordinator
B.A., Biology, University of Virginia

Amy Farak (Naval Undersea Warfare Center Division, Newport), Biologist and Environmental Planner
B.S., Marine Biology, Roger Williams University

Joshua Frederickson (Naval Undersea Warfare Center Division Newport), Biologist and Environmental Planner
M.S., Environmental Science, University of Rhode Island
B.S., Environmental Science, University of Massachusetts

Robert H. Headrick (Office of Naval Research), Ocean Acoustics Team Leader
Ph.D., Oceanographic Engineering, MIT/WHOI Joint Program
M.S., Ocean Engineering, Massachusetts Institute of Technology/Woods Hole Oceanographic Institution (MIT/WHOI) Joint Program
O.E., Ocean Engineering, MIT/WHOI Joint Program
B.S., Chemical Engineering, Oklahoma State University

Keith Jenkins (Space & Naval Warfare Systems Command), Marine Scientist
M.S., Fisheries Oceanography, Old Dominion University
B.S., Marine Biology, Old Dominion University

Chip Johnson (U.S. Navy Pacific Fleet), Marine Species Advisor and Staff Marine Biologist
M.A., Marine Science, Virginia Institute of Marine Science, College of William and Mary
B.S., Biology, University of North Carolina, Wilmington

Susan Levitt (Naval Sea Systems Command), Environmental Planning – Environmental Engineer
B.S., Environmental Science, Allegheny College

Ken MacDowell (U.S. Navy Pacific Fleet), Training/Operations Environmental Support
B.S., University of the State of New York
Commander, USN (ret).

Jerry Olen (Space & Naval Warfare Systems Command), Environmental Readiness Program Manager
M.A., Political Science, Midwestern University
B.S., Environmental Engineering, California State University

Julie Rivers (U.S. Navy Pacific Fleet), Natural and Marine Resources Program Manager – Biologist
B.S., Biology, Beloit College

Robert Schnoor (Office of Naval Research), Ocean Research Facilities Team Leader
M.S., Meteorology, U.S. Naval Postgraduate School
B.S., Oceanography, U.S. Naval Academy

Cory Scott (Naval Facilities Engineering Command Pacific), Project Manager
B.S., Ecosystem Management and Restoration, Natural Resources Planning, Humboldt State University

Neil Sheehan (U.S. Navy Pacific Fleet), Project Lead
LL.M (International and Environmental Law), George Washington University School of Law
J.D., University of Dayton
B.A., State University of New York, Buffalo

Roy Sokolowski (U.S. Navy Pacific Fleet), Environmental Protection Specialist – Acoustician
Submarine Sonar Technician Senior Chief Petty Officer, USN (ret).

Alex Stone (U.S. Navy Pacific Fleet), Project Lead
B.S., Environmental Studies, George Washington University

Deborah Verderame (Naval Sea Systems Command), Environmental Planning – Environmental Engineer
M.S., Chemical/Environmental Engineering, University of Maryland
B.S., Biology, Fordham University
B.S., Chemical Engineering, Drexel University

7.2 CONTRACTOR PREPARERS

Maren Anderson (Tetra Tech, Inc.), Marine Mammal Scientist
B.A., Ecology and Evolutionary Biology, University of Colorado
Years of Experience: 4

Bruce Campbell (Parsons Infrastructure and Technology), Lead Analyst
M.S., Environmental Management, University of San Francisco
B.S., Environmental Biology, University of California, Santa Barbara
Years of Experience: 29

Brian Dresser (Tetra Tech, Inc.), Senior Scientist
M.S., Ecology, University of Georgia
Years of Experience: 15

Conrad Erkelens (ManTech SRS Technologies, Inc.), Senior Scientist
M.A., Anthropology, University of Hawaii
B.A., Anthropology, University of Hawaii
Years of Experience: 16

Jeremy Farr (Parsons Infrastructure and Technology), Environmental Planner
B.S., Environmental Management & Protection, California Polytechnic State University
Years of Experience: 3

Lauren Gilpatrick (Tetra Tech, Inc.), Wildlife Biologist
B.S., Wildlife Biology, University of Montana
Years of Experience: 3

Matt Hahn (ManTech SRS Technologies, Inc.), Military Operations Specialist
B.A., Business, University of St. Thomas
Years of Experience: 19

Paul Holthus (Tetra Tech, Inc.), Natural Resource Management Specialist
M.A., Geography, University of Hawaii
Years of Experience: 30

Lawrence Honma (Merkel & Associates, Inc.), Senior Marine Scientist
M.S., Marine Science, Moss Landing Marine Labs, San Francisco State University
B.S., Wildlife and Fisheries Biology, University of California at Davis
Years of Experience: 20

Taylor Houston (Parsons Infrastructure and Technology), Natural Resource Specialist/Project Manager
B.S., Natural Resource Management
Years of Experience: 12

Donald Jolly (Parsons Infrastructure and Technology), Principal Archaeologist
M.S., Quaternary Studies
Years of Experience: 25

Kevin Kelly (Tetra Tech, Inc.), Marine Resource Specialist
M.S., Oceanography, University of Hawaii
Years of Experience: 12 years

Tina Kuroiwa (Tetra Tech, Inc.), Marine Scientist
Ph.D., Ecology, Evolution & Behavior, The Graduate School, City University of New York
Years of Experience: 6

Kate Lomac MacNair (Tetra Tech, Inc.), Marine Mammal Scientist
B.S., in progress
Years of Experience: 3

Mandi McElroy (Tetra Tech, Inc.), Wildlife Biologist
M.S., Wildlife Ecology and Management, University of Georgia
Years of Experience: 9

June Mire (Tetra Tech, Inc.), Subject Matter Expert
Ph.D., Zoology, University of California, Berkeley
Years of Experience: 26

Karyn Palma (ManTech SRS Technologies, Inc.), Technical Editor
B.A., Environmental Studies, University of California, Santa Barbara
Years of Experience: 15

Colleena Perez (Tetra Tech, Inc.), Scientist IV
M.S., Marine Science, Moss Landing Marine Labs, San Francisco State University
Years of Experience: 7

Noelle Ronan (Tetra Tech, Inc.), Wildlife Biologist
M.S., Wildlife Science, Oregon State University
Years of Experience: 13

James Stribling (Tetra Tech, Inc.), Director
Ph.D., Entomology, Ohio State University
Years of Experience: 24

Philip Thorson (ManTech SRS Technologies, Inc.), Senior Research Biologist/Marine Mammal Biologist
Ph.D., Biology, University of California at Santa Cruz
B.A., Biology, University of California at Santa Cruz
Years of Experience: 28

Heather Turner (ManTech SRS Technologies, Inc.), Marine Biologist
M.A.S., Marine Biodiversity and Conservation, Scripps Institution of Oceanography, University of California, San Diego
B.S., Environmental Science, University of California, Berkeley
Years of Experience: 4

Suzanne Villacorta (Tetra Tech, Inc.), Regulatory Analyst and Environmental Scientist
J.D., Syracuse University College of Law
Years of Experience: 15

Karen Waller (ManTech SRS Technologies, Inc.), Vice President/Quality Assurance
B.S., Public Affairs, Indiana University
Years of Experience: 22

Brian D. Wauer (ManTech SRS Technologies, Inc.), Director, Range and Environmental Services
B.S., Administrative Management, University of Arkansas
B.S., Industrial Management, University of Arkansas
Years of Experience: 26

Lawrence Wolski (ManTech SRS Technologies, Inc.), Marine Scientist
M.S., 1999, Marine Sciences, University of San Diego
B.S., 1994, Biology, Loyola Marymount University
Years of Experience: 14

Mike Zickel (Ecosystem Management and Associates, Inc.), Senior Technical Manager
M.S., Marine Estuarine Environmental Sciences, Chesapeake Biological Lab, University of Maryland, College Park
B.S., Physics, College of William and Mary
Years of Experience: 14

Ann Zoidis (Tetra Tech, Inc.), Senior Biologist
M.S., Physiology and Behavioral Biology, San Francisco State University
Years of Experience: 24

Patrick Zuloaga (Tetra Tech, Inc.), Ecologist
B.S., Organismic Biology and Ecology, Florida Atlantic University
Years of Experience: 9

Hawaii-Southern California Training and Testing Activities Final Environmental Impact Statement/ Overseas Environmental Impact Statement

Volume 3

August 2013

HSTT EIS/OEIS Project Manager
Naval Facilities Engineering Command, Pacific/EV21.CS
258 Makalapa Dr., Ste 100
Pearl Harbor, HI 96860-3134

Appendix A: Navy Activities Descriptions

APPENDIX A

NAVY ACTIVITIES DESCRIPTIONS

This Page Intentionally Left Blank

TABLE OF CONTENTS

LIST OF TABLES

There are no tables in this section.

LIST OF FIGURES

This Page Intentionally Left Blank

APPENDIX A NAVY ACTIVITIES DESCRIPTIONS

The United States (U.S.) Department of the Navy has been conducting military readiness activities throughout the Hawaii and Southern California Range Complexes and the Pacific Ocean for decades. The tempo and types of training and testing activities have fluctuated within the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area) due to changing requirements, the introduction of new technologies, the dynamic nature of international events, advances in warfighting doctrine and procedures, and force structure changes. Such developments have influenced the frequency, duration, intensity, and location of required training and testing.

A.1 TRAINING ACTIVITIES

The Navy's training activities are organized generally into eight primary mission areas and a miscellaneous category (other training) that includes those activities that do not fall within one of the eight primary mission areas, but are an essential part of Navy training. Many of the activities described here may have a land component, occurring both at sea and on or over land. In this Environmental Impact Statement (EIS)/Overseas EIS (OEIS), only the at-sea component is analyzed.

In addition, because the Navy conducts a number of activities within major range events, descriptions of those major range events are also included in this appendix. It is important to note that these major range events are comprised entirely of individual activities described in the primary mission areas.

A.1.1 ANTI-AIR WARFARE TRAINING

Anti-air warfare is the primary mission area that addresses combat operations by air and surface forces against hostile aircraft. Navy ships contain an array of modern anti-aircraft weapon systems, including naval guns linked to radar-directed fire-control systems, surface-to-air missile systems, and radar-controlled cannons for close-in point defense. Strike/fighter aircraft carry anti-aircraft weapons, including air-to-air missiles and aircraft cannons. Anti-air warfare training encompasses events and exercises to train ship and aircraft crews in employment of these weapons systems against simulated threat aircraft or targets. Anti-air warfare training includes surface-to-air gunnery, surface-to-air and air-to-air missile exercises, and aircraft force-on-force combat maneuvers.

A.1.1.1 Air Combat Maneuver

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Anti-Air Warfare</td></tr>
<tr><td>Air Combat Maneuver (ACM)</td><td colspan="2">Aircrews engage in flight maneuvers designed to gain a tactical advantage during combat.</td></tr>
<tr><td>Long Description</td><td colspan="2">Basic flight maneuvers where aircrew engage in offensive and defensive maneuvering against each other. During an air combat maneuver engagement, no ordnance is fired, countermeasures such as chaff and flares may be used. These maneuvers typically involve two aircraft; however, based upon the training requirement, air combat maneuver exercises may involve over a dozen aircraft.
Participants typically are two or more aircraft. No weapons are fired.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Fixed-wing aircraft (e.g., F/A-18, F-35, F-5)
Systems: None
Ordnance/Munitions: None
Targets: None
Duration: 1 to 2 hours</td><td>Location:
Hawaii Range Complex: Warning Areas: 188,189, 190,192, 193, 194
Southern California Range Complex: Warning Area 291 (Tactical Maneuvering Areas)</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Aircraft noise
Energy: None
Physical Disturbance and Strike: Aircraft strike (birds only)
Entanglement: None
Ingestion: None</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">None</td></tr>
<tr><td>Assumptions used for Analysis</td><td colspan="2">No munitions fired. Flare and chaff may be used. All flare and chaff accounted for in flare exercise and chaff exercise events.</td></tr>
</table>

A.1.1.2 Air Defense Exercise

Activity Name	Activity Description	
Anti-Air Warfare		
Air Defense Exercises (ADEX)	Aircrew and ship crews conduct defensive measures against threat aircraft or missiles.	
Long Description	Aircrew and ship personnel perform measures designed to defend against attacking threat aircraft or missiles or reduce the effectiveness of such attack. This exercise involves full detection though engagement sequence. Aircraft operate at varying altitudes and speeds. This exercise may include Air Intercept Control exercises which involve aircraft controllers on vessels, in fixed-wing aircraft or at land based locations, use search radars to track and direct friendly aircraft to intercept the threat aircraft, and Detect to Engage exercises in which personnel on vessels use their search radars in the process of detecting, classifying, and tracking enemy aircraft or missiles up to the point of engagement.	
Information Typical to the Event	**Platform:** Fixed-wing aircraft (e.g., F/A-18, F-35, E-2), surface vessels (all) **Systems:** None **Ordnance/Munitions:** None **Targets:** Other aircraft, unmanned drones **Duration:** 1 to 4 hours	**Location:** Hawaii Range Complex : Warning Areas: 188,189, 190,192, 193, 194 Southern California Range Complex: Warning Area 291
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Aircraft noise, vessel noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, aircraft strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	No weapons fired	

A.1.1.3 Gunnery Exercise (Air-to-Air) – Medium-Caliber

Activity Name	Activity Description	
Anti-Air Warfare		
Gunnery Exercise (Air-to-Air) Medium Caliber **(GUNEX [A-A]) – medium-caliber**	Aircrews defend against threat aircraft with cannons (machine gun).	
Long Description	Fighter jet aircrews defend against threat aircraft with cannons (machine gun). An event involves two or more fighter aircrafts and a target banner towed by a contracted aircraft (e.g., Lear jet). The banner target is recovered after the event.	
Information Typical to the Event	**Platform:** Fixed- wing aircraft (e.g., F/A-18C, F-35) **Systems:** None **Ordnance/Munitions:** Medium-caliber munition (non-explosive) **Targets:** Towed banner **Duration:** 1 to 2 hours	**Location:** Southern California Range Complex: Warning Area 291
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Aircraft noise **Energy:** None **Physical Disturbance and Strike:** Military expended material (non-explosive projectile) strike, aircraft strike (birds only) **Entanglement:** None **Ingestion:** Medium-caliber projectiles, casings	
Detailed Military Expended Material Information	Projectiles Casings	
Assumptions used for Analysis	Only non-explosive munitions used Target is recovered	

A.1.1.4 Missile Exercise (Air-to-Air)

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Anti-Air Warfare</td></tr>
<tr><td>Missile Exercise (Air-to-Air)</td><td colspan="2">Aircrews defend against threat aircraft with missiles.</td></tr>
<tr><td>Long Description</td><td colspan="2">An event involves two or more jet aircraft and a target. Missiles have either a high explosive warhead or are non-explosive practice munitions. The target is either an unmanned aerial target drone (e.g.: BQM-34, BQM-74), a Tactical Air-Launched Decoy, or a parachute suspended illumination flare. Target drones deploy parachutes and are recovered by boat or helicopter; Tactical Air-Launched Decoys and illumination flares are expended and not recovered. These events typically occur at high altitudes.
Anti-air missiles may also be employed when training against threat missiles.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Fixed-wing aircraft (e.g., F/A-18C, F-35)
Systems: None
Ordnance/Munitions: Anti-air missiles (e.g., AIM-7, AIM-9, AIM-120, AIM-132 [non-explosive and high explosive])
Targets: BQM-34, BQM-74 (Figure A-1), illumination flare (e.g., LUU-2) (Figure A-2), Tactical Air-Launched Decoy (Figure A-3)
Duration: 1 to 2 hours</td><td>Location:
Hawaii Range Complex: Warning Area 188
Southern California: Warning Area 291, Southern California Anti-submarine Warfare Range, Fleet Training Area Hot, Missile Range</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: In-air explosives; aircraft noise
Energy: None
Physical Disturbance and Strike: Military expended material strike (target and missile fragment), Aircraft strike (birds only), missiles (non-explosive)
Entanglement: Parachutes
Ingestion: Military expended materials (missile fragments, parachute, flare casing, target fragments)</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">Missile and target fragments
Parachutes
Flare casings</td></tr>
<tr><td>Assumptions used for Analysis</td><td colspan="2">All missiles are explosive (Alternatives 1 and 2), and all missiles explode at high altitude
All propellant and explosives are consumed
Assume 1.5 flares per Missile Exercise event</td></tr>
</table>

Figure A-1: BQM-74 (Aerial Target)

Figure A-2: LUU-2B/B Illuminating Flare (Aerial Target)

Figure A-3: Tactical Air-Launched Decoy (Aerial Target)

A.1.1.5 Gunnery Exercise (Surface-to-Air) – Large Caliber

Activity Name	Activity Description	
Anti-Air Warfare		
Gunnery Exercise (Surface-to-Air) – Large Caliber **(GUNEX [S-A]) – Large Caliber**	Surface vessel crews defend against threat aircraft or missiles with large-caliber guns.	
Long Description	Surface vessel personnel defend against threat aircraft or missile targets with guns to disable or destroy the threat. An event involves one vessel and a simulated threat aircraft or anti-vessel missile that is detected by the vessel's radar. Large-caliber guns fire projectiles, either non-explosive or high explosive (configured to explode in air); to disable or destroy the threat before it reaches the vessel. The target is towed by a commercial air services jet.	
Information Typical to the Event	**Platform:** Surface combatant vessel (e.g., CG, DDG, FFG, Littoral Combat Ship), fixed-wing aircraft **Systems:** None **Ordnance/Munitions:** Large caliber (e.g., 5-inch gun, 76 mm, 57 mm [non-explosive] under the No Action Alternative and high explosive under Alternatives 1 and 2) **Targets:** Towed banners behind aircraft **Duration:** 1 to 2 hours	**Location:** Hawaii Range Complex: Warning Areas 188, 192, Mela South Southern California Range Complex: Warning Area 291
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Aircraft noise, vessel noise, weapons firing noise, in-air explosives **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (projectiles), vessel strike, aircraft strike (birds only) **Entanglement:** None **Ingestion:** Projectile fragments, target fragments	
Detailed Military Expended Material Information	Projectiles Projectile fragments Target fragments	
Assumptions used for Analysis	All projectiles under the No Action Alternative are assumed to be non-explosive All projectiles under Alternatives 1 and 2 assumed to be high explosive. All projectiles explode well above surface	

A.1.1.6 Gunnery Exercise (Surface-to-Air) – Medium Caliber

Activity Name	Activity Description	
Anti-Air Warfare		
Gunnery Exercise (Surface-to-Air) – Medium Caliber **(GUNEX [S-A]) – Medium Caliber**	Surface vessel crews defend against threat aircraft or missiles with medium-caliber guns.	
Long Description	Surface vessel personnel defend against threat aircraft or missile targets with guns to disable or destroy the threat. An event involves one vessel and a simulated threat aircraft or anti-vessel missile that is detected by the vessel's radar. Medium-caliber guns fire projectiles, typically non-explosive, to disable or destroy the threat before it reaches the vessel. The target is towed by a commercial air services jet.	
Information Typical to the Event	**Platform:** Surface vessel (all), fixed-wing aircraft **Systems:** None **Ordnance/Munitions:** Medium-caliber munitions (non-explosive) **Targets:** Towed banners behind aircraft **Duration:** 1 to 2 hours	**Location:** Hawaii Range Complex: Warning Areas 188, 192, Mela South Southern California Range Complex: Warning Area 291
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Aircraft noise, Vessel noise, Weapons firing noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (projectiles), vessel strike, aircraft strike (birds only) **Entanglement:** None **Ingestion:** Projectiles, casings	
Detailed Military Expended Material Information	Projectiles Casings	
Assumptions used for Analysis	All projectiles non-explosive. Close-In Weapon System employed in all events. Routine Close-In Weapon System maintenance related firing can occur throughout study area, as long as a clear range is established.	

A.1.1.7 Missile Exercise (Surface-to-Air)

Activity Name	Activity Description
Anti-Air Warfare	
Missile Exercise (Surface-to-Air) (MISSILEX [S-A])	Surface vessel crews engage threat missiles and aircraft with missiles.
Long Description	Surface vessel crews defend against threat missiles and aircraft with vessel launched missiles. The event involves a simulated threat aircraft or anti-ship missile which is detected by the vessel's radar. Vessel launched anti-air missiles are fired (high explosive) to disable or destroy the threat. The target typically is a remote controlled drone. Anti-Air missiles may also be used to train against land attack missiles.
Information Typical to the Event	**Platform:** Surface vessels (all) **Systems:** None **Ordnance/Munitions:** Anti-air missiles (e.g., Sea Sparrow, Standard Missile SM-2, Rolling Airframe Missile [high explosive]) **Targets:** Unmanned drones (e.g., BQM-34, BQM-74) **Duration:** 1 to 2 hours **Location:** Hawaii Range Complex: Warning Area 188 Southern California Range Complex: Warning Area 291
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, weapons firing noise, in-air explosives **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (missile fragments), vessel strike, aircraft strike (birds only) **Entanglement:** None **Ingestion:** Missile fragments
Detailed Military Expended Material Information	Missile fragments
Assumptions used for Analysis	Assume all anti-air missiles are high explosive. Missile explodes well above surface. All explosive and propellant consumed. Target typically not destroyed, unmanned drones are recovered.

A.1.1.8 Missile Exercise – Man Portable Air Defense System

Activity Name	Activity Description	
Anti-Air Warfare		
Missile Exercise-Man Portable Air Defense System (MISSILEX-MANPADS)	Marines employ the man portable air defense systems, a shoulder fired surface to air missile, against threat missiles or aircraft.	
Long Description	Marines employ the man-portable air defense systems, a shoulder fired surface to air missile, against threat missiles or aircraft. An event involves Marines firing the man-portable air defense system at remote piloted or ballistic aerial targets. Missile Exercise-Man Portable Air Defense System may also be conducted by combat forces from shore locations. The exercise may involve live fire or tracking only, without the firing of an actual missile.	
Information Typical to the Event	**Platform:** None **Systems:** Man Portable Defense Systems **Ordnance/Munitions:** Stinger or other man portable missiles (explosive) **Targets:** Remotely piloted target, ballistic aerial target **Duration:** Varies	**Location:** Southern California Range Complex: Shore Bombardment Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** In-air explosives **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (missile and target fragments) **Entanglement:** None **Ingestion:** Missile and target fragments	
Detailed Military Expended Material Information	Missile and target fragments	
Assumptions used for Analysis	None	

A.1.2 AMPHIBIOUS WARFARE TRAINING

Amphibious warfare is a type of naval warfare involving the utilization of naval firepower and logistics, and Marine Corps landing forces to project military power ashore. Amphibious warfare encompasses a broad spectrum of operations involving maneuver from the sea to objectives ashore, ranging from reconnaissance or raid missions involving a small unit, to large-scale amphibious operations involving over one thousand Marines and Sailors, and multiple ships and aircraft embarked in a Strike Group.

Amphibious warfare training includes tasks at increasing levels of complexity, from individual, crew, and small unit events to large task force exercises. Individual and crew training include the operation of amphibious vehicles and naval gunfire support training. Small-unit training operations include events leading to the certification of a Marine Expeditionary Unit as “deployment ready” or “special operations capable,” depending on if Marine Special Forces are attached to the unit. Such training includes shore assaults, boat raids, airfield or port seizures, and reconnaissance. Larger-scale amphibious exercises involve ship-to-shore maneuver, shore bombardment and other naval fire support, and air strike and close air support training.

A.1.2.1 Naval Surface Fire Support Exercise Land-Based Target

Activity Name	**Activity Description**	
Amphibious Warfare		
Naval Surface Fire Support Exercise (Land) **(FIREX [Land])**	Surface vessel crews use small-, medium-, and large-caliber guns to fire on land-based targets in support of forces ashore.	
Long Description	Surface vessel crews use small-, medium-, and large-caliber (main battery) guns to support forces ashore. One or more vessels position themselves up to six nautical miles from the target area and a land based spotter relays type and exact location of the target. After observing the fall of the shot, the spotter relays any adjustments needed to reach the target. Once the rounds are on target, the spotter requests a sufficient number to effectively destroy the target. This exercise occurs on land ranges where high explosive and non-explosive practice ordnance is authorized and is often supported by target shapes such as tanks, truck, trains, or aircraft on the ground.	
Information Typical to the Event	**Platform:** Surface combatant vessels (e.g., CG, DDG) **Systems:** None **Ordnance/Munitions:** Small, medium, and large caliber (explosive and non-explosive) **Targets:** Other aircraft, unmanned drones **Duration:** 4 to 6 hours	**Location:** Southern California Range Complex: Shore Bombardment Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, weapons firing noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, MEM strike **Entanglement:** None **Ingestion:** Projectile casings	
Detailed Military Expended Material Information	Casings	
Assumptions used for Analysis	NO LAND BASED IMPACTS INCLUDED IN THIS DOCUMENT-Projectile impact is on the land and is not further analyzed for this DEIS/OEIS	

A.1.2.2 Naval Surface Fire Support Exercise at Sea

Activity Name	Activity Description	
Amphibious Warfare		
Naval Surface Fire Support Exercise (At Sea) **(FIREX at Sea)**	Surface vessel crews use large-caliber guns to support forces ashore; however, the land target is simulated at sea. Rounds are scored by passive acoustic hydrophones located at or near the target area.	
Long Description	Surface vessel crews use large-caliber guns to support forces ashore; however, the land target is simulated at sea. Rounds are scored by passive acoustic hydrophones located at or near the target area. The scoring system is comprised of hydrophones permanently installed on the ocean floor as part of the Barking Sands Tactical Underwater Range west of Kauai. A scoring system provides a realistic presentation, such as a land mass with topography, to the vessel's combat system. This virtual land target area overlays the hydrophone array. The vessel fires its ordnance into the target area and the acoustic noise resulting from the impact of the round landing in the water is detected by the hydrophones. The scoring system triangulates the exact point of impact of the round, allowing the exercise to be conducted as if the vessel were firing at an actual land target. Surface vessel crews use large-caliber (main battery) guns to support forces ashore.	
Information Typical to the Event	**Platform:** Surface combatant vessels (e.g., DDG, CG), rigid-hull inflatable boat (for recovering buoys) **Systems:** None **Ordnance/Munitions:** Large caliber (5-inch rounds) explosive and non-explosive **Targets:** None **Duration:** 2 to 4 hours of firing, 18 hours total	**Location:** Hawaii Range Complex: Warning Area-188 (including Barking Sands Underwater Range Extension and Barking Sands Tactical Underwater Range)
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, weapons firing noise, underwater explosives (E5) **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (projectiles and projectile fragments), vessel strike **Entanglement:** None **Ingestion:** Projectile fragments	
Detailed Military Expended Material Information	Projectiles Projectile fragments	
Assumptions used for Analysis	Events occur greater than 12 nautical miles from shore Non-explosive practice munitions may be used. Acoustic sensors can detect projectile splash. High explosives may be used. Assume all explosive rounds detonate on impact with water surface	

A.1.2.3 Amphibious Assault

Activity Name	Activity Description	
Amphibious Warfare		
Amphibious Assault	Forces move ashore from vessels at sea for the immediate execution of inland objectives.	
Long Description	Landing forces embarked in vessels, craft, or helicopters launch an attack from the sea onto a hostile shore. Amphibious assault is conducted for the purposes of prosecuting further combat operations, obtaining a site for an advanced naval or airbase, or denying the enemy use of an area. Unit Level Training exercises involve one or more amphibious vessels, and their associated watercraft and aircraft, to move personnel and equipment from vessel to shore without the command and control and supporting elements involved in a full scale event. The goal is to practice loading, unloading, and movement and to develop the timing required for a full-scale exercise.	
Information Typical to the Event	**Platform:** Amphibious vessels and landing craft (e.g., LHA, LHD, LPD, LSD), amphibious vehicles, rotary-wing aircraft **Systems:** None **Ordnance/Munitions:** None **Targets:** None **Duration:** Up to 2 weeks	**Location:** Hawaii Range Complex: Pacific Missiles Range Facility (Main Base), Marine Corps Base Hawaii, Marine Corps Training Area Bellows Southern California Range Complex Silver Strand Training Complex: Boat Lanes 11–14
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike; aircraft strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None anticipated	
Assumptions used for Analysis	Typical event: 1 to 3 amphibious vessels (e.g., LHA or LHD, LPD, LSD); 2 to 8 landing craft (Landing Craft, Air Cushioned; Landing Craft, Utility); 4 to 14 amphibious assault vehicles; up to 22 aircraft (e.g., MH-53, H-46/MV-22, AH-1, UH-1, AV-8); a Marine Expeditionary Unit (2,200 Marines)	

A.1.2.4 Amphibious Assault – Battalion Landing

Activity Name	Activity Description	
Amphibious Warfare		
Amphibious Assault – Battalion Landing	Marine Corps Battalion Landing Team forces launch an attack from sea to a hostile or potentially hostile shore for the immediate execution of inland maneuver.	
Long Description	Marine Corps Battalion Landing Team moves from amphibious vessels at sea, into hostile territory, establish a beachhead, then occupy the area, or move further inland for an extended period. Battalion Landing Team is a task organization composed of an infantry battalion reinforced by combat support and Combat Service Support units for amphibious assaults. The Battalion Landing Team is the ground force element of a Marine expeditionary unit when formed into a Marine air-ground task force.	
Information Typical to the Event	**Platform:** Amphibious vessels **Systems:** None **Ordnance/Munitions:** None **Targets:** None **Duration:** 4 days	**Location:** Southern California Range Complex: San Clemente Island, Shore Bombardment Area, Shallow Water Training Range (Nearshore),Eel Cove, West Cove, Wilson Cove
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** None **Energy:** None **Physical Disturbance and Strike:** Vessel strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	None	

A.1.2.5 Amphibious Raid

Activity Name	Activity Description
Amphibious Warfare	
Amphibious Raid	Small unit forces move swiftly from vessels at sea for a specific short term mission. These are quick operations with as few personnel as possible.
Long Description	Small unit forces swiftly move from amphibious vessels at sea into hostile territory for a specific mission, including a planned withdrawal. Raids are conducted to inflict loss or damage, secure information, create a diversion, confuse the enemy, or capture or evacuate individuals or material. Amphibious raid forces are kept as small as possible to maximize stealth and speed of the operation. An event may employ assault amphibian vehicle units, small boat units, small unit live-fire and non-live-fire operations. Surveillance or reconnaissance unmanned surface and aerial vehicles may be used during this event.
Information Typical to the Event	**Platform:** Amphibious assault vessels (e.g., LHA, LHD), amphibious transport dock and dock landing ships (e.g., LPD, LSD), amphibious vehicles (landing crafts, air cushioned, and amphibious assault vehicles), small boats (e.g., rigid-hull inflatable boats) **Systems:** Unmanned surface and aerial vehicles **Ordnance/Munitions:** Non-explosive practice munitions **Targets:** None **Duration:** 4 to 8 hours **Location:** Hawaii Range Complex: Pacific Missile Range Facility (Main Base), Marine Corps Base Hawaii, Marine Corps Training Area Bellows Silver Strand Training Complex: Boat Lanes 1–8, 11–14 (Bravo, Delta I, II, III, Echo, Fox, Golf, Hotel) Southern California Range Complex: West Cove, Horse Beach Cove, North West Harbor, Camp Pendleton Amphibious Assault Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, weapons firing noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, in-water device strike, aircraft strike (birds only) **Entanglement:** None **Ingestion:** None
Detailed Military Expended Material Information	None anticipated
Assumptions used for Analysis	Firing of weapons during these events accounted for in gunnery exercises, surface to surface activities

A.1.2.6 Expeditionary Fires Exercise/Supporting Arms Coordination Exercise

Activity Name	**Activity Description**	
Amphibious Warfare		
Expeditionary Fires Exercise/Supporting Arms Coordination Exercise	Military units provide integrated and effective close air support, Naval Surface Fire Support fire, and Marine Corps artillery fire in support of amphibious operations.	
Long Description	Military units provide integrated and effective close air support, Naval Surface Fire Support fire, and Marine Corps artillery fire in support of amphibious operations. The mission of the exercises is to achieve effective integration of Naval gunfire, close air support, and Marine Corps artillery fire support.	
Information Typical to the Event	**Platform:** Surface vessels, amphibious vessels, 4 AH-1Ws attack rotary-wing aircraft, 6 fixed-wing strike fighter or attack aircraft **Systems:** None **Ordnance/Munitions:** Large caliber (e.g., howitzers, 81 mm mortars, 5-inch rounds, MK-80 series bombs [explosive and non-explosive]) **Targets:** None **Duration:** 8 days	**Location:** Southern California Range Complex: San Clemente Island, Shore Bombardment Area, Shallow Water Training Range (Nearshore)
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Aircraft strike, vessel strike **Entanglement:** None **Ingestion:**	
Detailed Military Expended Material Information	Shell casings from large-caliber rounds	
Assumptions used for Analysis	Only the at-sea components of this activity are analyzed in this document.	

A.1.2.7 Humanitarian Assistance Operations

Activity Name	Activity Description	
Amphibious Warfare		
Humanitarian Assistance Operation/Non-Combatant Evacuation Operation	Military units evacuate noncombatants from hostile or unsafe areas or provide humanitarian assistance in times of disaster.	
Long Description	Military units evacuate noncombatants from hostile or unsafe areas to safe havens or to provide humanitarian assistance in times of disaster. Non-Combatant Evacuation Operation is conducted by military units (generally Marine Corps) usually operating in conjunction with Navy ships and aircraft. Non-combatants are evacuated when their lives are endangered by war, civil unrest, or natural disaster. Marine Corps Marine expeditionary unit train for evacuations in hostile environments that require the use of force, though usually there is no opposition to evacuation from the host country. Helicopters and landing crafts could be expected to participate in this operation during day or night. No ordnance is used.	
Information Typical to the Event	**Platform: Systems:** Rotary and fixed-wing aircraft, amphibious vessels **Ordnance/Munitions:** None **Targets:** None **Duration:** Varies	**Location:** Hawaii Range Complex: Pacific Missiles Range Facility (Main Base), Niihau, Marine Corps Base Hawaii, Marine Corps Training Area Bellows Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Aircraft strike, vessel strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	None	

A.1.3 STRIKE WARFARE TRAINING

Strike warfare includes training of fixed-wing fighter/attack aircraft or rotary-wing aircraft in delivery of precision guided munitions, non-guided munitions, rockets, and other ordnance against land targets in all weather and light conditions. Training events typically involve a simulated strike mission with a flight of four or more aircraft. The strike mission may simulate attacks on "deep targets" (i.e., those geographically distant from friendly ground forces), or may simulate close air support of targets within close range of friendly ground forces. Laser designators from aircraft or ground personnel may be employed for delivery of precision guided munitions. Some strike missions involve no-drop events in which prosecution of targets is simulated, but video footage is often obtained by onboard sensors.

A.1.3.1 Bombing Exercise (Air-to-Ground)

Activity Name	Activity Description	
Strike Warfare		
Bombing Exercise (Air-to-Ground)	Bombing exercise involves training of strike fighter aircraft delivery of ordnance against land targets in day or night conditions.	
Long Description	Bombing exercise involves training of strike fighter aircraft delivery of ordnance against land targets in day or night conditions. The bombing exercise may involve close air support training in direct support of and in close proximity to forces on the ground, such as Navy or Marine forces engaged in training exercises on land, and may include the use of targeting laser.	
Information Typical to the Event	**Platform:** Fixed-wing strike fighter aircraft **Systems:** Targeting laser systems **Ordnance/Munitions:** MK-76, BDU-45, and BDU-45 (non-explosive), MK-80 series bombs (explosive) **Targets:** Land targets **Duration:** 1 to 2 hours	**Location:** Hawaii Range Complex: Kaula Island
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Aircraft noise **Energy:** Targeting laser **Physical Disturbance and Strike:** Military expended materials (non-explosive munitions), aircraft strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	Bomb and target fragments	
Assumptions used for Analysis	The typical bomb release altitude is below 3,000 feet (ft.) (914 meters [m]) and within a range of 1,000 yards (914 m) for unguided munitions Only the in-water impacts of strike warfare activities are analyzed in the EIS/OEIS – NO LAND BASED IMPACTS INCLUDED IN THIS DOCUMENT	

A.1.3.2 Gunnery Exercise (Air-to-Ground)

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Strike Warfare</td></tr>
<tr><td>Gunnery Exercise (Air-to-Ground)</td><td colspan="2">Strike fighter aircraft and helicopter crews use guns to attack ground targets, day or night, with the goal of destroying or disabling enemy vehicles, structures, or personnel.</td></tr>
<tr><td>Long Description</td><td colspan="2">Strike fighter aircraft and helicopter crews use guns to attack ground targets, day or night, with the goal of destroying or disabling enemy vehicles, structures, or personnel.
A flight of two strike fighter aircraft will begin its descent to the target from an altitude of about 3,000 ft. (914 m) while still several miles away. Within a distance of 4,000 ft. (1,219 m) from the target, each aircraft will fire a burst of rounds before reaching an altitude of 1,000 ft. (305 m), then break off and reposition for another strafing run until each aircraft expends its exercise ordnance allowance. This exercise may include the use of targeting laser.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Fixed-wing strike fighter, rotary-wing aircraft
Systems:
Ordnance/Munitions: Small- and medium-caliber weapons (e.g., 20/25 mm, 50-caliber, and 7.63 mm)
Targets: Land Targets
Duration: 1 hour</td><td>Location:
Hawaii Range Complex: Kaula Island</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Aircraft noise
Energy: Targeting laser
Physical Disturbance and Strike: Military expended materials(non-explosive munitions)
Entanglement: None
Ingestion: Military expended materials (non-explosive munitions)</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">Small-caliber projectiles</td></tr>
<tr><td>Assumptions used for Analysis</td><td colspan="2">Only the in-water impacts of strike warfare activities are analyzed in the EIS/OEIS – NO LAND BASED IMPACTS INCLUDED IN THIS DOCUMENT.</td></tr>
</table>

A.1.4 ANTI-SURFACE WARFARE TRAINING

Anti-surface warfare is a type of naval warfare in which aircraft, surface ships, and submarines employ weapons and sensors in operations directed against enemy surface ships or boats. Air-to-surface exercises are conducted by long-range attacks using air-launched cruise missiles or other precision guided munitions, or using aircraft cannon. Anti-surface warfare also is conducted by warships employing torpedoes, naval guns, and surface-to-surface missiles. Submarines attack surface ships using torpedoes or submarine-launched, anti-ship cruise missiles. Training in anti-surface warfare includes surface-to-surface gunnery and missile exercises, air-to-surface gunnery and missile exercises, and submarine missile or torpedo launch events. Gunnery and missile training generally involves expenditure of ordnance against a towed target. A sinking exercise is a specialized training event that provides an opportunity for ship, submarine, and aircraft crews to use multiple weapons systems to deliver high explosive ordnance on a deactivated vessel, which is deliberately sunk.

Anti-surface warfare also encompasses maritime security, that is, the interception of a suspect surface ship by a Navy ship for the purpose of boarding-party inspection or the seizure of the suspect ship. Training in these tasks is conducted in visit, board, search and seizure exercises.

A.1.4.1 Maritime Security Operations

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Anti-Surface Warfare</td></tr>
<tr><td>Maritime Security Operations</td><td colspan="2">Helicopter and surface vessel crews conduct a suite of Maritime Security Operations (e.g., visit, search, board, and seizure; maritime interdiction operations; force protection; and anti-piracy operation).</td></tr>
<tr><td>Long Description</td><td colspan="2">Helicopter and surface ship crews conduct a suite of Maritime Security Operations (e.g., visit search, board, and seizure; maritime interdiction operations; force protection; and anti piracy operation). These activities involve training of boarding parties delivered by helicopters and surface ships to surface vessels for the purpose of simulating vessel search and seizure operations. Various training scenarios are employed and may include small arms with non-explosive blanks and surveillance or reconnaissance unmanned surface and aerial vehicles. The entire exercise may last two to three hours.
Vessel Visit, Board, Search, and Seizure: Military personnel from vessels and aircraft board suspect vessels, potentially under hostile conditions.
Maritime Interdiction Operations: Vessels and aircraft train in pursuing, intercepting, and ultimately detaining suspect vessels.
Oil Platform Defense: Naval personnel train to defend oil platforms or other similar at sea structures.
Warning Shot/Disabling Fire: Naval personnel train in the use of weapons to force fleeing or threatening small boats (typically operating at high speeds) to come to a stop.
Ship Force Protection: Vessel crews train in tracking multiple approaching, circling small craft, assessing threat potential, and communicating amongst crewmates and other vessels to ensure vessels are protected against attack.
Anti Piracy Training: Naval personnel train in deterring and interrupting piracy activity. Training includes large vessels (pirate “mother ships”), and multiple small, maneuverable, and fast craft.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Surface vessel (any), rotary-wing aircraft, small boats, high speed vessels, unmanned vehicles (surface and aerial)
Systems: None
Ordnance/Munitions: Small caliber (non-explosive)
Targets: Range support vessel, high performance boats, remote controlled high speed targets (Figure A-5 and Figure A-6) towing surface targets
Duration: Up to 3 hours</td><td>Location:
Hawaii Operating Area
Southern California Range Complex:
W-291, Operating Area 3803, Southern California Anti-Submarine Warfare Range
Silver Strand Training Complex: Boat Lanes 1-10</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Vessel noise, aircraft noise, weapons firing noise
Energy: None
Physical Disturbance and Strike: Military expended material strike (projectiles), vessel strike, aircraft strike (birds only)
Entanglement: None
Ingestion: Small-caliber projectiles, casings</td></tr>
</table>

Activity Name	Activity Description
Anti-Surface Warfare	
Maritime Security Operations	Helicopter and surface vessel crews conduct a suite of Maritime Security Operations (e.g., visit, search, board, and seizure; maritime interdiction operations; force protection; and anti-piracy operation).
Detailed Military Expended Material Information	Small-caliber projectiles Casings
Assumptions used for Analysis	Maritime security operations is a broad term used to describe activities intended train naval forces in the skills necessary to protect naval vessels from small boat attack, counter piracy and drug operations (maritime interdiction operations and visit, board, search, and seizure), and protect key infrastructure (e.g. oil platforms). Maritime security operations need to remain broad as naval forces need to be able to tailor training events to respond to emergent threats. Maritime security operations events typically do not involve live fire of weapons. All maritime security operations events involve vessel movement, sometimes at high rates of speed (naval vessels maneuvering to overtake suspect vessel and/or small boats (targets) closing in and maneuvering around naval vessels), and some event involve helicopters and boarding parties. Maritime security operations training events are conducted proximate to naval homeports (San Diego, California) including during times of transit in and out of port, as well as during major training events.

A.1.4.2 Gunnery Exercise Surface-to-Surface (Ship) – Small Caliber

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Anti-Surface Warfare</td></tr>
<tr><td>Gunnery Exercise Surface-to-Surface (Ship) – Small Caliber</td><td colspan="2">Vessel crews engage surface targets with vessel's small-caliber guns designed to provide close range defense against patrol boats, smaller boats, swimmers, and floating mines.</td></tr>
<tr><td>Long Description</td><td colspan="2">This exercise involves vessel crews engaging surface targets at sea with small-caliber (0.50 caliber or smaller) weapons.
Vessels use small-caliber weapons to practice defensive marksmanship, typically against stationary floating targets. The target may be a 10 ft. diameter red balloon (Killer Tomato, see Figure A-4), a 50 gallon steel drum, or other available target, such as a cardboard box. Some targets are expended during the exercise and are not recovered.
Vessel crew qualifications conducted at sea employ stationary targets on deck. Small-caliber projectiles fired during these events will be expended in the water.
Shipboard protection systems utilizing small-caliber projectiles will train against high speed mobile targets.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Surface vessels
Systems: None
Ordnance/Munitions: Small caliber (non-explosive)
Targets: Recoverable or expendable floating target (stationary or towed), remote controlled high speed targets (Figure A-5 and Figure A-6)
Duration: 2 to 3 hours</td><td>Location:
Hawaii Range Complex: Warning Areas -188, 191, 192, 193, 194, 196, Mela South
Southern California Range Complex: Warning Area-291, Southern California Anti-Submarine Warfare Range, Shore Bombardment Area
HSTT Transit Corridor</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Vessel noise, weapons firing noise
Energy: None
Physical Disturbance and Strike: Vessel and in-water device strike, military expended material strike (projectile, target),
Entanglement: None
Ingestion: Small-caliber projectiles, casings, target fragments</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">Small-caliber projectiles
Casings
Target fragments</td></tr>
<tr><td>Assumptions used for Analysis</td><td colspan="2">Small-caliber gun rounds per event: 1,000 to 3,000 non-explosive practice munitions
Majority of events will occur proximate to Naval stations</td></tr>
</table>

Figure A-4: "Killer Tomato" Stationary Floating Target

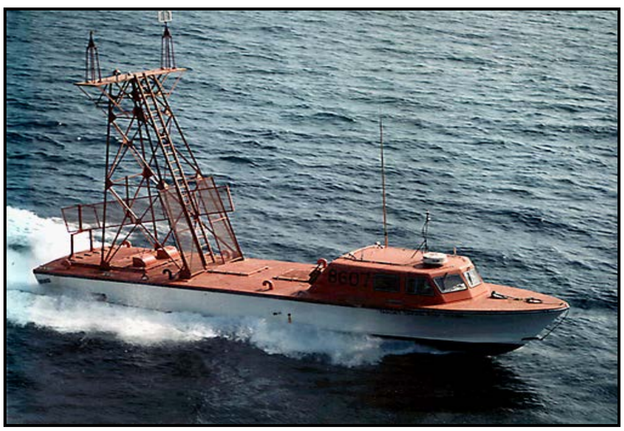


Figure A-5: QST-35 Seaborne Powered Target

Figure A-6: High Speed Maneuvering Surface Target

A.1.4.3 Gunnery Exercise Surface-to-Surface (Ship) – Medium Caliber

Activity Name	Activity Description	
Anti-Surface Warfare		
Gunnery Exercise Surface-to-Surface (Ship) – Medium Caliber	Vessel crews engage surface targets with vessel's medium-caliber guns designed to provide close range defense against patrol boats, smaller boats, swimmers, and floating mines.	
Long Description	This exercise involves vessel crews engaging surface targets at sea with medium-caliber (larger than 0.50 calibers up to 56 mm) weapons. Vessels use medium-caliber weapons to practice defensive marksmanship, typically against a stationary floating target (a 10 ft. diameter red balloon [Killer Tomato]) and high speed mobile targets. Some targets are expended during the exercise and are not recovered. Shipboard protection systems (Close-In Weapon System) utilizing medium-caliber projectiles will train against high speed mobile targets.	
Information Typical to the Event	**Platform:** Surface vessels **Systems:** None **Ordnance/Munitions:** Medium caliber (high explosive or non-explosive) **Targets:** Recoverable and expendable floating target (stationary or towed), remote control high-speed targets **Duration:** 2 to 3 hours	**Location:** Hawaii Range Complex: Warning Areas -188, 191, 192, 193, 194, 196, Mela South Southern California Range Complex: Warning Area-291, Southern California Anti-Submarine Warfare Range, Shore Bombardment Area HSTT Transit Corridor
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives (E1, E2), vessel noise, weapons firing noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, in-water device strike, military expended material strike (projectiles and casings, projectile and target fragments) **Entanglement:** None **Ingestion:** Medium-caliber projectiles and casings, target fragments, projectile fragments	
Detailed Military Expended Material Information	Medium-caliber projectiles and casings, target fragments, projectile fragments Approximately 200 medium-caliber rounds per event One target used per event. Approximately 50 percent of targets are “Killer Tomatoes” (usually recovered). Approximately 35 percent are high-speed maneuvering targets, which are recovered. Approximately 15 percent of targets are other stationary targets such as a steel drum	
Assumptions used for Analysis	None	

A.1.4.4 Gunnery Exercise Surface-to-Surface (Ship) – Large Caliber

Activity Name	Activity Description
Anti-Surface Warfare	
Gunnery Exercise Surface-to-Surface (Ship) – Large Caliber	Vessel crews engage surface targets with vessel's large-caliber guns designed to provide defense against vessels, patrol boats, smaller boats.
Long Description	This exercise involves vessels' gun crews engaging surface targets at sea with their main battery large-caliber (typically 57 mm, 76 mm, and 5-inch) guns. Targets include the QST-35 seaborne powered target, high speed maneuverable surface target, or a specially configured remote controlled water craft. Some targets are expended during the exercise and are not recovered. The exercise proceeds with the target boat approaching from about 10 nm distance. The target is tracked by radar and when within a predetermined range, it is engaged first with "warning shots". As threats get closer all weapons may be used to disable the threat. This exercise may involve a single firing vessel, or be undertaken in the context of a coordinated larger exercise involving multiple ships, including a major training event. Large-caliber guns will also be fired during weapon certification events and in conjunction with weapon maintenance. During all events, either high explosive or non-explosive rounds may be used. High explosive rounds can either be fused for detonation on impact (with water surface or target), or for proximity to the target (in air detonation).
Information Typical to the Event	**Platform:** Surface vessels (e.g., CG, DDG, FFG, LCS) **Systems:** None **Ordnance/Munitions:** Large caliber (e.g., 57 mm, 76 mm, and 5-inch [high explosive and non-explosive]) **Targets:** Remote controlled high speed targets **Duration:** Up to 3 hours **Location:** Hawaii Range Complex: Warning Areas -188, 191, 192, 193, 194, 196, Mela South Southern California Range Complex: Warning Area-291, Southern California Anti-Submarine Warfare Range, Shore Bombardment Area HSTT Transit Corridor
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives (E3, E5), vessel noise, weapons firing noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, in-water device strike, military expended material strike (projectile, target fragments) **Entanglement:** None **Ingestion:** Target fragments, projectile fragments
Detailed Military Expended Material Information	Large-caliber projectiles and casings Target fragments Projectile fragments
Assumptions used for Analysis	For analytical purposes assume all high explosive rounds are fused to detonate upon impact with water surface or target After impacting the water, the high explosive rounds are expected to detonate within three feet of the surface. Non-explosive rounds and fragments from the high explosive rounds will sink to the bottom of the ocean For Alternative 2, analysis considers the introduction of (two) kinetic weapon equipped vessels being introduced to the fleet. Increases in events (six) and projectiles expended (240) reflect the likely training requirements of this new weapon system Assume each non-explosive projectile will be up to 5-inch diameter and 30-inch length, and each firing will also expend a metallic sleeve used to convey the projectile down the gun barrel

A.1.4.5 Gunnery Exercise Surface-to-Surface (Boat) – Small Caliber

Activity Name	Activity Description
Anti-Surface Warfare	
Gunnery Exercise Surface-to-Surface (Boat) – Small Caliber	Small boat crews engage surface targets with small-caliber weapons.
Long Description	Boat crews engage surface targets with small-caliber weapons. Boat crews may use high or low speeds to approach and engage targets simulating other boats, swimmers, floating mines, or near shore land targets with small-caliber (up to and including .50 caliber) weapons. A commonly used target is an empty steel drum. A number of different types of boats are used depending on the unit using the boat and their mission. Boats are most used to protect ships in harbors and high value units, such as: aircraft carriers, nuclear submarines, liquid natural gas tankers, etc., while entering and leaving ports, as well as to conduct riverine operations, and various naval special warfare operations. The boats used by these units include: small unit river craft, combat rubber raiding craft, rigid-hull inflatable boats, patrol craft, and many other versions of these types of boats. These boats use inboard or outboard, diesel or gasoline engines with either propeller or water jet propulsion.
Information Typical to the Event	**Platform:** Boats **Systems:** None **Ordnance/Munitions:** Small caliber (non-explosive), anti-swimmer grenades **Targets:** Recoverable or expendable floating target **Duration:** 1 hour **Location:** Southern California Range Complex: Warning Area-291, Southern California Anti-Submarine Warfare Range, Shore Bombardment Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, weapons firing noise, in-water explosives (E4) **Energy:** None **Physical Disturbance and Strike:** Vessel strike, in-water device strike, military expended material strike (projectile, target fragments) **Entanglement:** None **Ingestion:** Projectiles, casings, and target fragments
Detailed Military Expended Material Information	Small-caliber projectiles Casings Target fragments
Assumptions used for Analysis	*The specific areas are where activities typically occur. They can occur throughout the full area listed in Table 2.8-1 of Chapter 2. Majority of events will occur proximate to naval stations. Events will occur relatively near shore due to short range of boats and safety concerns. Events mostly occur within three nm of the shoreline, but can occur further from shore.

A.1.4.6 Gunnery Exercise Surface-to-Surface (Boat) – Medium Caliber

Activity Name	Activity Description	
Anti-Surface Warfare		
Gunnery Exercise Surface-to-Surface (Boat) – Medium Caliber	Small boat crews engage surface targets with medium-caliber weapons.	
Long Description	Boat crews engage surface targets with medium-caliber weapons. Boat crews may use high or low speeds to approach and engage targets simulating other boats, floating mines, or near shore land targets with medium-caliber (up to and including 40 mm) weapons. A commonly used target is an empty steel drum. A number of different types of boats are used depending on the unit using the boat and their mission. Boats are most used to protect ships in harbors and high value units, such as: aircraft carriers, nuclear submarines, liquid natural gas tankers, etc., while entering and leaving ports, as well as to conduct riverine operations, and various naval special warfare operations. The boats used by these units include: small unit river craft, combat rubber raiding craft, rigid-hull inflatable boats, patrol craft, and many other versions of these types of boats. These boats use inboard or outboard, diesel or gasoline engines with either propeller or water jet propulsion.	
Information Typical to the Event	**Platform:** Boats **Systems:** None **Ordnance/Munitions:** Medium caliber (up to and including 40 mm [explosive and non-explosive]) **Targets:** Recoverable or expendable floating target (stationary or towed) **Duration:** 1 hour	**Location:** Hawaii Range Complex: Warning Area 188 Southern California Range Complex: Warning Area-291, Shore Bombardment Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives (E1, E2), vessel noise, weapons firing noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (projectile, target fragments), vessel and in-water device strike **Entanglement:** None **Ingestion:** Projectiles and target fragments, projectiles, casings	
Detailed Military Expended Material Information	Projectiles and target fragments, projectiles, casings One target used per event, typically a stationary target such as a 50-gallon (189 liter) steel drum	
Assumptions used for Analysis	Assume all Alternatives 1 and 2 events include the use of some explosive rounds Most events will involve boat crews training with MK 203 40 mm grenade launcher Most events will occur proximate to Navy homeports (San Diego)	

A.1.4.7 Missile Exercise Surface-to-Surface

Activity Name	Activity Description	
Anti-Surface Warfare		
Missile Exercise (Surface-to-Surface)	Surface vessel crews defend against surface threats (vessels or boats) with missiles.	
Long Description	Surface vessels launch missiles at surface maritime targets with the goal of destroying or disabling enemy vessels or boats. After detecting and confirming a surface threat, the vessel will fire precision guided anti-surface missile. Events with destroyers and cruisers will involve long range (over the horizon) harpoon (or similar) anti surface missiles. While past harpoon events occurred during sinking exercises, requirement exists for non sinking exercise events to certify ship crews. If a sinking exercise target is unavailable, towed sled would likely be used. Events with Littoral Combat Ships will involve shorter range anti-surface missiles. Events with Littoral Combat Ships would be to certify vessel's crew to defend against "close-in" (less than 10 miles) surface threats. These exercises are live fire, that is, a missile is fired down range. Anti-surface missiles could be equipped with either high explosive or non-explosive warheads.	
Information Typical to the Event	**Platform:** Surface vessels (e.g., CG, DDG, LCS) **Systems:** None **Ordnance/Munitions:** Anti-surface missiles, Harpoons (explosive and non-explosive) **Targets:** High speed surface targets, towed sleds **Duration:** 2 to 4 hours	**Location:** Hawaii Range Complex: Warning Area 188 Southern California Range Complex: Warning Area 291
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives (E10), vessel noise, weapons firing noise **Energy:** None **Physical Disturbance and Strike:** Vessel and in-water device strike; military expended material strike (missiles and target fragments) **Entanglement:** None **Ingestion:** Missile fragments, target fragments	
Detailed Military Expended Material Information	Missiles, missile fragments Target fragments	
Assumptions used for Analysis	Assume one missile and one target per event While missile could explode above water's surface after contacting target, analysis assumes all warheads explode at or just below surface	

A.1.4.8 Gunnery Exercise Air-to-Surface – Small Caliber

Activity Name	Activity Description	
Anti-Surface Warfare		
Gunnery Exercise (Air-to-Surface) – Small Caliber	Helicopter aircrews, including embarked personnel, use small-caliber guns to engage surface targets.	
Long Description	Helicopters, carrying several air crewmen, fly a racetrack pattern around an at-sea target. Each gunner will engage the target with small-caliber weapons. Targets range from a smoke float, an empty steel drum, to high speed remote controlled boats and jet-skis.	
Information Typical to the Event	**Platform:** Helicopter **Systems:** None **Ordnance/Munitions:** Small caliber (non-explosive) **Targets:** Recoverable or expendable floating target (stationary or towed), remote high speed target **Duration:** 1 hour	**Location:** Hawaii Range Complex: Warning Areas 188, 191, 192, 193, 194, 196, Mela South Southern California Range Complex: Southern California Anti-Submarine Warfare Range, (T-3, T-4, T-5, Mine Training Range-2), Warning Area-291, Shore Bombardment Area,
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Aircraft noise **Energy:** None **Physical Disturbance and Strike:** In-water device strike, military expended material strike (projectiles), aircraft strike (birds only) **Entanglement:** None **Ingestion:** Projectiles, target fragments, casings	
Detailed Military Expended Material Information	Projectiles, Target fragments, casings One target used per event. Expendable smoke float (50 percent), stationary target (45 percent), or remote controlled target (5 percent)	
Assumptions used for Analysis	Most events will occur proximate to Naval Stations where MH-60 helicopters are home based and target services are available	

A.1.4.9 Gunnery Exercise Air-to-Surface – Medium Caliber

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Anti-Surface Warfare</td></tr>
<tr><td>Gunnery Exercise (Air-to-Surface) – Medium Caliber</td><td colspan="2">Fixed-wing and helicopter aircrew, including embarked personnel, use medium-caliber guns to engage surface targets.</td></tr>
<tr><td>Long Description</td><td colspan="2">Fighter and helicopter aircrew, including embarked personnel, engage surface targets with medium-caliber guns. Targets simulate enemy ships, boats, swimmers, and floating/near-surface mines. Fighter aircraft descend on a target firing high explosive or non-explosive practice munitions medium-caliber projectiles. Helicopters, carrying several air crewmen, fly a racetrack pattern around an at-sea target. Crew will engage the target with medium-caliber weapons. Targets range from a smoke float, an empty steel drum, to high speed remote controlled boats and jet-skis.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Fixed-wing (e.g., F/A-18, F-35); Helicopter (e.g., MH-60)
Systems: None
Ordnance/Munitions: Medium caliber (non-explosive and explosive)
Targets: Recoverable or expendable floating target (stationary or towed), remote high speed target
Duration: 1 hour</td><td>Location:
Hawaii Range Complex: Warning Areas 188, 191, 192, 193, 194, 196, Mela South
Southern California Range Complex: Southern California Anti-Submarine Warfare Range, (T-3, T-4, T-5, Mine Training Range-2), Warning Area-291</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Underwater explosives (E1, E2), aircraft noise
Energy: None
Physical Disturbance and Strike: Military expended material strike (projectile, target fragments), In-water device strike, aircraft strike (birds only)
Entanglement: None
Ingestion: Projectile, casings and target fragments</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">Projectiles, casings, projectile and target fragments
One target used per event. Expendable smoke float (50 percent), stationary target (45 percent), or remote controlled target (5 percent)</td></tr>
<tr><td>Assumptions used for Analysis</td><td colspan="2">Most medium-caliber air-to-surface gunnery exercises will be with non-explosive training projectiles. High-explosive rounds will supplement when non-explosive training projectiles are not available</td></tr>
</table>

A.1.4.10 Missile Exercise Air-to-Surface – Rocket

Activity Name	Activity Description	
Anti-Surface Warfare		
Missile Exercise (Air-to-Surface) Rocket	Fixed-wing and helicopter aircrew fire both precision-guided and unguided rockets against surface targets.	
Long Description	Fighter, maritime patrol aircraft, and helicopter aircrews fire both precision-guided and unguided rockets against surface targets. Aircraft involved may be unmanned. Fixed-wing aircraft (fighters or maritime patrol aircraft) approach an at-sea surface target from high altitude and launch high explosive non-explosive precision guided rockets. Helicopters designate an at-sea surface target with a laser or optics for precision guided high explosive or non-explosive practice munitions rockets.	
Information Typical to the Event	**Platform:** Fixed-wing (e.g., F/A-18, F-35, P-8, P-3, unmanned aerial vehicle) Helicopters (MH-60, Fire Scout) **Systems:** None **Ordnance/Munitions:** Rockets (non-explosive for No Action Alternative; high explosive for Alternatives 1 and 2) **Targets:** Recoverable floating target (stationary or towed) **Duration:** 1 hour	**Location:** Hawaii Range Complex: Warning Area 188 Southern California Range Complex: Warning Area 291, Southern California Anti-Submarine Warfare Range, Fleet Training Area Hot, Missile Ranges
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives (E5), aircraft noise **Energy:** target Laser **Physical Disturbance and Strike:** In-water device strike, military expended material strike (rocket, rocket and target fragments) **Entanglement:** None **Ingestion:** Target fragments, rocket fragments	
Detailed Military Expended Material Information	Rockets, rocket fragments Target fragments	
Assumptions used for Analysis	Assume all explosive rockets detonate in water. Assume all rockets under the No Action Alternative are non-explosive. Assume all rockets under Alternatives 1 and 2 are explosive Rockets may be used in conjunction with force protection events	

A.1.4.11 Missile Exercise Air-to-Surface

Activity Name	Activity Description	
Anti-Surface Warfare		
Missile Exercise (Air-to-Surface)	Fixed-wing and helicopter aircrew fire precision-guided missiles against surface targets.	
Long Description	Fighter, maritime patrol aircraft, and helicopter aircrews fire both precision-guided missiles and unguided rockets against surface targets. Aircraft involved may be unmanned. Fixed-wing aircraft (fighters or maritime patrol aircraft) approach an at-sea surface target from high altitude, and launch high explosive precision guided missiles. Helicopters designate an at-sea surface target with a laser or optics for a precision guided high explosive or non-explosive missile. Helicopter launched missiles typically pass through the target's "sail," and detonate at, or just below, the water's surface.	
Information Typical to the Event	**Platform:** Fixed-wing aircraft and helicopters **Systems:** None **Ordnance/Munitions:** Missiles (high explosive or non-explosive) **Targets:** Recoverable floating target (stationary or towed), Remotely operated target **Duration:** 2 hours	**Location:** Hawaii Range Complex: Warning Area-188 Southern California range Complex: Shore Bombardment Area, Southern California Anti-Submarine Warfare Range (Laser Training Range 1/2)
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives (E6, E8), aircraft noise, vessel noise **Energy:** None **Physical Disturbance and Strike:** In-water device strike, Military expended material strike (missile fragment), Aircraft strike (birds only) **Entanglement:** None **Ingestion:** Missile fragments, target fragments	
Detailed Military Expended Material Information	Missile fragments Target fragments	
Assumptions used for Analysis	Assume one missile and one target per event While missile could explode above water's surface after contacting target, analysis assumes all warheads explode at or just below surface	

A.1.4.12 Bombing Exercise Air-to-Surface

Activity Name	Activity Description	
Anti-Surface Warfare		
Bombing Exercise (Air-to-Surface)	Fixed-wing aircrews deliver bombs against surface targets.	
Long Description	Fixed-wing aircrews deliver bombs against surface targets. Fixed-wing aircraft conduct a bombing exercise against stationary floating targets (e.g.: MK-58 smoke buoy). An aircraft clears the area, deploys a smoke buoy or other floating target, and then delivers high explosive or non-explosive practice munitions bomb(s) on the target. A range boat may be used to deploy targets for an aircraft to attack. Exercises for strike fighters typically involve a flight of two aircraft delivering unguided or guided munitions that may be either high explosive or non-explosive practice munitions. The following munitions may be employed by strike fighter aircraft in the course of the bombing exercise: Unguided munitions: Non explosive Sub Scale Bombs (MK-76 and BDU-45); explosive and non-explosive general purpose bombs (MK-80 series); MK-20 Cluster Bomb (explosive, non-explosive). Precision-guided munitions: Laser-guided bombs (explosive, non-explosive); Laser-guided Training Rounds (non-explosive); Joint Direct Attack Munition (explosive, non-explosive).	
Information Typical to the Event	**Platform:** Fixed-wing (e.g., F/A-18, F-35, P-8, P-3) **Systems:** None **Ordnance/Munitions:** Bombs (e.g., MK-76, BDU-45, MK-80 series, MK-20 [high explosive, non-explosive]) **Targets:** Expendable floating target (e.g., smoke float) **Duration:** 1 hour	**Location:** Hawaii Range Complex: Hawaii Operating Area Southern California Range Complex: Southern California Anti-Submarine Warfare Range T-3, T-4, T-5, Mine Training Range-2, Shore Bombardment Area HSTT Transit Corridor
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives (E8, E9, E10, E12), aircraft noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (non-explosive bomb), aircraft strike (birds only) **Entanglement:** None **Ingestion:** Bomb fragments, target fragments, smoke floats	
Detailed Military Expended Material Information	Bomb fragments Target fragments Smoke floats	
Assumptions used for Analysis	Approximately 90 percent of non-explosive bombs are the sub-scale bombs such as the MK-76 and BDU-48	

A.1.4.13 Laser Targeting

Activity Name	**Activity Description**	
Anti-Surface Warfare		
Laser Targeting	Fixed-winged, helicopter, and vessel crews illuminate enemy targets with lasers.	
Long Description	Fixed-winged and helicopter aircrew and shipboard personnel illuminate enemy targets with lasers for engagement by aircraft with laser guided bombs or missiles. This exercise may be conducted alone or in conjunction with other events utilizing precision guided munitions, such as anti surface missiles and guided rockets. Events where weapons are fired are addressed in the appropriate activity (e.g. air-to-surface missile exercise). Lower powered lasers may also be used as non-lethal deterrents during maritime security operations (force protection).	
Information Typical to the Event	**Platform:** Vessels, fixed-wing aircraft, rotary-wing aircraft **Systems:** None **Ordnance/Munitions:** None unless conducted with other event (e.g., missile exercise) **Targets:** Land targets, Remote-controlled surface targets **Duration:** 1 to 2 hours	**Location:** Hawaii Range Complex: Warning Area 188 Southern California Range Complex: Southern California Anti-Submarine Warfare Range, Shore Bombardment Area, (Laser Training Range 1/2)
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, aircraft noise **Energy:** In-air low energy lasers **Physical Disturbance and Strike:** Vessel strike, aircraft strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	Laser targeting for missile/rocket guidance will occur in areas where these events also occur Use of lasers as force protection non-lethal deterrents will primarily occur proximate to Navy homeports Land target impacts are not analyzed within this EIS/OEIS	

A.1.4.14 Sinking Exercise

Activity Name	Activity Description	
Anti-Surface Warfare		
Sinking Exercise	Aircraft, vessel, and submarine crews deliver ordnance on a seaborne target, usually a deactivated ship, which is deliberately sunk using multiple weapon systems.	
Long Description	Ship personnel and aircrew deliver high explosive ordnance on a seaborne target, (large deactivated vessel), which is deliberately sunk using multiple weapon systems. A sinking exercise is typically conducted by aircraft, surface vessels, and submarines in order to take advantage of the ability to fire high explosive ordnance on a full size ship target. The target is typically a decommissioned ship made environmentally safe for sinking according to U.S. Environmental Protection Agency standards. The location is greater than 50 nautical miles from shore and in water depths greater than 6,000 ft. Vessel, aircraft, and submarine crews attack with coordinated tactics and deliver live high explosive ordnance to sink the target. Non-explosive practice munitions may be used during the initial stages to extend target life. Typically, the exercise lasts for four to eight hours and possibly over 1 to 2 days, however it is unpredictable, and ultimately ends when the ship sinks.	
Information Typical to the Event	**Platform:** Vessels, Aircraft, Submarines **Systems:** None **Ordnance/Munitions:** Potentially all available (explosive and non-explosive), torpedo **Targets:** Decommissioned ship made environmentally safe for sinking (according to U.S. Environmental Protection Agency standards) **Duration:** 4 to 8 hours, possibly over 1 to 2 days (unpredictable and ultimately ends when the ship sinks)	**Location:** Hawaii Range Complex: Hawaii Operating Area Southern California Range Complex: Warning Area 291
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives (E3, E5, E9, E10, E11, E12), vessel noise, aircraft noise, weapons firing noise **Energy:** In-air low energy lasers **Physical Disturbance and Strike:** Military expended material strike (non-explosive projectiles, projectile fragments), vessel strike, aircraft strike (birds only) **Entanglement:** Guidance wires **Ingestion:** Munitions fragments, casings	

Activity Name	**Activity Description**
Anti-Surface Warfare	
Sinking Exercise	Aircraft, vessel, and submarine crews deliver ordnance on a seaborne target, usually a deactivated ship, which is deliberately sunk using multiple weapon systems.
Detailed Military Expended Material Information	Munitions fragments, non-explosive ordnance, guidance wires, casings Ship hulk (decommissioned ship made environmentally safe for sinking according to U.S. Environmental Protection Agency standards)
Assumptions used for Analysis	Greater than 50 nautical miles from shore and in water depths greater than 6,000 ft. The participants and assets could include: • One full-size target ship hulk • One to five CG, DDG, or FFG ships • One to 10 F/A-18, or MPA aircraft • One or two HH-60H, MH-60R/S, or SH-60B helicopters • One E-2 aircraft for Command and Control • One submarine • One to three range clearance aircraft. • Two to four Harpoon surface-to-surface or air-to-surface missiles • Two to eight air-to-surface Maverick missiles • Two to sixteen MK-82 general purpose bombs • Two to four Hellfire air-to-surface missiles • One or two SLAM-ER air-to-surface missiles • Two to six AGM-88 High-speed Anti-Radiation Missiles (HARM) • Fifty to 500 rounds 5-inch and 76 mm gun • One to two MK-48 heavyweight submarine-launched torpedo • Two Thousand medium-caliber rounds • Assume 2 guidance wires expended per event

A.1.5 Anti-Submarine Warfare Training

Anti-submarine warfare involves helicopter and maritime patrol aircraft, ships, and submarines. These units operate alone or in combination, in operations to locate, track, and neutralize submarines. Controlling the undersea battlespace is a unique naval capability and a vital aspect of sea control. Undersea battlespace dominance requires proficiency in anti-submarine warfare. Every deploying strike group and individual surface combatant must possess this capability.

Various types of active and passive sonar are used by the Navy to determine water depth, locate mines, and identify, track, and target submarines. Passive sonar "listens" for sound waves by using underwater microphones, called hydrophones, which receive, amplify, and process underwater sounds. No sound is introduced into the water when using passive sonar. Passive sonar can indicate the presence, character, and movement of submarines. However, passive sonar provides only a bearing (direction) to a sound-emitting source; it does not provide an accurate range (distance) to the source. Active sonar is needed to locate objects because active sonar provides both bearing and range to the detected contact (such as an enemy submarine).

Active sonar transmits pulses of sound that travel through the water, reflect off objects and return to a receiver. By knowing the speed of sound in water and the time taken for the sound wave to travel to the object and back, active sonar systems can quickly calculate direction and distance from the sonar platform to the underwater object. Active sonar is necessary to detect and track submarines that do not emit detectable levels of noise, either because of noise reduction design features or because of the presence of overwhelming background noise levels.

The Navy's anti-submarine warfare training plan, including the use of active sonar in at-sea training scenarios, includes multiple levels of training. Individual-level anti-submarine warfare training addresses basic skills such as detection and classification of contacts, distinguishing discrete acoustic signatures including those of ships, submarines, and marine life, and identifying the characteristics, functions, and effects of controlled jamming and evasion devices.

More advanced, integrated anti-submarine warfare training exercises involving active sonar is conducted in coordinated, at-sea operations during multi-dimensional training events involving submarines, ships, aircraft, and helicopters. This training integrates the full anti-submarine warfare continuum from detecting and tracking a submarine to attacking a target using either exercise torpedoes or simulated weapons. Training events include detection and tracking exercises against "enemy" submarine contacts; torpedo employment exercises against the target; and exercising command and control tasks in a multi-dimensional battlespace.

A.1.5.1 Tracking Exercise/Torpedo Exercise – Submarine

Activity Name	Activity Description	
Anti-Submarine Warfare		
Tracking Exercise/Torpedo Exercise – Submarine	Submarine crews search, track, and detect submarines. Exercise torpedoes may be used during this event.	
Long Description	The anti-submarine warfare tracking/torpedo exercise-submarine involves a submarine employing hull mounted and/or towed array sonar against an anti-submarine warfare target such as a MK-39 Expendable Mobile Anti-Submarine Warfare Training Target, a MK-30, or another submarine. During this event, passive sonar is used almost exclusively; active sonar use is restricted because it would reveal the tracking submarine’s presence to the target submarine. The preferred type of range for this exercise is an instrumented underwater training range with the capability to track the locations of submarines and targets, to enhance the after-action learning component of the training. Three such ranges exist in the Hawaii-Southern California Training and Test (HSTT) Study Area; the Barking Sands Tactical Underwater Range and Barking Sands Underwater Range Extension west of Kauai under the control of the Pacific Missile Range Facility, and the Southern California Anti-submarine Warfare Range west of San Clemente Island. This exercise may involve a single submarine, or be undertaken in the context of a coordinated larger exercise involving multiple aircraft, ships, and submarines, including a major range event. The tracking exercise becomes a torpedo exercise when the submarine launches an exercise torpedo. Torpedo exercises typically have a range support vessel (surface craft or a support helicopter) to launch and recover targets and torpedoes. The exercise torpedo is recovered by helicopter or small craft. The preferred range for this exercise is an instrumented underwater range, but it may be conducted in other Operating Areas (OPAREAs) depending on training requirements and available assets.	
Information Typical to the Event	**Platform:** One or more submarines, support craft **Systems:** Mid-frequency (primarily passive) and high-frequency sonar **Ordnance/Munitions:** Exercise torpedoes (non-explosive torpedo exercise only) **Targets:** Submarine MK-30, MK-39 Expendable Mobile Anti-Submarine Warfare Training Target **Duration:** 8 hours	**Location:** Hawaii Operating Area, (including Barking Sands Underwater Range Extension; Barking Sands Tactical Underwater Range; Shallow Water Training Range, North Maui Submarine Operating Area Southern California Operating Area, Southern California Anti-submarine Warfare Range, Shallow Water Training Range (Offshore/Nearshore) HSTT Transit Corridor

Activity Name	**Activity Description**
Anti-Submarine Warfare	
Tracking Exercise/Torpedo Exercise – Submarine	Submarine crews search, track, and detect submarines. Exercise torpedoes may be used during this event.
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency acoustic countermeasure (ASW4), hull-mounted sonar (MF3), high-frequency sonar (HF1, HF3, HF8), heavyweight torpedo (TORP2), vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Vessel and in-water device strike, aircraft strike (birds only), and military expended material strike (torpedo accessories) **Entanglement:** Guidance wires **Ingestion:** None
Detailed Military Expended Material Information	Torpedo accessories (guidance wires, ballast weights, flex tubing) Expended countermeasures
Assumptions used for Analysis	Tracking exercise can occur in all locations, torpedo exercise will not occur in Hawaii-Southern California Training and Test Transit Corridor. Torpedoes are recovered Guidance wire has a low breaking strength and breaks easily. Weights and flex tubing sink rapidly Other Hawaii-Southern California Training and Test area events typically refer to those events that occur while vessels are in transit (e.g., HSTT Transit Corridor)

A.1.5.2 Tracking Exercise/Torpedo Exercise – Surface

Activity Name	Activity Description	
Anti-Submarine Warfare		
Tracking Exercise/Torpedo Exercise – Surface	Surface vessel crews search, track, and detect submarines. Exercise torpedoes may be used during this event.	
Long Description	Surface ships search, detect, and track threat submarines to determine a firing position to launch a torpedo and attack the submarine. A surface vessel operates at slow speeds while employing hull mounted and/or towed array sonar. Passive or active sonar is employed depending on the type of threat submarine, the tactical situation, and environmental conditions. The target for this exercise is a MK-39 Expendable Mobile Anti-Submarine Warfare Training Target, MK-30 Recoverable Training Target, or live submarine. Tracking exercise/torpedo exercise – surface could occur anywhere throughout the Hawaii-Southern California Training and Test Study Area. This exercise may involve a single ship, or be undertaken in the context of a coordinated larger exercise involving multiple aircraft, ships, and submarines, including a major range event. The tracking exercise becomes a torpedo exercise when the ship launches an exercise torpedo. The exercise torpedo is recovered by helicopter or small craft. The preferred range for this exercise is an instrumented underwater range, but it may be conducted in other operating areas depending on training requirements and available assets.	
Information Typical to the Event	**Platform:** One or more surface vessels, rotary-wing aircraft **Systems:** Mid-frequency sonar, Nixie (countermeasure system) **Ordnance/Munitions:** Exercise torpedoes (non-explosive only) **Targets:** Submarine MK-30 or MK-39 Expendable Mobile Anti-Submarine Warfare Training Target **Duration:** 2 to 4 hours	**Location:** Hawaii Range Complex: Hawaii Operating Area (including Barking Sands Underwater Range Extension; Barking Sands Tactical Underwater Range; Shallow Water Training Range Southern California Range Complex: Southern California Operating Areas, Point Mugu Sea Range (overlap area only)
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency sonar (ASW1), mid-frequency acoustic countermeasure (ASW3, ASW4), high-frequency sonar (HF1), hull mounted sonar (MF1, MF2, MF3, MF11), helicopter dipping sonar (MF4), high duty cycle variable depth sonar (MF12), lightweight torpedo (TORP1), vessel noise **Energy:** None **Physical Disturbance and Strike:** Vessel and in-water device strike; military expended material strike **Entanglement:** None **Ingestion:** Target fragments	
Detailed Military Expended Material Information	MK-39 Expendable Mobile Anti-Submarine Warfare Training Target Torpedo accessories (ballast weights) from exercise torpedoes	
Assumptions used for Analysis	Tracking exercise can occur in all locations, torpedo exercise will <u>not</u> occur in Point Mugu Sea Range portion of Southern California. Submarines may provide service as the target except for torpedo exercise events. Torpedoes are recovered Other Hawaii-Southern California Training and Test area events typically refer to those events that occur while vessels are in transit	

A.1.5.3 Tracking Exercise/Torpedo Exercise – Helicopter

Activity Name	**Activity Description**
Anti-Submarine Warfare	
Tracking Exercise/ Torpedo Exercise-Helicopter	Helicopter crews search, track, and detect submarines. Recoverable air launched torpedoes may be employed against submarine targets.
Long Description	This exercise involves helicopters using sonobuoys and dipping sonar to search for, detect, classify, localize, and track a simulated threat submarine with the goal of determining a firing solution that could be used to launch a torpedo and destroy the submarine. Sonobuoys are typically employed by a helicopter operating at altitudes below 3,000 ft. (914 m). Both passive and active sonobuoys are employed. The dipping sonar is employed from an altitude of about 50 ft. (15 m) after the search area has been narrowed based on the sonobuoy search. Both passive and active sonar are employed. The anti-submarine warfare target used for this exercise will likely be an Expendable Mobile Anti-submarine Warfare Training Target, a MK-30 recoverable exercise target or a live submarine if available. This exercise may involve a single aircraft, or be undertaken in the context of a coordinated larger exercise involving multiple aircraft and vessels, including a major range event. The tracking exercise becomes a torpedo exercise when the helicopter launches an exercise torpedo. The exercise torpedo is recovered by a special recovery helicopter or small craft. The preferred range for this exercise is an instrumented range, but it may be conducted in other operating areas depending on training requirements and available assets.
Information Typical to the Event	**Platform:** Helicopters, surface vessels **Systems:** Mid-frequency helicopter dipping sonar, sonobuoys **Ordnance/Munitions:** Exercise torpedoes (non-explosive) **Targets: MK-39** Expendable Mobile Anti-Submarine Warfare Training Target or MK-30 recoverable target, or live submarine **Duration:** 2 to 4 hours **Location:** Hawaii Range Complex: Hawaii Operating Area (including Barking Sands Underwater Range Extension; Barking Sands Tactical Underwater Range; Shallow Water Training Range Southern California Range Complex: Southern California Anti-submarine Warfare Range, Shallow Water Training Range, San Clemente Island Underwater Range HSTT Transit Corridor
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Helicopter dipping sonar (MF4), sonobuoy (MF5), mid-frequency acoustic countermeasure (ASW4), lightweight torpedo (TORP1]), aircraft noise, vessel noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike, aircraft strike (birds only), vessel and in-water device strike **Entanglement:** Parachutes **Ingestion:** Parachutes
Detailed Military Expended Material Information	One Expendable Mobile Anti-Submarine Warfare Training Target If target is air-dropped, one parachute per target Up to 20 sonobuoys per event (one parachute for each sonobuoy) Torpedo accessories (ballast weights, parachutes)
Assumptions used for Analysis	Tracking exercise can occur in all locations, torpedo exercise will not occur in Hawaii-Southern California Training and Testing Transit Corridor or Point Mugu Sea Range portion of Southern California. Submarines may provide service as the target.

A.1.5.4 Tracking Exercise/Torpedo Exercise – Maritime Patrol Aircraft

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Anti-Submarine Warfare</td></tr>
<tr><td>Tracking Exercise/ Torpedo Exercise – Maritime Patrol Aircraft</td><td colspan="2">Maritime patrol aircraft crews search, detect, and track submarines. Recoverable air launched torpedoes may be employed against submarine targets.</td></tr>
<tr><td>Long Description</td><td colspan="2">This exercise involves fixed-wing maritime patrol aircraft employing sonobuoys to search for, detect, classify, localize, and track a simulated threat submarine with the goal of determining a firing solution that could be used to launch a torpedo and destroy the submarine.

Sonobuoys are typically employed by a maritime patrol aircraft operating at altitudes below 3,000 ft. (914 m), however, sonobuoys may be released at higher altitudes. Sonobuoys are deployed in specific patterns based on the expected threat submarine and specific water conditions. Depending on these two factors, these patterns will cover many different size areas. Both passive and active sonobuoys are employed. For certain sonobuoys, tactical parameters of use may be classified. The anti-submarine warfare target used for this exercise may be a MK-39 Expendable Mobile Anti-Submarine Warfare Training Target, a MK-30 target, or a live submarine. This exercise may involve a single aircraft, or be undertaken in the context of a coordinated larger exercise involving multiple aircraft and vessels, including a major range event.

The tracking exercise becomes a torpedo exercise when the aircraft launches an exercise torpedo.

The exercise torpedo is recovered by helicopter or small craft. The preferred range for this exercise is an instrumented underwater range, but it may be conducted in other operating areas depending on training requirements and available assets.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: One or more fixed-wing aircraft (Maritime Patrol Aircraft [manned or unmanned]), surface combatant or small vessels

Systems: Sonobuoys

Ordnance/Munitions: Exercise torpedoes (non-explosive)

Targets: Mk-39 Expendable Mobile Anti-Submarine Warfare Training Target, a MK-30 recoverable target, or a live submarine

Duration: 2 to 8 hours</td><td>Location:

Hawaii Operating Area, (including Barking Sands Underwater Range Extension; Barking Sands Tactical Underwater Range; Shallow Water Training Range

Southern California Operating Area, Southern California Anti-submarine Warfare Range, Shallow Water Training Range (Offshore/Nearshore)</td></tr>
<tr><td>Potential Impact Concerns

(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Sonobuoys (MF5), lightweight torpedo (TORP1]), vessel noise, aircraft noise

Energy: None

Physical Disturbance and Strike: Aircraft strike (birds only), vessel and in-water device strike, military expended material strike; torpedo accessories (ballast weights, parachutes)

Entanglement: Parachutes

Ingestion: Parachutes</td></tr>
</table>

Activity Name	**Activity Description**
Anti-Submarine Warfare	
Tracking Exercise/ Torpedo Exercise – Maritime Patrol Aircraft	Maritime patrol aircraft crews search, detect, and track submarines. Recoverable air launched torpedoes may be employed against submarine targets.
Detailed Military Expended Material Information	One Expendable Mobile Anti-Submarine Warfare Training Target (MK-39); MK-30 are recovered Torpedo accessories (ballast weights, parachutes) from exercise torpedoes Expended sonobuoys with parachutes
Assumptions used for Analysis	Tracking exercise can occur in all locations, torpedo exercise will not occur in Point Mugu Sea Range portion of Southern California Submarine may provide service as the target. If target is air-dropped, one parachute per target Other Hawaii-Southern California Training and Test area events typically refer to those events that occur while vessels are in transit

A.1.5.5 Tracking Exercise – Maritime Patrol Aircraft Extended Echo Ranging Sonobuoys

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Anti-Submarine Warfare</td></tr>
<tr><td>Tracking Exercise-Maritime Patrol Aircraft Extended Echo Ranging Sonobuoys</td><td colspan="2">Maritime patrol aircraft crews search, detect and track submarines using extended echo ranging sonobuoys. Recoverable air launched torpedoes may be employed against submarine targets.</td></tr>
<tr><td>Long Description</td><td colspan="2">This exercise involves fixed-wing maritime patrol aircraft employing Improved Extended Echo Ranging and Multistatic Active Coherent sonobuoy systems to search for, detect, classify, localize, and track a simulated threat submarine with the goal of determining a firing solution that could be used to launch a torpedo and destroy the submarine. The Improved Extended Echo Ranging events use the SSQ-110A sonobuoy as an impulsive source, while the Multistatic Active Coherent events utilize the SSQ-125 sonobuoy as a tonal source. Each exercise would include the use of approximately 10 SSQ-110A or SSQ-125 sonobuoys. The anti-submarine warfare target used for this exercise may be a MK-39 Expendable Mobile Anti-Submarine Warfare Training Target, a MK-30 target, or a live submarine. This exercise may involve a single aircraft, or be undertaken in the context of a coordinated larger exercise involving multiple aircraft and ships, including a major range event.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Maritime Patrol Aircraft
Systems: Improved Extended Echo Ranging and multistatic active coherent sonobuoy systems
Ordnance/Munitions: None
Targets: MK-39 Expendable Mobile Anti-Submarine Warfare Training Target, a MK-30 recoverable target, or a live submarine
Duration: 2 to 8 hours</td><td>Location:
Hawaii Operating Area
Southern California Operating Areas, Point Mugu Sea Range (overlap area only), Shallow Water Training Range (Nearshore/Offshore)</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Sonobuoy (ASW2), underwater explosives (E4), aircraft noise
Energy: None
Physical Disturbance and Strike: Aircraft strike (birds only), military expended material strike
Entanglement: Parachutes
Ingestion: Parachutes, sonobuoy fragments</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">One Expendable Mobile Anti-Submarine Warfare Training Target (MK-39); MK-30 are recovered
Expended sonobuoys with parachutes</td></tr>
<tr><td>Assumptions used for Analysis</td><td colspan="2">If target is air-dropped, one parachute per target</td></tr>
</table>

A.1.5.6 Kilo Dip – Helicopter

Activity Name	Activity Description	
Anti-Submarine Warfare		
Kilo Dip-Helicopter	Helicopter crews briefly deploy their dipping acoustic sources to ensure the system's operational status.	
Long Description	This brief exercise involves an MH-60 helicopter and its dipping sonar. The helicopter transits to one of the Helicopter Offshore Training Areas located off the coast of southern California. There, the helicopter lowers its dipping sonar into the ocean and transmits the sonar briefly to ensure that the sonar system is operating correctly.	
Information Typical to the Event	**Platform:** MH-60 helicopter **Systems:** Mid-frequency helicopter dipping sonar **Ordnance/Munitions:** None **Targets:** None **Duration:** 20 minutes	**Location:** Southern California Range Complex: Helicopter Offshore Training Areas
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency helicopter dipping sonar (e.g., MF4) **Energy:** None **Physical Disturbance and Strike:** Helicopter strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	None	

A.1.5.7 Submarine Command Course Operations

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Anti-Submarine Warfare</td></tr>
<tr><td>Submarine Command Course</td><td colspan="2">Train prospective submarine Commanding Officers to operate against surface, air, and subsurface threats</td></tr>
<tr><td>Long Description</td><td colspan="2">Train prospective Commanding Officers on submarines to operate against each other to locate and conduct simulated attacks.
Submarine Command Course Operations is a Commander, U.S. Submarine Forces requirement to provide training to prospective submarine commanders in rigorous and realistic scenarios. This training assesses prospective commanding officers’ abilities to operate in numerous hostile environments, encompassing surface vessels, aircraft, as well as other submarines.
The course incorporates anti-submarine warfare tracking exercise, anti-submarine warfare torpedo exercise.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Submarines, surface ships, and fixed-wing and rotary-wing aircraft
Systems: Mid-frequency (primarily passive) and high-frequency sonar Ordnance/Munitions: Exercise torpedoes (torpedo exercise only
Targets: MK-30 recoverable target
Duration: 3 to 5 days (at-sea portion)</td><td>Location:
Hawaii Operating Area, Maui North/South</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Mid-frequency hull-mounted sonar (MF1, MF2, MF3), helicopter dipping sonar (MF4), sonobuoy (MF5), mid-frequency acoustic countermeasure (ASW3, ASW4), high-frequency hull-mounted sonar (HF1), lightweight torpedo (TORP1), heavyweight torpedo (TORP2)
Energy: None
Physical Disturbance and Strike: Vessel and in-water device strike, military expended material strike, aircraft strike (birds only)
Entanglement: Guidance wires, parachutes
Ingestion: Torpedo accessories, parachutes</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">Torpedo accessories (guidance wires, ballast weights, flex tubing)
Expended countermeasures
Expended sonobuoys with parachutes</td></tr>
<tr><td>Assumptions used for Analysis</td><td colspan="2">Torpedoes are recovered
Guidance wire brittle, breaks easily. Weights sink rapidly, etc.
For Alternatives 1 and 2 the anti-submarine warfare portion of this event is incorporated in Tracking Exercise/Torpedo Exercise Submarine</td></tr>
</table>

A.1.6 ELECTRONIC WARFARE TRAINING

Electronic warfare is the mission area of naval warfare that aims to control use of the electromagnetic spectrum and to deny its use by an adversary. Typical electronic warfare activities include threat avoidance training, signals analysis for intelligence purposes, and use of airborne and surface electronic jamming devices to defeat tracking systems.

A.1.6.1 Electronic Warfare Operations

Activity Name	**Activity Description**
Electronic Warfare	
Electronic Warfare Operations	Aircraft, surface vessel, and submarine personnel attempt to control portions of the electromagnetic spectrum used by enemy systems to degrade or deny the enemy's ability to take defensive actions.
Long Description	Aircraft, surface ship, and submarine personnel attempt to control critical portions of the electromagnetic spectrum used by enemy systems to degrade or deny their ability to defend its forces from attack or recognize an emerging threat early enough to take defensive actions. Electronic Warfare Operations can be active or passive, offensive or defensive. Fixed-wing aircraft employ active jamming and deception against enemy search radars to mask the friendly inbound strike aircraft mission. Surface vessels and submarines detect and evaluate enemy electronic signals from enemy aircraft or missile radars, evaluate courses of action concerning the use of passive or active countermeasures, then use vessel maneuvers and either chaff, flares, active electronic countermeasures, or a combination of them to defeat the threat.
Information Typical to the Event	**Platform:** Fixed and rotary-wing aircraft, surface combatant vessels **Systems:** None **Ordnance/Munitions:** None **Targets:** Land based fixed/mobile threat emitters **Duration:** 1 to 2 hours **Location:** Hawaii Operating Area Southern California Waters (Electronic Warfare Range)
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, aircraft strike (birds only) **Entanglement:** None **Ingestion:** None
Detailed Military Expended Material Information	None
Assumptions used for Analysis	All chaff and flares involved in this event are covered under chaff exercise and flare exercises, respectively

A.1.6.2 Counter Targeting Flare Exercise

Activity Name	Activity Description	
Electronic Warfare		
Counter Targeting-Flare Exercise	Fixed-winged aircraft and helicopters defend against an attack by deploying flares to disrupt threat infrared missile guidance systems.	
Long Description	Train fixed-winged aircraft and helicopter crews to deploy flares to disrupt threat infrared missile guidance systems to defend against an attack. Aircraft detect electronic targeting signals from threat radars or missiles or a threat missile plume when it is launched; dispense flares; and immediately maneuver to defeat the threat. This exercise trains aircraft personnel in the use of defensive flares designed to confuse infrared sensors or infrared homing missiles, thereby causing the sensor or missile to lock onto the flares instead of the real aircraft. Typically an aircraft will expend five flares in an exercise while operating above 3,000 ft. Flare exercises are often conducted with chaff exercises, rather than as a stand-alone exercise. Pyrotechnics are used on the range to simulate missile firings.	
Information Typical to the Event	**Platform:** Fixed-wing aircraft, rotary-wing aircraft **Systems:** None **Ordnance/Munitions:** Flares and pyrotechnics **Targets:** None **Duration:** 1 to 2 hours	**Location:** Hawaii Operating Area Southern California Waters (Electronic Warfare Range)
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Aircraft Noise **Energy:** None **Physical Disturbance and Strike:** Aircraft strike (birds only) **Entanglement:** None **Ingestion:** Expended components of flares (pistons)	
Detailed Military Expended Material Information	Flares and residuals from pyrotechnics	
Assumptions used for Analysis	Approximately five flares per aircraft	

A.1.6.3 Counter Targeting Chaff Exercise – Ship

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Electronic Warfare</td></tr>
<tr><td>Counter Targeting Chaff Exercise – Ship</td><td colspan="2">Surface vessel crews defend against an attack by deploying chaff, a radar reflective material, which disrupt threat targeting and missile guidance radars.</td></tr>
<tr><td>Long Description</td><td colspan="2">Surface vessel crews deploy chaff to disrupt threat targeting and missile guidance radars to defend against an attack.
Surface vessel crews detect electronic targeting signals from threat radars or missiles, dispense chaff, and immediately maneuver to defeat the threat. The chaff cloud deceives the inbound missile, and the vessel clears away from the threat.
Chaff is a radar reflector material made of thin, narrow, metallic strips cut in various lengths to elicit frequency responses, which deceive enemy radars. Chaff is employed create a target from the chaff that will lure enemy radar and weapons system away from the actual friendly platform.
Ships may also train with advanced countermeasure systems, such as the MK 53 Decoy Launching System (Nulka).</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Surface vessels
Systems: None
Ordnance/Munitions: None
Targets: MK 53 expendable decoys
Duration: 1.5 hours</td><td>Location:
Hawaii Operating Area
Southern California Waters (Electronic Warfare Range)</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: None
Energy: None
Physical Disturbance and Strike: Vessel strike
Entanglement: None
Ingestion: Expended components of chaff (end caps, pistons, chaff)</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">Chaff canisters
Expended components of chaff (end caps, pistons, chaff)
MK 53 expendable decoys</td></tr>
<tr><td>Assumptions used for Analysis</td><td colspan="2">None</td></tr>
</table>

A.1.6.4 Counter Targeting Chaff Exercise – Aircraft

Activity Name	**Activity Description**	
Electronic Warfare		
Counter Targeting Chaff Exercise – Aircraft	Fixed-winged aircraft and helicopter crews defend against an attack by deploying chaff, a radar reflective material, which disrupt threat targeting and missile guidance radars.	
Long Description	Fixed-winged aircraft and helicopter crews deploy chaff to disrupt threat targeting and missile guidance radars and to defend against an attack. Fixed-winged aircraft and helicopter crews detect electronic targeting signals from threat radars or missiles, dispense chaff, and immediately maneuver to defeat the threat. The chaff cloud deceives the inbound missile and the aircraft clears away from the threat. Chaff is a radar reflector material made of thin, narrow, metallic strips cut in various lengths used to lure an enemy radar and weapons system away from the actual friendly platform.	
Information Typical to the Event	**Platform:** Fixed-wing aircraft, rotary-wing aircraft **Systems:** None **Ordnance/Munitions:** None **Targets:** None **Duration:** 1.5 hours	**Location:** Hawaii Operating Area Southern California Waters (Electronic Warfare Range)
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Aircraft noise **Energy:** None **Physical Disturbance and Strike:** Aircraft strike (birds only) **Entanglement:** None **Ingestion:** Expended components of chaff (end caps, pistons, chaff)	
Detailed Military Expended Material Information	Chaff cartridges Plastic end caps Pistons	
Assumptions used for Analysis	Chaff is usually expended while conducting other training activities, such as air combat maneuvering	

A.1.7 MINE WARFARE TRAINING

Mine warfare training is the naval warfare area involving the detection, avoidance, and neutralization of mines to protect Navy ships and submarines, and offensive mine laying in naval operations. A naval mine is a self-contained explosive device placed in water to destroy ships or submarines. Naval mines are deposited and left in place until triggered by the approach of, or a contact with an enemy ship, or are destroyed or removed. Naval mines can be laid by purpose-built minelayers, other ships, submarines, or airplanes. Mine warfare training includes mine countermeasures exercises and mine laying exercises.

A.1.7.1 Mine Countermeasure Exercise – Ship Sonar

Activity Name	Activity Description	
Mine Warfare		
Mine Countermeasure Exercise – Ship Sonar	Surface vessel crews detect and avoid mines while navigating restricted areas or channels using active sonar.	
Long Description	Surface vessel crews detect and avoid mines or other underwater hazardous objects while navigating restricted areas or channels using active sonar. Littoral Combat Ship utilizes unmanned surface vehicles and remotely operated vehicles to tow mine detection (hunting) equipment. Systems will operate from shallow zone greater than 40 ft. to deep water. Events could be embedded in major training events.	
Information Typical to the Event	**Platform:** Surface combatant vessels (e.g., Littoral Combat Ships), unmanned surface vehicles **Systems:** AN/AQS-20, Remote Mine hunting System, AN/AQS-24, SQS-53 and SQS-56 **Ordnance/Munitions:** None **Targets:** Minefields, Temporary placed mine (training to deploy or operate gear) **Duration:** 1.5 to 4 hours	**Location:** Hawaii Range Complex: Hawaii Operating Area, Kingfisher, Shallow-water Minefield Sonar Training Area Southern California Range Complex: Kingfisher, Shallow Water Training Range -Offshore or Shallow Water Minefield
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Sonar and other acoustic sources (MF1K, MF2K HF4) vessel noise **Energy:** Sub-surface laser imaging **Physical Disturbance and Strike:** Vessel and in-water device strike, seafloor device strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None anticipated Temporary placed mines will be recovered	
Assumptions used for Analysis	No explosives used Constraints: Assume system will be operated in areas free of obstructions, and will be towed well above the seafloor. Towed system will be operated in a manner to avoid entanglement and damage. Events will take place in water depths 40 ft. and greater Existing placed mineshapes to be used. Potential for temporary placement of mineshapes	

A.1.7.2 Mine Countermeasure Exercise – Surface

Activity Name	Activity Description	
Mine Warfare		
Mine Countermeasure Exercise – Surface	Mine countermeasure ship crews detect, locate, identify, and avoid mines while navigating restricted areas or channels, such as while entering or leaving port.	
Long Description	This event trains mine countermeasure ship crews to detect mines for future neutralization or to alert other ships. Training utilizes simulated minefields constructed of moored or bottom mines, or instrumented mines that can record effectiveness of mine detection efforts. Ships will accurately fix their position while navigating through the restricted mine threat area at slow speeds of about 5 to 10 knots or less, while using active sonar to search the area ahead of the ship for moored mines or other hazards of navigation.	
Information Typical to the Event	**Platform:** Surface combatant vessel **Systems:** Sonar (e.g., AN/SQQ-32) **Ordnance/Munitions:** None **Targets:** None **Duration:** The exercise may last as long as 15 hours	**Location:** Southern California Range Complex: Kingfisher, Shallow Water Training Range-Offshore, Shallow Water Minefield, Silver Strand Training Complex, Camp Pendleton Amphibious Assault Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mine detection sonar (HF4), vessel noise **Energy:** None **Physical Disturbance and Strike:** None **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	None	

A.1.7.3 Mine Neutralization – Explosive Ordnance Disposal

Activity Name	Activity Description	
Mine Warfare		
Mine Neutralization – Explosive Ordnance Disposal	Personnel disable threat mines. Explosive charges are used.	
Long Description	Navy divers, typically explosive ordnance disposal personnel, disable threat mines with explosive charges to create a safe channel for friendly vessels to transit. Personnel detect, identify, evaluate, and neutralize mines in the water with an explosive device and may involve detonation of one or more explosive charges from 10 to 60 pounds of TNT equivalent. These operations are normally conducted during daylight hours for safety reasons. Time delay fuses may be used for these events.	
Information Typical to the Event	**Platform:** Rotary-wing aircraft, small boats **Systems:** None **Ordnance/Munitions:** Underwater detonation charges **Targets:** Minefields **Duration:** Up to 4 hours	**Location:** Hawaii Range Complex: Puuloa Underwater Range, Marine Corps Base Hawaii, Marine Corps Training Area Bellows, Barbers Point Underwater Range, Naval Inactive Ship Maintenance Facility, Lima Landing, Ewa Training Minefield Southern California Range Complex: Northwest Harbor, Horse Beach Cove, Southern California Anti-submarine Warfare Range, Shallow Water Training Range, in Special Warfare Training Area, Offshore waters Silver Strand Training Complex: Boat Lanes 1–14
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives (E1, E4, E5, E6, E7, E8), vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, aircraft strike (birds only), seafloor device strike **Entanglement:** None **Ingestion:** Target fragments	
Detailed Military Expended Material Information	Target fragments; mooring blocks	
Assumptions used for Analysis	Time delayed fuses may be used (up to 15 minutes). Charge placed anywhere in water column, including bottom Mine shapes will be recovered	

A.1.7.4 Mine Countermeasure – Towed Mine Neutralization

Activity Name	Activity Description	
Mine Warfare		
Mine Countermeasures – Towed Mine Neutralization	Helicopter aircrews employ towed mine neutralization systems (e.g. Organic Airborne and Surface Influence Sweep [OASIS], MK-103/104/105)	
Long Description	Naval helicopters use towed devices to clear minefields by triggering mines that sense and explode when they detect ships/submarines by engine/propeller sounds or magnetic (steel construction) signature. Towed devices can also employ cable cutters to detach floating moored mines. Training will either be conducted against non-explosive training mineshapes, or, without any mineshapes. A high degree of pilot skill is required in deploying devices, safely towing them at relatively low speeds and altitudes, and then recovering devices. Devices used include the following: Organic Airborne and Surface Influence Sweep (OASIS). The Organic Airborne and Surface Influence Sweep is a towed device that imitates the magnetic and acoustic signatures of naval ships and submarines. MK 105 sled: the MK 105 sled, similar to the Organic Airborne and Surface Influence Sweep, creates a magnetic field used to trigger mines. The MK 105 sled can also be used in conjunction with the MK 103 cable cutter system and the MK 104 acoustic countermeasure. AN/SPU-1/W “Magnetic Orange Pipe”: As the name implies, the AN/SPU-1/W is a magnetic pipe that is used to trigger magnetically influenced mines.	
Information Typical to the Event	**Platform:** Surface combatant vessel (e.g., Littoral Combat Ship), unmanned surface vehicle, unmanned underwater vehicles, rotary-wing aircraft **Systems:** None **Ordnance/Munitions:** Cable cutters (MK-103) **Targets:** Existing minefields, temporary placed mines, or no targets (training to deploy/operate gear) **Duration:** Typically 1.5 hours, up to 4 hours	**Location:** Southern California Range Complex: Pyramid Cove, Northwest Harbor, Kingfisher Training Range, Mine Training Range-1/2, Shallow Water Minefield, Helicopter Offshore Training Area, Camp Pendleton Amphibious Assault Area All Silver Strand Training Complex Boat Lanes 1–14, in water greater than 40 ft. deep
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, aircraft noise **Energy:** Electromagnetics **Physical Disturbance and Strike:** Vessel and in-water device strike, seafloor device strike (bottom placed mine shapes) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	Mooring blocks	
Assumptions used for Analysis	Towed from helicopters, ships, unmanned surface vehicles and unmanned underwater vehicles. Mechanical sweeping (cable cutting), acoustic, and magnetic influence sweeping. Cable cutters utilize an insignificant charge (similar to shotgun shell). Acoustic sweeps generate ship type noise via mechanical system. Towing systems though minefields (or without mines, to train to deploy, tow, and recover). May involve instrumented mines (VIMS).	

A.1.7.5 Airborne Mine Countermeasure – Mine Detection

Activity Name	Activity Description	
Mine Warfare		
Airborne Mine Countermeasure – Mine Detection	Vessel crews and helicopter aircrews detect mines using towed or laser mine detection systems (e.g., AN/AQS-20, Airborne Laser Mine Detection System).	
Long Description	Helicopter crews use towed and airborne devices to detect, locate, and classify potential mines. Towed devices employ active acoustic sources, such as high frequency and side scanning sonar. These devices are similar in function to systems used to map the seafloor or locate submerged structures or items. Airborne devices utilize laser systems to locate mines located below the surface. Devices used include the AN/AQS-20/A, towed minehunting sonar used to detect and classify bottom and floating/moored mines in deep and shallow water, and the Airborne Laser Mine Detection System, developed to detect and classify floating and near-surface, moored mines.	
Information Typical to the Event	**Platform:** Rotary-wing aircraft, Unmanned surface vehicles, Unmanned underwater vehicles **Systems:** Airborne Laser Mine Detection System (AN/AQS-20A, AN/AQS-24A) **Ordnance/Munitions:** None **Targets:** Existing minefields, temporary placed mines, or no targets (training to deploy/operate gear) **Duration:** Typically 1.5 hours, up to 4 hours	**Location:** Southern California Range Complex: Pyramid cove, Northwest Harbor, Kingfisher Training Range, Mine Training Range-1/2, Shallow Water Minefield, Helicopter Offshore Training Area, Camp Pendleton Amphibious Assault Area Silver Strand Training Complex: Boat Lanes 1–14, in water greater than 40 ft. deep
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mine detection sonar (HF4), vessel noise, aircraft noise **Energy:** In-air low energy laser **Physical Disturbance and Strike:** Vessel and in-water device strike, aircraft strike (birds only), seafloor device strike (bottom placed mine shapes) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	Sonar mine detection systems towed from helicopters, vessels, unmanned surface vehicles Use of airborne laser systems to detect mine shapes Laser systems similar to commercial Light Detection And Ranging (LIDAR) systems Mine shapes will be recovered	

A.1.7.6 Mine Countermeasure – Mine Neutralization

Activity Name	Activity Description	
Mine Warfare		
Mine Countermeasure (MCM) – Mine Neutralization	Vessel crews or helicopter aircrews disable mines by firing small- and medium-caliber projectiles.	
Long Description	Vessel and helicopter crews utilize small- and medium- caliber weapons to neutralize potential mines. Weapons may employ laser detection and targeting systems. Small- and medium- caliper projectiles are non-explosive, and neutralize mines by breaching casing, causing the mine to flood or detonate.	
Information Typical to the Event	**Platform:** Rotary-wing aircraft, surface combatant vessels **Systems:** None **Ordnance/Munitions:** Small-caliber and medium-caliber (non-explosive) **Targets:** Existing minefields, Temporarily placed mines **Duration:** Typically 1.5 hours, up to 4 hours	**Location:** Southern California Range Complex: Pyramid cove, Northwest Harbor, Kingfisher Training Range, Mine Training Range-1/2, Shallow Water Minefield
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, aircraft noise **Energy:** In-air low energy laser **Physical Disturbance and Strike:** Vessel and in-water device strike; military expended material strike (projectiles); seafloor device strike (bottom placed mine shapes); aircraft strike (birds only) **Entanglement:** None **Ingestion:** Small- and medium-caliber projectiles, Casings	
Detailed Military Expended Material Information	Small- and medium-caliber projectiles Casings	
Assumptions used for Analysis	None	

A.1.7.7 Mine Neutralization – Remotely Operated Vehicle

Activity Name	Activity Description	
Mine Warfare		
Mine Countermeasures – Mine Neutralization – Remotely Operated Vehicles	Vessel crews or helicopter aircrews disable mines using remotely operated underwater vehicles.	
Long Description	Vessel and helicopter crews utilize remotely operated vehicles to neutralize potential mines. Remotely operated vehicles will use sonar and optical systems to locate and target mine shapes. Explosive mine neutralizers may be used during live fire events.	
Information Typical to the Event	**Platform:** Rotary-wing aircraft, surface combatant vessels **Systems:** Acoustic mine targeting system **Ordnance/Munitions:** High explosive neutralizers (possibly) **Targets:** Existing minefields, temporary placed mines **Duration:** Typically 1.5 hours, up to 4 hours	**Location:** Southern California Range Complex: Kingfisher, Shallow Water Training Range-Offshore, Shallow Water Minefield, Camp Pendleton Amphibious Assault Area Silver Strand Training Complex: Boat Lanes 1–14; Breakers Beach, Delta I, II, and Delta North, Echo
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives (E4), vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Vessel and in-water device strike, sea floor device strike (bottom placed mine shapes), aircraft strike (birds only) **Entanglement:** Fiber optic cable **Ingestion:** Neutralizer fragments	
Detailed Military Expended Material Information	Neutralizer fragments Fiber optic cables	
Assumptions used for Analysis	Acoustic sources associated with remotely operated vehicle mine neutralization systems do not require quantitative analysis. See Section 2.3.7.2.	

A.1.7.8 Mine Laying

Activity Name	Activity Description	
Mine Warfare		
Mine Laying	Fixed-winged aircraft and submarine crews drop or launch non-explosive mine shapes.	
Long Description	Fixed-winged aircraft and submarine crews lay offensive or defensive mines for a tactical advantage for friendly forces. Fixed-winged aircraft lay a precise minefield pattern for specific tactical situations. The aircrew typically makes multiple passes in the same flight pattern, and drops one or more training shapes (four shapes total). Training shapes are non-explosive and are recovered when possible.	
Information Typical to the Event	**Platform:** Fixed-wing aircraft (e.g., F/A-18, P-3, P-8, F-35, B-52, B1B) **Systems:** None **Ordnance/Munitions:** Non-explosive mine shapes, "Quick-strike" mines **Targets:** None **Duration:** 1 hour	**Location:** Hawaii Range Complex: R-3101 Southern California Range Complex: Mine Training Range, Shallow Water Training Ranges, Pyramid Cove, China Point
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Aircraft noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (non-explosive mine shapes), aircraft strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	Non-explosive mine shapes	
Assumptions used for Analysis	Similar to non-explosive bombing exercise These events primarily occur during major training exercises While mineshapes will be recovered if possible, assume they will not for the analysis Mine laying will take place in waters less than 100 ft. Assume 12 mineshapes used per event	

A.1.7.9 Marine Mammal System

Activity Name	Activity Description	
Mine Warfare		
Marine Mammal Systems Operations	Navy personnel and Navy marine mammals work together to detect specified underwater objects.	
Long Description	The Navy deploys trained bottlenose dolphins (*Tursiops trucatus)* and California sea lions (*Zalophus californianus*) as part of the marine mammal mine-hunting and object-recovery system. Each system consists of a motorized small craft, several crewmembers and a trained dolphin or sea lion. Self-Contained Underwater Breathing Apparatus (SCUBA) assisted personnel and Navy marine mammals work together to detect specified underwater objects. Personnel work with the help of marine mammals to detect underwater objects. Approximately 10 percent of training involves the setting of a 13 or 29 lb. (5.9- or 13-kilogram) Net Explosive Weight charge to detonate the objects.	
Information Typical to the Event	**Platform:** Small boats **Systems:** None **Ordnance/Munitions:** 13- or 29-lb. Net Explosive Weight Charge **Targets:** None **Duration:** Varies	**Location:** Hawaii Range Complex: Hawaii Operating Area, Kingfisher, Shallow Waters Minefield, Sonar Training Area Silver Strand Training Complex: Boat Lanes 1–14; Breakers Beach
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives (E6, E7), vessel noise **Energy:** None **Physical Disturbance and Strike:** None **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	Minimal mine detonation residue (only during the 10 percent of training that includes an explosive charge)	
Assumptions used for Analysis	Sequential detonations at water depths of 10 to 72 ft. (3 to 22 m) and are bottom laid. Single charges are laid within water depths of 24 to 72 ft. (7 to 22 m), 20 ft. (6 m) from the surface or below.	

A.1.7.10 Shock Wave Action Generator

Activity Name	Activity Description	
Mine Warfare (MIW)		
Shock Wave Action Generator	Navy divers place a small charge on a simulated underwater mine.	
Long Description	For shock wave action generator training, a metal sheet containing a non-explosive limpet mine is lowered into the water, sometimes from the side of a small vessel, such as an LCM-8 craft. Divers place a single shock wave generator on the mine that is located mid-water column, within water depths of 10 to 20 ft. (3 to 6 m). A bag is placed over the mine to catch falling debris.	
Information Typical to the Event	**Platform:** None **Systems:** None **Ordnance/Munitions:** One 15 gram explosive charge **Targets:** Metal sheet with limpet mine **Duration:** 2 hours	**Location:** Silver Strand Training Complex: Boat Lanes 1–14; San Diego Bay-Echo
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives, vessel noise **Energy:** None **Physical Disturbance and Strike:** None **Entanglement:** None **Ingestion:** Mine detonation residue	
Detailed Military Expended Material Information	Minimal mine detonation residue (most materials are recovered after each event)	
Assumptions Used for Analysis	None	

A.1.7.11 Surf Zone Test Detachment/Equipment Test and Evaluation

Activity Name	Activity Description	
Mine Warfare (MIW)		
Surf Zone Test Detachment/Equipment Test and Evaluation	Navy personnel test and evaluate the effectiveness of new detection and neutralization equipment designated for surf conditions.	
Long Description	Navy personnel test and evaluate the effectiveness of new detection and neutralization equipment designated for surf conditions. To support clearance capability in the surf zone (out to 10 ft. [3 m] of water), Explosive Ordnance Disposal personnel would test and evaluate the effectiveness of new detection and neutralization equipment designated for surf conditions. Use of explosives will occur during 1 percent of training activities (0.1 to 29 lb. [.045 to 9 kg] Net Explosive Weight) and will only occur in the Silver Strand Training Complex Boat Lanes. Time delay fuses may be used for these events.	
Information Typical to the Event	**Platform:** None **Systems:** Hand-held sonar systems **Ordnance/Munitions:** Explosive charges **Targets:** Simulated mines **Duration:** 3 hours	**Location:** Silver Strand Training Complex: Boat Lanes 1–14; San Diego Bay-Echo
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Hand-held sonar systems (HHS1) and explosives (E7) **Energy:** None **Physical Disturbance and Strike:** None. **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	Minimal mine detonation residue (only during the 1 percent of training that includes an explosive charge)	
Assumptions Used for Analysis	None	

A.1.7.12 Submarine Mine Exercise

Activity Name	Activity Description	
Mine Warfare (MIW)		
Submarine Mine Exercise	Submarine crews practice detecting mines in a designated area.	
Long Description	Submarine crews use active sonar to detect and avoid mines or other underwater hazardous objects, while navigating restricted areas or channels, such as while entering or leaving port. This event trains submarine crews to detect and avoid mines. Training utilizes simulated minefields constructed of moored or bottom mines, or instrumented mines that can record effectiveness of mine detection efforts. In a typical training exercise, submarine crews will use the AN/BQS-15 high-frequency active sonar to locate and avoid the mine shapes. Each mine avoidance exercise involves one submarine operating the AN/BQS-15 sonar for 6 hours to navigate through the training minefield. During mine warfare exercises submarines will expend several submarine-launched expendable bathythermographs to determine water conditions affecting sonar performance.	
Information Typical to the Event	**Platform:** Submarine **Systems:** Sonar (AN/BQS-15) **Ordnance/Munitions:** None **Targets:** Mine shapes **Duration:** 6 hours	**Location:** Hawaii Operating Area, Kahoolawe Submarine Training Minefield Advanced Research Projects Agency Training Minefield, Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** High-frequency sonar (e.g., AN/BQS-15) **Energy:** None **Physical Disturbance and Strike:** None **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	None	

A.1.7.13 Civilian Port Defense

Activity Name	Activity Description
Mine Warfare	
Civilian Port Defense	Maritime security activities for military and civilian ports and harbors.
Long Description	Naval forces provide Mine Warfare capabilities to Department of Homeland Security led event. The three pillars of Mine Warfare, Airborne (helicopter), Surface (ships and unmanned vehicles), and Undersea (divers, marine mammals, and unmanned vehicles) mine countermeasures will be brought to bear in order to ensure strategic U.S. ports remain free of mine threats. Various Mine Warfare sensors, which utilize active acoustics, will be employed in the detection, classification, and neutralization of mines. Along with traditional Mine Warfare techniques, such as helicopter towed mine countermeasures, new technologies (unmanned vehicles) will be utilized. Event locations and scenarios will vary according to Department of Homeland Security strategic goals and evolving world events. Purpose of HSTT analysis is to ensure adequate Marine Mammal Protection Act (MMPA) authorizations are in place to support the use of acoustic mine detection sensors. Additional analysis and regulatory engagement will be conducted as appropriate as planning for the actual events begin.
Information Typical to the Event	**Platform:** Surface combatant vessels, Small boats, Rotary-wing aircraft **Systems:** Unmanned underwater and surface vehicles, various mine detection sensors **Ordnance/Munitions:** High explosive charges **Targets:** Temporary mineshapes **Duration:** Multiple days **Location:** San Diego Bay Pearl Harbor
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Sonar ([HF4] e.g., AN/AQS-20, AN/AQS-24), underwater explosives (E2, E4); vessel noise; aircraft noise **Energy:** Electromagnetic (magnetic influence mine sweeping) **Physical Disturbance and Strike:** Vessel and in-water device strikes; seafloor device strike (bottom placed mine shapes); aircraft strike (birds only) **Entanglement:** None **Ingestion:** None
Detailed Military Expended Material Information	None
Assumptions used for Analysis	Non-permanent mine shapes will be laid in various places on the bottom of San Diego Bay. Shapes are varied, from about 1 m circular to about 2.5 m long by 1 m wide. They will be recovered using normal assets, with diver involvement. Programmatic analysis for acoustic effects only. While goal is to conduct once per year, alternating east/west coast, assume that a West Coast event will occur every year with a total of three per five year period.

A.1.8 NAVAL SPECIAL WARFARE TRAINING

Naval special warfare and other Navy forces train to conduct military operations in five Special Operations mission areas: unconventional warfare, direct action, special reconnaissance, foreign internal defense, and counterterrorism. Naval special warfare training involves specialized tactics, techniques, and procedures, employed in training events that include: insertion/extraction operations using parachutes rubber boats, or helicopters; boat-to-shore and boat-to-boat gunnery; underwater demolition training; reconnaissance; and small arms training.

A.1.8.1 Personnel Insertion/Extraction – Non-Submarine

Activity Name	Activity Description	
Naval Special Warfare		
Personnel Insertion/Extraction – Non-Submarine	Personnel train to approach or depart an objective area using various transportation methods and tactics.	
Long Description	Personnel train to approach or depart an objective area using various transportation methods and tactics. These activities train forces to insert and extract personnel and equipment day or night. Tactics and techniques employed include insertion from aircraft by parachute, by rope, or from low, slow-flying helicopters from which personnel jump into the water. Parachute training is required to be conducted on surveyed drop zones to enhance safety. Insertion and extraction methods also employ small inflatable boats.	
Information Typical to the Event	**Platform:** Fixed and rotary-wing aircraft **Systems:** None **Ordnance/Munitions:** None **Targets:** None **Duration:** 2 to 8 hours	**Location:** Southern California Range Complex: Southern California Operating Area, San Clemente Island Silver Strand Training Complex: Boat Lanes 1–14, Echo
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Aircraft noise **Energy:** None **Physical Disturbance and Strike:** Aircraft strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	None	

A.1.8.2 Personnel Insertion/Extraction – Submarine

Activity Name	Activity Description	
Naval Special Warfare		
Personnel Insertion/Extraction - Submarine	Military personnel train for covert insertion and extraction into target areas using submarines.	
Long Description	Military personnel train for covert insertion and extraction into target areas using submarines. Often, an undersea delivery vehicle, similar to a "mini-sub" may be used to transfer the personnel from the submarine to their objective near shore. Several methods are used by submarines and embarked personnel to move from the submarine to the objective area: • The lock-in/lock-out procedure allows personnel to swim out of submerged submarines. • The Sea, Air, Land (SEAL) Delivery Vehicle may be used by Naval Special Warfare personnel to move from the submarine to an underwater area closer to shore. Submarines approach a hostile area and move at a very slow speed while inserting or extracting Naval Special Warfare or other personnel by using one, or a combination of the procedures discussed above. Once the personnel have inserted or extracted, the submarine will leave the area. Opposition force personnel may be employed as well as small arms with blanks or live ammunition once the personnel reach the beach area. These operations will vary in length depending on the transportation method and systems being used. Training may include navigation runs into and out of the San Diego Bay or Pearl Harbor that may be conducted in coordination with other training activities.	
Information Typical to the Event	**Platform:** Sea, Air, Land Delivery Vehicle **Systems:** None **Ordnance/Munitions:** None (if used, small-caliber) **Targets:** None **Duration:** 2 to 8 hours	**Location:** Hawaii Range Complex: Hawaii Operating Area, Marine Corps Training Area Bellows; Pacific Missile Range Facility (Main Base) Silver Strand Training Complex: Boat Lanes 1-10, Delta III, Echo, Foxtrot, Golf, Hotel
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** None **Energy:** None **Physical Disturbance and Strike:** None **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	Small-caliber projectiles, if used	
Assumptions Used for Analysis	None	

A.1.8.3 Underwater Demolition Multiple Charge – Mat Weave and Obstacle Loading

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Naval Special Warfare</td></tr>
<tr><td>Underwater Demolitions Multiple Charge-Mat Weave and Obstacle Loading</td><td colspan="2">Military personnel use explosive charges to destroy barriers or obstacles to amphibious vehicle access to beach areas.</td></tr>
<tr><td>Long Description</td><td colspan="2">Navy personnel train to construct, place, and safely detonate multiple charges laid in a pattern for underwater obstacle clearance.
Naval Special Warfare or Explosive Ordnance Disposal personnel locate barriers or obstacles designed to block amphibious vehicle access to beach areas, then use explosive charges to destroy them. Pattern charges (mat weaves) may use as much as 500 lb. (227 kg) of high explosive.
Time delay fuses may be used for these events.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Small boats
Systems: None
Ordnance/Munitions: High-explosive charges (up to 500 lb.)
Targets: None
Duration: Varies</td><td>Location:
Southern California Range Complex: Northwest Harbor (Training Areas and Ranges 2 and 3), Special Warfare Training Area</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Underwater explosives (E9)
Energy: None
Physical Disturbance and Strike: None
Entanglement: None
Ingestion: None</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">Minimal mine detonation residue (most materials are recovered after each event)</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="2">None</td></tr>
</table>

A.1.8.4 Underwater Demolition Qualification/Certification

Activity Name	**Activity Description**	
Naval Special Warfare		
Underwater Demolition Qualification/Certification	Navy divers conduct training and certification in placing underwater demolition charges.	
Long Description	Demolition re-qualifications and training provides teams with experience in underwater detonations by conducting detonations on metal plates near the shoreline. At water depths of 10 to 72 ft. (3 to 22 m), two sequential 12.5 to 13.75 lb. (5.7 to 6.2 kg) Net Explosive Weight charges are placed on the bottom or a single 25.5 lb. (11.5 kilogram) charge is placed from a depth of 20 ft. (6 m) to the bottom.	
Information Typical to the Event	**Platform:** Small boats **Systems:** None **Ordnance/Munitions:** High-explosive charges (up to 29 lb.) **Targets:** None **Duration:** Varies	**Location:** Southern California Range Complex Silver Strand Training Complex: Boat and Beach Lanes 1–14
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives (E7) **Energy:** None **Physical Disturbance and Strike:** None **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	Minimal mine detonation residue (most materials are recovered after each event)	
Assumptions Used for Analysis	None	

A.1.9 OTHER TRAINING

A.1.9.1 Precision Anchoring

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Other Training</td></tr>
<tr><td>Precision Anchoring</td><td colspan="2">Releasing of anchors in designated locations.</td></tr>
<tr><td>Long Description</td><td colspan="2">Vessels navigate to a pre-planned position and deploy the anchor. The vessel uses all means available to determine its position when anchor is dropped to demonstrate calculating and plotting the anchor's position within 100 yards of center of planned anchorage.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: All surface vessels
Systems: None
Ordnance/Munitions: None
Targets: None
Duration: Up to 1 hour</td><td>Location:
Hawaii Range Complex: Pearl Harbor Defense Sea Area
Silver Strand Training Complex: Anchorages</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: None
Energy: None
Physical Disturbance and Strike: Vessel strike, seafloor device strike (anchor)
Entanglement: None
Ingestion: None</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">None</td></tr>
<tr><td>Assumptions used for Analysis</td><td colspan="2">None</td></tr>
</table>

A.1.9.2 Small Boat Attack

Activity Name	Activity Description	
Other		
Small Boat Attack	Small attacks are conducted on boats. For this activity, one or two small boats or personal watercraft conduct attack activities on units afloat.	
Long Description	Small attacks are conducted on boats, usually within anchorages or boat lanes. For this activity, one or two small boats or personal watercraft conduct attack activities on units afloat, firing blank small-caliber rounds. The activity will usually include observers.	
Information Typical to the Event	**Platform:** Small boats or watercraft **Systems:** **Ordnance/Munitions:** Small caliber (non-explosive) **Targets:** High-performance small boats and unmanned vehicles **Duration:** Varies	**Location:** Hawaii Operating Areas Silver Strand Training Complex: Boat Lanes 1-10
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** None **Energy:** None **Physical Disturbance and Strike:** Vessel strike, military expended material strike (non-explosive projectiles) **Entanglement:** None **Ingestion:** Small-caliber projectiles	
Detailed Military Expended Material Information	Small-caliber projectiles	
Assumptions used for Analysis	None	

A.1.9.3 Offshore Petroleum Discharge System

Activity Name	**Activity Description**	
Other		
Offshore Petroleum Discharge System	This activity trains personnel in the transfer of petroleum (though only sea water is used during training) from ship to shore.	
Long Description	Offshore petroleum discharge system training consists of five training subcomponents including the beach termination unit; operation utility boat technicians; boat coxswain; dive boat operation technician; and single anchor leg moor training. This activity trains personnel in the transfer of petroleum (though only sea water is used during training) from ship to shore. From approximately one mile offshore, technicians and underwater construction team divers roll out conduit from a ship offshore, deploy the single anchor leg mooring which sinks to and settles on the ocean floor, and use anchors at various points along the conduit to secure it to the seafloor. The conduit terminates at the shore location of the termination unit manifold. The current training at Silver Strand Training Complex consists of rolling out a four mile fluid-transfer conduit from the beach out to approximately one mile offshore and anchoring it to the seafloor with a Single Anchor Leg Moor. The improved offshore petroleum discharge system would have a self-sinking hose that could extend up to eight miles offshore, but like the current system, would still be rolled out to approximately one mile offshore during training activities at Silver Strand Training Complex.	
Information Typical to the Event	**Platform:** Surface combatant vessels, small boats, support craft/other **Systems:** None **Ordnance/Munitions:** None **Targets:** None **Duration:** Varies	**Location:** Silver Strand Training Complex: Boat Lanes 1-10, Bravo, Waters outside of boat lanes
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** None **Energy:** None **Physical Disturbance and Strike:** None **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	None	

A.1.9.4 Elevated Causeway System

Activity Name	**Activity Description**	
Other		
Elevated causeway System	A temporary pier is constructed off of the beach. Piles are driven into the sand and then later removed.	
Long Description	A pier is constructed off of the beach. The pier is designed to allow for offload of materials and equipment from supply ships. Piles are driven into the sand with an impact hammer. Causeway platforms are then hoisted and secured onto the piles with hydraulic jacks and cranes. It is assembled by joining standard causeway sections together and can be assembled in 10 days. The pier, including associated piles, is removed at the conclusion of training.	
Information Typical to the Event	**Platform:** Support craft/other **Systems:** None **Ordnance/Munitions:** None **Targets:** None **Duration:** Up to 10 days for assembly	**Location:** Silver Strand Training Complex: Boat Lanes 1-10, Designated Bravo Beach training lane; Camp Pendleton Amphibious Assault Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Pile driving and removal **Energy:** None **Physical Disturbance and Strike:** None **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	Programmatic analysis (only assessing acoustic impacts from the pile driving)	

A.1.9.5 Submarine Navigation

Activity Name	**Activity Description**	
Other		
Submarine Navigational	Submarine crews operate sonar for navigation and object detection while transiting in and out of port during reduced visibility.	
Long Description	Submarine crews train to operate sonar for navigation. The ability to navigate using sonar is critical for object detection while transiting in and out of port during periods of reduced visibility. Submarine Navigation training activities conducted while transiting in and out of port are done so while surfaced, with bridge watches and a single lookout.	
Information Typical to the Event	**Platform:** Submarines **Systems:** High frequency submarine sonar system **Ordnance/Munitions:** None **Targets:** None **Duration:** Up to 2 hours	**Location:** Hawaii Range Complex: Pearl Harbor Channel and virtual channel south of Pearl Harbor Southern California Range Complex: Naval Base Point Loma and seaward virtual channel
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** High frequency submarine sonar system (HF1); hull-mounted sonar (MF3) **Energy:** None **Physical Disturbance and Strike:** Vessel strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	None	

A.1.9.6 Submarine Under Ice Certification

Activity Name	Activity Description	
Other		
Submarine Under Ice Certification	Submarine crews train to operate under ice. Ice conditions are simulated during training and certification events.	
Long Description	Submarine crews train to operate under ice. Ice conditions are simulated during training and certification events.	
Information Typical to the Event	**Platform:** Submarine **Systems:** Submarine high frequency sources **Ordnance/Munitions:** None **Targets:** None **Duration:** A single exercise is comprised of 36 hours of training, spread out over 6 days in 6-hour training sessions.	**Location:** Hawaii Operating Areas Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** High–frequency submarine sonar (HF1) **Energy:** None **Physical Disturbance and Strike:** Vessel strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	None	

A.1.9.7 Salvage Operations

Activity Name	Activity Description	
Other		
Salvage Operations	Navy divers train to tow disabled ships, repair damaged ships, remove sunken ships, and conduct deep ocean recovery.	
Long Description	Navy divers train to tow disabled ships, repair damaged ships, remove sunken ships, and conduct deep ocean recovery. The Navy's Mobile Diving and Salvage Unit One and divers from other countries practice swift and mobile ship and barge salvage, towing, battle damage repair, deep ocean recovery, harbor clearance, removal of objects from navigable waters, and underwater ship repair capabilities.	
Information Typical to the Event	**Platform:** Surface vessels, other support vessels **Systems:** None **Ordnance/Munitions:** None **Targets:** None **Duration:** Varies	**Location:** Hawaii Range Complex: Puuloa Underwater Range, Pearl Harbor Defensive Sea Area, Keehi Lagoon, Pearl Harbor
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** None **Energy:** None **Physical Disturbance and Strike:** None **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	None	

A.1.9.8 Surface Ship Sonar Maintenance

Activity Name	**Activity Description**	
Other		
Surface Ship Sonar Maintenance	Pierside and at-sea maintenance of sonar systems.	
Long Description	This scenario consists of surface combatant vessels performing periodic maintenance to the hull mounted sonar systems while in port or at sea. This maintenance takes up to four hours. Surface vessels operate active sonar systems for maintenance while in shallow water near their homeport, however, sonar maintenance could occur anywhere as the system's performance may warrant.	
Information Typical to the Event	**Platform:** Surface combatant vessels **Systems:** Hull mounted sonar systems **Ordnance/Munitions:** None **Targets:** None **Duration:** Up to 4 hours	**Location:** Hawaii Range Complex: Hawaii Operating Area; Pearl Harbor; Fleet Operational Readiness Accuracy Check Site Range Southern California Range Complex: Southern California Operating Area; San Diego Bay and ports HSTT Transit Corridor
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency hull mounted sonar (MF1, MF2), vessel noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	None	

A.1.9.9 Submarine Sonar Maintenance

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Other-Maintenance</td></tr>
<tr><td>Submarine Sonar Maintenance</td><td colspan="2">Pierside and at-sea maintenance of sonar systems.</td></tr>
<tr><td>Long Description</td><td colspan="2">A submarine performs periodic maintenance on the AN/BQQ-10 sonar system while in port or at sea. Submarines conduct maintenance to their sonar systems in shallow water near their homeport; however, sonar maintenance could occur anywhere as the system's performance may warrant</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Submarines
Systems: High frequency submarine sonar system,
Ordnance/Munitions: None
Targets: None
Duration: 45 minutes up to 1 hour</td><td>Location:
Hawaii Range Complex: Hawaii Operating Area; Pearl Harbor; Fleet Operational Readiness Accuracy Check Site Range
Southern California Range Complex: Southern California Operating Area ; San Diego Bay and ports
HSTT Transit Corridor</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Sonar (submarine sonar, MF3)
Energy: None
Physical Disturbance and Strike: Vessel strike
Entanglement: None
Ingestion: None</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">None</td></tr>
<tr><td>Assumptions used for Analysis</td><td colspan="2">None</td></tr>
</table>

A.1.10 Integrated Training and Major Range Events

A major range event is comprised of several unit-level range operations conducted by several units operating together while commanded and controlled by a single commander. These exercises typically employ an exercise scenario developed to train and evaluate the Strike Group/Force in required naval tactical tasks. In a major range event, most of the operations and activities being directed and coordinated by the Strike Group commander are identical in nature to the operations conducted in the course in individual, crew, and smaller-unit training events. In a major range event, however, these disparate training tasks are conducted in concert, rather than in isolation.

A.1.10.1 Composite Training Unit Exercise

Activity Name	Activity Description	
Major Training Events		
Anti-Submarine Warfare for Composite Unit Training Exercise	Anti-submarine warfare activities conducted during a Composite Training Unit Exercise	
Long Description	Intermediate level battle group exercise designed to create a cohesive Strike Group prior to deployment or Joint Task Force Exercise. Typically seven surface ships, helicopters, maritime patrol aircraft, two submarines, and various unmanned vehicles. Each Strike Group performs a rehearsal called Composite Training Unit Exercise before deployment. Prior to the Composite Training Unit Exercise, each ship and aircraft in the strike group trains in their specialty. The Composite Training Unit Exercise is an intermediate-level strike group exercise designed to forge the group into a cohesive fighting team. Composite Training Unit Exercise is normally conducted during a 1 to 3 week period 6 to 8 weeks before Joint Task Force Exercise and consists of an 18 day schedule of event driven exercise, and a 3 day Final Battle Problem. The Composite Training Unit Exercise is an integration phase, at-sea, major range event. For the carrier strike group, this exercise integrates the aircraft carrier and carrier air wing with surface and submarine units in a challenging operational environment. For the expeditionary strike group/amphibious readiness group, this exercise integrates amphibious ships with their associated air wing, surface ships, submarines, and the Marine Expeditionary Unit. Live-fire operations that may take place during Composite Training Unit Exercise include long-range air strikes, Naval Surface Fire Support, and surface-to-air, surface-to-surface, and air-to-surface missile exercises. The Marine Expeditionary Unit also conducts realistic training based on anticipated operational requirements and to further develop the required coordination between Navy and Marine Corps forces. Special Operations training may also be integrated with the exercise scenario.	
Information Typical to the Event	**Platform:** Surface vessels, Fixed-wing aircraft, rotary-wing aircraft, unmanned vehicles, submarines **Systems:** All sonar systems **Ordnance/Munitions:** All ship and aircraft weapons, explosive sonobuoys may be used **Targets:** All surface, air, and anti-submarine warfare targets (e.g., MK-39 Expendable Mobile Anti-submarine Warfare Training Targets) **Duration:** 21 days	**Location:** Southern California Operating Area and Point Mugu Sea Range (overlap area only)
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency hull-mounted sonar (MF1, MF2, MF3), helicopter dipping sonar (MF4), sonobuoy (MF5), high duty cycle variable depth sonar (MF12), multistatic active coherent sonobuoy (ASW2),mid-frequency acoustic countermeasure (ASW3, ASW4), signal devices (MF6), high-frequency hull-mounted sonar (HF1), explosive sonobuoys (E4); vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike, vessel and in-water device strike, aircraft strike (birds only) **Entanglement:** Parachutes **Ingestion:** Parachutes, countermeasures, sonobuoy fragments	
Detailed Military Expended Material Information	One MK-39 Expendable Mobile Anti-submarine Warfare Training Targets Air deployed sonobuoy will have a parachute Expended countermeasures	
Assumptions used for Analysis	For Composite Training Unit Exercise only the anti-submarine warfare activities were analyzed as a Composite Training Unit Exercise. Other warfare area training conducted during the Composite Training Unit Exercise was analyzed as unit level training (gunnery exercise, missile exercise, etc.)	

A.1.10.2 Joint Task Force Exercise/Sustainment Exercise

Activity Name	Activity Description
Major Training Events	
Joint Task Force Exercise	Final Fleet exercise prior to deployment of the Strike Group. Serves as a ready-to-deploy certification for all units involved. Typically nine surface ships, helicopters, maritime patrol aircraft, two submarines, and various unmanned vehicles.
Long Description	The Joint Task Force Exercise is a dynamic and complex major range event that is the culminating exercise in the Sustainment Phase training for the Carrier Strike Groups and Expeditionary Strike Groups. For an Expeditionary Strike Group, the exercise incorporates an Amphibious Ready Group Certification Exercise for the amphibious ships and a Special Operations Capable Certification for the Marine Expeditionary Unit. When schedules align, the Joint Task Force Exercise may be conducted concurrently for an Expeditionary Strike Group and Carrier Strike Group. Joint Task Force Exercise emphasizes mission planning and effective execution by all primary and support warfare commanders, including command and control, surveillance, intelligence, logistics support, and the integration of tactical fires. Joint Task Force Exercises are complex scenario-driven exercises that evaluate a strike group in all warfare areas. Joint Task Force Exercise is normally 10 days long, not including a 3-day in-port Force Protection Exercise, and is the final at-sea exercise for the Carrier Strike Group or Expeditionary Strike Group prior to deployment. Joint Task Force Exercise occurs 3 to 4 times per year.
Information Typical to the Event	**Platform:** Multiple surface combatant vessels, Fixed-wing aircraft, Rotary-wing aircraft, unmanned vehicles, and submarines **Systems:** Anti-Submarine Warfare systems, Anti-Surface Warfare and Anti-Air Warfare gun and missile systems **Ordnance/Munitions:** Numerous gun rounds, bombs, and missiles, all captured in specific events **Targets:** MK-39 Expendable Mobile Anti-Submarine Warfare Training Target, MK-30 Recoverable Training Target, submarine **Duration:** Up to 10 days **Location:** Southern California Operating Area and Point Mugu Sea Range (overlap area only)
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency sonar (e.g., MF1, MF1K, MF2, MF2K, MF3, MF4, MF5, MF6, ASW2, ASW3, ASW4,) high-frequency sonar (HF1), light and heavyweight torpedoes, (e.g., TORP1, TORP2), high-frequency acoustic modems, vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Vessel and in-water device strike, aircraft strike, (birds only) military expended materials, seafloor device strike **Entanglement:** parachutes **Ingestion:** Parachutes, target and munitions fragments, small-caliber gun rounds, chaff
Detailed Military Expended Material Information	Anti-Submarine Warfare target: One MK-39 or MK-30 target (MK-30 is recovered and reused, MK-39 is not) per event. If target is air-dropped, one parachute per target Target remnants, chaff, flares Sonobuoys: (one parachute for each sonobuoy) Large, medium, and small-caliber projectiles, bombs, missiles, rockets, expendable acoustic countermeasures
Assumptions used for Analysis	All Military expended materials, ordnance, explosives, and sonar use is included in individual events

A.1.10.3 Rim of the Pacific Exercise

Activity Name	Activity Description
Major Training Events	
Rim of the Pacific Exercise	A biennial multinational training exercise in which navies from Pacific Rim nations and the United Kingdom assemble in Pearl Harbor, Hawaii to conduct training in a number of warfare areas throughout the Hawaiian Islands. Marine mammal systems may be used during a Rim of the Pacific exercise. Components of Rim of the Pacific such as certain Mine Warfare training may be conducted in the Southern California Range Complex.
Long Description	Rim of the Pacific is the world's largest multinational maritime exercise, typically lasting four to five weeks. Hosted by Commander, Pacific Fleet, the exercise is scheduled in the summer on even years. Rim of the Pacific typically consists of 14 nations, 32 ships, 5 submarines, more than 170 aircraft, and 20,000 personnel. The exercise typically consists of three major phases. Phase I, the Harbor Phase, will consist of operational planning meetings, safety briefings, and sporting events. This phase is designed to make final preparations for the at-sea phases of the exercises, as well as build on professional and personal relationships between the participating countries. Phase II, the Operational Phase, is driven by a structured schedule of events. This portion may include live fire gunnery and missile exercises, maritime interdiction and vessel boarding, anti-surface warfare, undersea warfare, and naval maneuvers, air defense exercises, as well as, explosive ordnance disposal, diving and salvage operations, mine clearance operations, and an amphibious landing. This phase exercises the ability of each nation to conduct robust command and control operations with multinational players and enhances each unit's operational capabilities. Phase III, the Tactical Phase of the exercise, is scenario-driven. The intense training during this phase allows participating nations to further strengthen their maritime skills and capabilities and improve their ability to communicate and operate in simulated hostile scenarios. This phase concludes with the ships' return to Pearl Harbor, where participating nations will reconvene to discuss the exercise and overall accomplishments.
Information Typical to the Event	**Platform:** Surface ships, Aircraft, Submarines **Systems:** Anti-Submarine Warfare systems, Anti-Surface Warfare and Anti-Air Warfare gun and missile systems **Ordnance/Munitions:** Numerous gun rounds, bombs, and missiles, all captured in specific events **Targets:** MK-39 Expendable Mobile Anti-Submarine Warfare Training Target, MK-30 Recoverable Training Target, submarine **Duration:** 30 days **Location:** Hawaii Range Complex: Hawaii Operating Area (including Barking Sands Underwater Range Extension; Barking Sands Tactical Underwater Range; Shallow Water Training Range Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency sonar (e.g., MF1, MF1K, MF2, MF2K, MF3, MF4, MF5, MF6, ASW2, ASW3, ASW4,) light and heavyweight torpedoes, (e.g., TORP1, TORP2), high-frequency acoustic modems and tracking pingers, vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike, vessel and in-water device strike, aircraft strike (birds only) **Entanglement:** Torpedo guidance wires, parachutes **Ingestion:** Parachutes, target and munitions fragments, small-caliber gun rounds, chaff

Detailed Military Expended Material Information	Anti-Submarine Warfare target: One MK-39 or MK-30 target (MK-30 is recovered and reused, MK-39 is not) per event. If target is air-dropped, one parachute per target Target remnants, chaff, flares Sonobuoys: (one parachute for each sonobuoy) Large, medium, and small-caliber projectiles, bombs, missiles, rockets Torpedo guidance wire Expendable acoustic countermeasures
Assumptions used for Analysis	All Military Expended Material, ordnance, explosives, and sonar use is included in individual events

A.1.10.4 Multi-Strike Group Exercise

Activity Name	Activity Description	
Major Training Events		
Multi-Strike Group Exercise	A 10-day exercise in which up to three strike groups would conduct training exercises simultaneously.	
Long Description	Elements of the anti-submarine warfare tracking exercise combine in the exercise of multiple air, surface, and subsurface units, over a period of up to 10 days. No explosive ordnance is used. Sonobuoys, active and passive sonar, and Nixie are used. The AN/SLQ-25 Nixie is a surface ship countermeasure system that includes a towed torpedo decoy device and a shipboard signal generator. The decoy emits signals to draw a torpedo away from its intended target. Up to three Strike Groups would conduct training exercises simultaneously in the Hawaii Range Complex. The Strike Groups would not be homeported in Hawaii, but would stop in Hawaii en route to a final destination. The Strike Groups would be in Hawaii for up to 10 days per exercise. The exercise would involve Navy assets engaging in a “free play” battle scenario, with U.S. forces pitted against a replicated opposition force. The exercise provides realistic in-theater training.	
Information Typical to the Event	**Platform:** Multiple surface combatant vessels, aircraft, and submarines **Systems:** Anti-submarine warfare systems, anti-surface warfare and anti-air warfare gun and missile systems **Ordnance/Munitions:** Numerous gun rounds, bombs, and missiles, all captured in specific events **Targets:** MK-39 Expendable Mobile Anti-Submarine Warfare Training Target, MK-30 recoverable training target, submarine **Duration:** Each multi-strike group exercise lasts for up to 10 days and consists of multiple 12-hour Anti-Submarine Warfare events.	**Location:** Hawaii Operating Area Southern California Operating Area and Point Mugu Range (overlap area only)
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency sonar (e.g., MF1, MF1K, MF2, MF2K, MF3, MF4, MF5, MF6, ASW2, ASW3, ASW4,) Light and heavyweight torpedoes, (e.g., TORP1, TORP2), high-frequency acoustic modems and tracking pingers, vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike, vessel and in-water device strike, aircraft strike (birds only) **Entanglement:** Parachutes **Ingestion:** Parachutes,	
Detailed Military Expended Material Information	Anti-Submarine Warfare target: One MK-39 or MK-30 target (MK-30 is recovered and reused, MK-39 is not) per event. If target is air-dropped, one parachute per target Target remnants, chaff, flares Sonobuoys: (one parachute for each sonobuoy) Large, medium, and small-caliber projectiles, bombs, missiles, rockets Expendable acoustic countermeasures	
Assumptions used for Analysis	All Military Expended Material, ordnance, and sonar use is included in individual events	

A.1.10.5 Integrated Anti-Submarine Warfare Course

Activity Name	Activity Description
Major Training Events	
Integrated Anti-Submarine Warfare Course	Multiple vessels, aircraft, and submarines integrate the use of their sensors, including sonobuoys, to search, detect, and track threat submarines.
Long Description	Integrated Anti-Submarine Warfare Course is a tailored course of instruction designed to improve Sea Combat Commander and Strike Group integrated anti-submarine warfare warfighting skill sets. Integrated Anti-Submarine Warfare Course is a coordinated training scenario that typically involves five surface ships, two to three embarked helicopters, a submarine and one maritime patrol aircraft searching for, locating, and attacking one submarine. The scenario consists of two 12-hour events that occur five times per year. The submarine may practice simulated attacks against the ships while being tracked. Hull mounted, towed array and dipping sonar is employed by ships and helicopters. The submarine also periodically operates its sonar.
Information Typical to the Event	**Platform:** Surface vessels, Fixed and rotary-wing aircraft, Submarines, Unmanned vehicles **Systems:** Hull-mounted, Towed array, and Dipping sonar, Mid-frequency sonar, acoustic countermeasures Sonobuoys **Ordnance/Munitions:** Sonobuoys **Targets:** Expendable mobile anti-submarine warfare training targets **Duration:** 2 to 5 days **Location:** Southern California Operating Area: Southern California Anti-submarine Warfare Range
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Sonar and other active acoustic sources (e.g., MF1, MF1K, MF2, MF2K, MF3, MF4, MF5, MF6, ASW2, ASW3, ASW4), vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike, vessel and in-water device strike, aircraft strike (birds only) **Entanglement:** Parachutes **Ingestion:** Parachutes, countermeasures, sonobuoy fragments
Detailed Military Expended Material Information	Parachutes, Sonobuoy fragments, Expended countermeasures
Assumptions used for Analysis	Two MK-39 Expendable Mobile Anti-Submarine Warfare Training Target may be used in place of an actual submarine target Air deployed sonobuoy will have a parachute

A.1.10.6 Group Sail

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Major Training Events</td></tr>
<tr><td>Group Sail</td><td colspan="2">Multiple ships and helicopters integrate the use of sensors, including sonobuoys, to search, detect, and track a threat submarine. Group sail exercises are not dedicated Anti-Submarine Warfare events and involve multiple warfare areas.</td></tr>
<tr><td>Long Description</td><td colspan="2">Multiple ships and helicopters integrate the use of sensors, including sonobuoys, to search, detect, classify, localize, and track a threat submarine to launch a torpedo. Group sail exercises are not dedicated ASW events and involve multiple warfare areas.
Group Sail is an intermediate training exercise primarily intended to introduce coordinated operations after Unit Level Training and prior to Composite Training. This event stresses planning, coordination, and communications during multiple warfare training scenarios.
Two or more ships and up to two helicopters searching for, locating, and attacking one submarine. Typically, one ship and helicopter are actively prosecuting while the other ship and helicopter are repositioning. Simultaneously, the submarine may practice simulated attacks against the ships. Multiple acoustic sources may be active at one time.
Typical participants and systems used during a Group Sail include:
• Navy Destroyer (2)
• Navy Frigate (1)
• Submarine (1)
• Maritime Patrol Aircraft (1)
• MH-60 (3)</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Rotary-wing aircraft, surface combatant vessels, submarine
Systems: Mid-frequency hull mounted sonar, towed array and dipping sonar, acoustic countermeasures high-frequency acoustic modems and tracking pingers
Ordnance/Munitions: Explosive sonobuoys may be used
Targets: Expendable Mobile Anti-submarine Warfare Training Targets
Duration: 2 to 3 days</td><td>Location:
Hawaii Operating Area
Southern California Operating Area</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Mid-frequency hull mounted sonar, towed array and dipping sonar, high frequency acoustic modems, acoustic countermeasures, and tracking pingers (HF1, MF1, MF2, MF3, MF4, MF5, MF6, ASW2, ASW3, ASW4), underwater explosives (E4) vessel noise, aircraft noise
Energy: None
Physical Disturbance and Strike: Vessel and in-water device strike, aircraft strike (birds only), military expended materials, seafloor device strike
Entanglement: Parachutes
Ingestion: Parachutes</td></tr>
<tr><td>Military Expended Detailed Material Information</td><td colspan="2">One MK-39 or MK-30 target (MK-30 is recovered and reused, MK-39 is not)
If target is air-dropped, one parachute per target
Sonobuoys: (one parachute for each sonobuoy), expended countermeasures</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="2">One Destroyer Squadron in Hawaii will conduct two Group Sails per year. These exercises are also known by the Hawaiian name "Koa Kai" (ocean warrior). Koa Kai is a 2 to 3 day event including Anti-Submarine Warfare.
While preference will be to train against an actual submarine, or MK 30 recoverable target, assume only MK 39 expendable targets will be used.</td></tr>
</table>

A.1.10.7 Undersea Warfare Exercise

Activity Name	Activity Description
Major Training Events	
Undersea Warfare Exercise	Elements of Anti-Submarine Warfare Tracking Exercises combine in this exercise of multiple air, surface, and subsurface units, over a period of several days. Sonobuoys released from aircraft. Active and passive sonar used.
Long Description	Elements of the anti-submarine warfare tracking exercise combine in an exercise of multiple air, surface, and subsurface units, over a period of 4 days. No explosive ordnance. Sonobuoys are released from aircraft, and active and passive sonar is used. Undersea Warfare Exercise is conducted up to five times annually. Undersea Warfare Exercise is an assessment based anti-submarine warfare exercise conducted by Expeditionary Strike Groups and Carrier Strike Groups while in transit from the west coast of the United States to the Western Pacific Ocean. Undersea Warfare Exercise can involve more than one Carrier Strike Group or Expeditionary Strike Group formation. Typical systems and participants used during an Undersea Warfare Exercise include: • AN/SQS-53: 64 hours (total = 192 hours) (3 Guided Missile Destroyers (DDGs) x 64 hours each) • Nixie (DDG): 70 hours (total = 210 hours) (3 DDG x 70 hours each) • AN/SSQ-62: 2 buoys (total = 6 buoys) (3 DDG x two buoys each) • AN/SQS-56: 64 hours • Nixie (Fast Frigate): 70 hours • AN/SSQ-62: 02
Information Typical to the Event	**Platform:** Rotary-wing aircraft, Fixed-wing Aircraft, submarines **Systems:** Mid-frequency and high-frequency sonar, dipping sonar high-frequency acoustic modems and sonobuoys **Ordnance/Munitions:** None **Targets:** MK-30, MK-39 Expendable Mobile Anti-submarine Warfare Training Targets, submarine **Duration:** 4 days **Location:** Hawaii Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency, high-frequency sonar, sonobuoys, high-frequency acoustic modems, and dipping sonar (MF1, MF2, MF3, MF4, MF5, MF6, ASW2, ASW4), aircraft noise **Energy:** None **Physical Disturbance and Strike:** Vessel and in-water device strike, aircraft strike, military expended materials **Entanglement:** Parachutes **Ingestion:** Parachutes
Military Expended Detailed Material Information	One MK-39 or MK-30 target (MK-30 is recovered and reused, MK-39 is not) If target is air-dropped, one parachute per target Sonobuoys: (one parachute for each sonobuoy)
Assumptions Used for Analysis	All MEM, ordnance, explosives, and sonar use is included in individual events.

A.1.10.8 Ship Anti-Submarine Warfare Readiness and Evaluation Measuring

Activity Name	Activity Description	
Major Training Events		
Ship Anti-Submarine Warfare Readiness and Evaluation Measuring	This exercise will typically involve multiple ships, submarines, and aircraft in several coordinated events over a period of a week or less. The Navy uses this exercise to collect and analyze high-quality data to quantitatively "assess" surface ship Anti-Submarine Warfare readiness and effectiveness.	
Long Description	Ship Anti-Submarine Warfare Readiness and Evaluation Measuring Exercise is a Chief of Naval Operations chartered program with the overall objective to collect and analyze high-quality data to quantitatively assess surface ship anti-submarine warfare readiness and effectiveness. The exercise will typically involve multiple ships, submarines, and aircraft in several coordinated events over a period of a week or less.	
Information Typical to the Event	**Platform:** Multiple rotary-wing aircraft, fixed-wing aircraft, submarines **Systems:** Mid-frequency and high-frequency sonar, dipping sonar, high frequency acoustic modems and sonobuoys **Ordnance/Munitions:** None **Targets:** MK-30, MK-39 Expendable Mobile Anti-submarine Warfare Training Targets, submarine **Duration:** 5-7 days/1 time per year	**Location:** Southern California Operating Area: Southern California Anti-submarine Warfare Range
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency, high-frequency sonar, high frequency acoustic modem, sonobuoys, and dipping sonar (MF1, MF2, MF3, MF4, MF5, MF6, ASW2, ASW4), aircraft noise **Energy:** None **Physical Disturbance and Strike:** Vessel and in-water device strike, Aircraft strike, Military expended materials **Entanglement:** Parachutes **Ingestion:** Parachutes	
Military Expended Detailed Material Information	• One MK-39 or MK-30 target (MK-30 is recovered and reused, MK-39 is not) • If target is air-dropped, one parachute per target • Sonobuoys: (one parachute for each sonobuoy)	
Assumptions Used for Analysis	All MEM, ordnance, explosives, and sonar use is included in individual events.	

A.2 NAVAL AIR SYSTEMS COMMAND TESTING ACTIVITIES

Naval Air Systems Command events will closely follow Fleet primary mission areas, such as the testing of airborne mine warfare and anti-submarine warfare weapons and systems. Naval Air Systems Command events include, but are not limited to, the testing of new aircraft platforms, weapons, and systems that have not been integrated into Fleet training events, such as directed energy weapons and the Joint Strike Fighter. In addition to testing new platforms, weapons, and systems, Naval Air Systems Command also conducts lot acceptance testing of airborne weapons and sonobuoys in support of the Fleet. These types of events do not fall within one of the Fleet primary mission areas; however, in general, most Naval Air Systems Command testing events in terms of their potential environmental effects are similar to Fleet training events.

While many of these systems will eventually be used by the Fleet during normal training and will be addressed in this EIS/OEIS for those Fleet activities, testing and development activities involving the same or similar systems as will be used by operational Fleet units may be used in different locations and manners than when actually used by operational Fleet units. Hence, the analysis for testing events and training of Fleet units may differ.

A.2.1 ANTI-AIR WARFARE TESTING

A.2.1.1 Air Combat Maneuver Test

Activity Name	Activity Description	
Anti-Air Warfare		
Air Combat Maneuver	Aircrews engage in flight maneuvers designed to gain a tactical advantage during combat.	
Long Description	Air Combat Maneuver is the general term used to describe an air-to-air test event involving two or more aircraft, each engaged in continuous proactive and reactive changes in aircraft attitude, altitude, and airspeed. No weapons are fired during Air Combat Maneuver activities.	
Information Typical to the Event	**Platform:** Fixed-wing aircraft (e.g., F-35; F/A-18, E/A-18G) **Systems:** None **Ordnance/Munitions:** None **Targets:** None **Duration:** 1.5 to 2 flight hours/event	**Location:** Hawaii Operating Area Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Aircraft noise **Energy:** None **Physical Disturbance and Strike:** Aircraft strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	Two Chaff Flares per event that are captured under Air Platform/Vehicle Test.	

A.2.1.2 Air Platform Vehicle Test

Activity Name	Activity Description	
Anti-Air Warfare		
Air Platform/Vehicle Test	Testing performed to quantify the flying qualities, handling, airworthiness, stability, controllability, and integrity of an air platform or vehicle, and in-flight refueling capabilities. No weapons are released during an Air Platform/Vehicle Test.	
Long Description	The Air Platform/Vehicle Test describes the testing performed to quantify the flying qualities, handling, airworthiness, stability, controllability, and integrity of an air platform/vehicle. Integration of non-weapons system including-flight refueling tests are also conducted as part of an Air Platform/Vehicle Test. Test results are compared against design and performance specifications for compliance. The test results are also used to define stability and controllability characteristics and limitations and to improve and update existing analytical and predictive models. A wide variety of fixed-wing and rotary-wing aircraft, including unmanned aerial systems would undergo air platform/vehicle testing. No weapons are released during an Air Platform/Vehicle Test. Aircraft may employ laser detection for targeting systems and trailing antenna. Events may involve two or more fighter jet aircrafts and a towed target tractor by a contracted aircraft (e.g., Lear jet for laser targeting tests).	
Information Typical to the Event	**Platform:** Fixed and rotary-wing (e.g. V-22, F-35, E-2/C-2), includes Unmanned Aerial Systems **Systems:** None **Ordnance/Munitions:** Flares **Targets:** None **Duration:** 2 to 8 flight hours/event	**Location:** Hawaii Operating Area Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Aircraft noise **Energy:** In-air low energy lasers **Physical Disturbance and Strike:** Military expended material strike (fuel tanks or similar), Aircraft strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	Fuel tanks, carriages, flares, dispensers, or similar types of support systems on aircraft may be jettisoned depending on test	
Assumptions used for Analysis	Estimated two to four fuel tanks expended per event; however this can vary based on requirements. fuel tanks may contain water to simulate different fuel levels.	

A.2.1.3 Air Platform Weapons Integration Test

Activity Name	**Activity Description**	
Anti-Air Warfare		
Air Platform Weapons Integration Test	Testing performed to quantify the compatibility of weapons with the aircraft from which they would be launched or released. Mostly non-explosive weapons or shapes are used.	
Long Description	The Air Platform Weapons Integration Test describes the testing performed to quantify the compatibility of weapons with the aircraft from which they would be released. Tests evaluate the compatibility of the weapon and its carriage, suspension, and launch equipment with the performance and handling characteristics of the designated aircraft. Additional tests assess the ability of the weapon to separate or launch safely from the aircraft at combat velocities, including at supersonic speeds. Test results are compared against design specifications for compliance. The test results are also used to define performance characteristics and to improve and update existing analytical and predictive models.	
Information Typical to the Event	**Platform:** Fixed and rotary-wing aircraft (e.g., F/A-18; F-35 ; E/A-18G; MH-60R) **Systems:** Gun systems integration; Air Intercept Missile Series (e.g., AIM-9x); Advanced Medium Range Air-to-Air Missile; AGM-114R, MK46, MK54, 20 mm **Ordnance/Munitions:** Missiles, rockets, small and medium-caliber projectiles, bombs (non-explosive) **Targets:** The use of drones, such as the BQM-74 and 34, may be used as a target for weapon and mission system test events. Surface targets will also be used as needed for proposed test events. **Duration:** 1.5 to 2.5 flight hours/event	**Location:** Hawaii Operating Area Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Weapons firing and aircraft noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (projectiles, missiles, rockets, bombs), aircraft strike (birds only) **Entanglement:** None **Ingestion:** Medium-caliber projectiles, casings	
Detailed Military Expended Material Information	Small-caliber projectiles Medium-caliber canon rounds Non-explosive rockets and missiles Non-explosive bombs Weapons carriage, suspension, and launch equipment	
Assumptions used for Analysis	Estimate two to four weapons carriages expended per event	

A.2.1.4 Intelligence, Surveillance, and Reconnaissance Test

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Anti-Air Warfare</td></tr>
<tr><td>Intelligence, Surveillance, and Reconnaissance Test</td><td colspan="2">Aircrews use all available sensors to collect data on threat vessels.</td></tr>
<tr><td>Long Description</td><td colspan="2">An Anti-Air Warfare intelligence, surveillance, and reconnaissance test involves evaluating communications capabilities of fixed-wing and rotary-wing aircraft, including unmanned systems that can carry cameras, sensors, communications equipment, or other payloads. New systems are tested at sea to ensure proper communications between aircraft and vessels.
Several unmanned aerial systems are planned for testing, including the Broad Area Maritime Surveillance system, Fire Scout vertical take-off and landing tactical unmanned air vehicle, and the Unmanned Combat Air System; Aircraft Carrier Demonstration; Unmanned Aerial System. Unmanned Aerial Systems are remotely piloted or self-piloted aircraft.
Tactical Unmanned Aerial Systems are designed to support tactical commanders with near-real-time imagery intelligence at ranges up to 200 kilometers. Most small- to mid-sized unmanned systems, such as Small Tactical Unmanned Aerial System/Tier II, act as eyes in the sky, relaying raw imagery back to military personnel on the ground. The data are then processed, analyzed, and shared up and down the chain of command. New technology systems provide combat identification Friend or Foe and are used for aircraft and ship-based communications.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Fixed-wing aircraft (e.g., E-2 and P-8, P-3); Rotary-wing aircraft; Broad Area Maritime Surveillance system; Fire Scout vertical take-off and landing tactical unmanned air vehicle; Unmanned Combat Air System; Aircraft Carrier Demonstration; Small Tactical Unmanned Aerial System/Tier II
Systems: Small Tactical Unmanned Aerial Systems (e.g., MK XII-Mode 5)
Ordnance/Munitions: None
Targets: None
Duration: 2-20 flight hours/event</td><td>Location:
Hawaii Operating Area
Southern California Operating Area</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Aircraft noise
Energy: None
Physical Disturbance and Strike: Aircraft strike (birds only)
Entanglement: None
Ingestion: None</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">None</td></tr>
<tr><td>Assumptions used for Analysis</td><td colspan="2">None</td></tr>
</table>

A.2.2 ANTI-SURFACE WARFARE TESTING

A.2.2.1 Air-to-Surface Missile Test

Activity Name	Activity Description
Anti-Surface Warfare	
Air-to-Surface Missile Test	This event is similar to the training event missile exercise air-to-surface. Test may involve both fixed-wing and rotary-wing aircraft launching missiles at surface maritime targets to evaluate the weapons system or as part of another systems integration test.
Long Description	Similar to a missile exercise air-to-surface, an Air to Surface Missile Test may involve both fixed-wing and rotary-wing aircraft launching missiles at surface maritime targets to evaluate the weapons system or as part of another systems integration test. Air-to-Surface Missile Tests can include high explosive, non-explosive, or non-firing (captive air training missile) weapons. Both stationary and mobile targets would be utilized during testing, and some operational tests would use explosive missiles (i.e., high explosive warhead). All developmental testing will use non-explosive missile (i.e., non-explosive warhead) with a live motor. NAVAIR plans to conduct integration testing of the MH-60R/S helicopters and the joint air to ground missile. Both stationary and mobile targets would be using during testing. Approximately 25 percent of some operational tests could use explosive missiles (i.e. high explosive warhead). All developmental testing will use non-explosive (i.e., non-explosive warhead). Similar integration tests would be conducted with the MH-60R/S and the Hellfire air to ground missile. Approximately 25 percent of these tests could involve high-explosive missiles (i.e. high-explosive warhead). P-3 and P-8A fixed-wing aircraft plan to conduct software and weapons verification testing with Harpoon or Joint Stand-off Weapon (or equivalent) missiles. Some explosive missiles are planned for use.
Information Typical to the Event	**Platform:** Fixed and rotary-wing aircraft (e.g., P3, P8; MH 60) **Systems:** Missile systems **Ordnance/Munitions:** Joint air to surface missile; Hellfire air-to-ground missile (high-explosive); Harpoon, Joint Stand-off Weapon (non-explosive); Captive air training missile; SLAM-ER missile **Targets:** Stationary and mobile surface marine targets **Duration:** 2 to 4 flight hours/event **Location:** Hawaii Operating Area Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives, aircraft noise, weapons firing noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (missiles), aircraft strike (birds only) **Entanglement:** None **Ingestion:** Missile fragments, Target fragments
Detailed Military Expended Material Information	Missile and target fragments
Assumptions used for Analysis	Two air-to-surface missiles per event, 25 percent will be high-explosive

A.2.2.2 Air-to-Surface Gunnery Test

Activity Name	Activity Description
Anti-Surface Warfare	
Air-to-Surface Gunnery Test	This event is similar to the training event gunnery exercise air-to-surface. Strike fighter and helicopter aircrews evaluate new or enhanced aircraft guns against surface maritime targets to test that the gun, gun ammunition, or associated systems meet required specifications or to train aircrew in the operation of a new or enhanced weapons system.
Long Description	Strike fighter and helicopter aircrews evaluate new or enhanced aircraft guns against surface maritime targets to test that the gun, gun ammunition, or associated systems meets required specifications or to train aircrew in the operation of a new or enhanced weapons system. Non-explosive practice munitions are typically used during this type of test; however, a small number of high explosive rounds may be used during final testing. Rounds that may be used include 7.62 mm, 20 mm, 30 mm, 0.30-caliber, and 0.50-caliber gun ammunition.
Information Typical to the Event	**Platform:** Fixed-wing and rotary aircraft (e.g., F-35; F/A-18; and MH 60) **Systems:** Small- and medium-caliber gun systems (GAU-17, GAU-21, M197, M230, M240) **Ordnance/Munitions:** Small- and Medium-caliber projectiles (e.g., 7.62 mm, 20 mm, 30 mm, 30 mm supercavitating, 0.30 caliber, and 0.50 caliber [non-explosive and explosive]) **Targets:** Stationary and mobile surface maritime targets may be used **Duration:** 2 flight hours/event **Location:** Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (projectiles), aircraft strike (birds only) **Entanglement:** None **Ingestion:** Projectile fragments, casings, target fragments, medium-caliber projectiles
Detailed Military Expended Material Information	Projectiles Casings Target fragments Projectile fragments
Assumptions used for Analysis	None

A.2.2.3 Rocket Test

Activity Name	Activity Description	
Anti-Surface Warfare		
Rocket Test	Rocket tests are conducted to evaluate the integration, accuracy, performance, and safe separation of laser-guided and unguided 2.75-inch rockets fired from a hovering or forward flying helicopter or from a fixed-wing strike aircraft.	
Long Description	Rocket tests are conducted to evaluate the integration, accuracy, performance, and safe separation of laser-guided and unguided 2.75-inch rockets fired from a hovering or forward flying helicopter or from a fixed-wing strike aircraft. Rocket tests would involve the release of primarily live motor/non-explosive warhead rockets. Some high explosive warhead rockets would be tested, and during a jettison test, rockets with a non-explosive motor and non-explosive warhead would be jettisoned along with the rocket launcher. Rocket tests are also conducted to train aircrew on the use of new or enhanced weapons systems. Rocket types may include variations of the Hydra-70 rocket developed under the Advanced Precision Kill Weapons System program or similar munitions developed under Low-cost Guided Imaging Rocket program as well as MEDUSA rockets. All rockets planned for testing are 2.75-inch rockets. Some rocket tests may be conducted in conjunction with upgrades to or integration of the Forward Looking Infrared targeting system.	
Information Typical to the Event	**Platform:** Fixed-wing or rotary aircraft (e.g., F/A 18; F-35; MH-60) **Systems:** **Ordnance/Munitions:** 2.75 inch rockets (e.g., Hydra-70 or similar [explosive and non-explosive]) **Targets:** Stationary and mobile surface maritime targets may be used **Duration:** 1.5 to 2 hours/event	**Location:** Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (rockets), aircraft strike (birds only) **Entanglement:** None **Ingestion:** Rocket fragments, target fragments	
Detailed Military Expended Material Information	Rocket fragments Target fragments Rocket launcher	
Assumptions used for Analysis	Under the No Action Alternative, all rockets are non-explosive Alternatives 1 and 2: Multiple rockets fired per event, 25 percent which will be high-explosive	

A.2.2.4 Laser Targeting Test

Activity Name	Activity Description	
Anti-Surface Warfare		
Laser Targeting Test	Aircrews illuminate enemy targets with lasers.	
Long Description	Aircrew use laser targeting devices integrated into aircraft or weapons systems to evaluate targeting accuracy and precision and to train aircrew in the use of newly developed or enhanced laser targeting devices designed to illuminate designated targets for engagement with laser-guided weapons. No weapons are released during a laser targeting test.	
Information Typical to the Event	**Platform:** Rotary or fixed-wing aircraft (e.g., MH-60; P8) **Systems:** Laser targeting systems, including the Laser Range Designator on the MH-60 helicopters **Ordnance/Munitions:** None **Targets:** None **Duration:** 2.5 flight hours/event	**Location:** Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Aircraft noise **Energy:** In-air low energy lasers **Physical Disturbance and Strike:** Aircraft strikes (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	Laser energy for targeting is not carried forward for analysis	

A.2.3 ELECTRONIC WARFARE TESTING

A.2.3.1 Electronic Systems Evaluation

Activity Name	**Activity Description**	
Electronic Warfare		
Electronic Systems Evaluation	Test to evaluate the effectiveness of electronic systems to control, deny, or monitor critical portions of the electromagnetic spectrum. In general, Electronic Warfare testing will assess the performance of three types of Electronic Warfare systems: Electronic Attack, Electronic Protect, and Electronic Support.	
Long Description	Electronic Systems Evaluations are performed to determine the effectiveness of designated Electronic Warfare systems to control, deny, or monitor critical portions of the electromagnetic spectrum. In general, Electronic Warfare testing will assess the performance of three types of Electronic Warfare systems; specifically, Electronic Attack, Electronic Protect, and Electronic Support. Aircraft Electronic Attack systems are designed to confuse the enemy or deny the enemy the use of its electronically-targeted weapons systems. The Suppression of Enemy Air Defenses and active jamming against hostile aircraft and surface combatant radars are examples of the application of Electronic Attack. Aircraft Electronic Protect systems are designed to intercept, identify, categorize, and defeat threat weapons systems that are already targeting that or other friendly aircraft. Aircraft Electronic Support systems employ passive tactics to intercept, exploit, locate (target), collect, collate, and decipher information from the Radio Frequency spectrum for the purpose of determining the intentions of the radiating source. Test results are compared against design specifications to evaluate the performance of the actually Electronic Warfare system. The test results are also used to define performance characteristics and to improve and update existing analytical and predictive models.	
Information Typical to the Event	**Platform:** Fixed or rotary-wing aircraft (e.g., E-2/C-2, P-3C, P-8, F/A-18, E-6B; CH-53K) **Systems:** Electronic warfare systems (electronic attack, electronic protect, and electronic support) **Ordnance/Munitions:** None **Targets:** None **Duration:** 2 to 6 flight hours/event	**Location:** Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Aircraft noise **Energy:** None **Physical Disturbance and Strike:** Aircraft strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	None	

A.2.4 ANTI-SUBMARINE WARFARE TESTING

A.2.4.1 Anti-Submarine Warfare Torpedo Test

Activity Name	Activity Description	
Anti-Submarine Warfare		
Anti-Submarine Warfare Torpedo Test	This event is similar to the training event, Torpedo Exercise. Test evaluates Anti-Submarine Warfare systems onboard rotary-wing and fixed-wing aircraft and the ability to search for, detect, classify, localize, and track a submarine or similar target.	
Long Description	Similar to a Torpedo Exercise, an Anti-Submarine Warfare Torpedo Test evaluates Anti-Submarine Warfare systems onboard rotary-wing (e.g., MH-60R helicopter) and fixed-wing Marine Patrol Aircraft (e.g., P-8, P-3) aircraft and the ability to search for, detect, classify, localize, track, and attack a submarine or similar target (e.g., MK-39 Expendable Mobile Anti-Submarine Warfare Training Target, or MK-30). The focus of the Anti-Submarine Warfare Torpedo test is on the torpedo and torpedoes (e.g., MK-46 or MK-54), but other Anti-Submarine Warfare systems are often used during the test, such as AN/AQS-22 dipping sonar (MH-60R) and sonobuoys (e.g., AN/SSQ-62). MK-39 or MK-30 targets simulate a submarine threat and are deployed at varying depths and speeds. If available, tests may be conducted using a submarine as the target. This activity can be conducted in shallow or deep waters and aircraft can originate from a land base or from a surface ship. The Torpedo Test culminates with the release of an exercise torpedo against the target and is intended to evaluate the targeting, release, and tracking process of deploying torpedoes from aircraft. All exercise torpedoes used in testing are either running (EXTORP) or non-running (REXTORP). Non-explosive torpedoes are recovered. A parachute assembly and guidance wire used for aircraft-launched torpedoes is jettisoned and sinks. Ballast (typically lead weights) may be released from the torpedoes to allow for recovery and sink to the bottom.	
Information Typical to the Event	**Platform:** Fixed and rotary-wing aircraft (e.g., P-3/P-8, MH-60R) **Systems:** Dipping sonar(e.g., AN/AQS-22); sonobuoys (e.g., AN/SSQ-62) **Ordnance/Munitions:** Torpedoes (e.g., MK-46, MK-54, MK-50, and MK-56; non-explosive) **Targets:** MK-39 Expendable Mobile Anti-Submarine Warfare Training Target, MK-30, or submarine **Duration:** 2 to 6 flight hours/event.	**Location:** Hawaii Operating Area Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency Sonar (MF4), sonobuoys (MF5), lightweight torpedoes (TORP1), aircraft noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike, aircraft strike (birds only) **Entanglement:** Parachutes, guidance wire **Ingestion:** Parachutes	
Detailed Military Expended Material Information	Torpedo accessories (e.g. parachute assembly, guidance wire) Sonobuoys Ballast targets	
Assumptions used for Analysis	Assume one torpedo accessory package (parachute, ballast, guidance wire) per torpedo Assume one target per torpedo Assume 12 sonobuoys per event Assume 15 percent of torpedoes are not recovered	

A.2.4.2 Kilo Dip

Activity Name	**Activity Description**	
Anti-Submarine Warfare		
Kilo dip	Functional check of the AN/AQS-22 dipping sonar prior to conducting full test or training event on the dipping sonar.	
Long Description	A kilo dip is the operational term used to describe a functional check of a helicopter deployed dipping sonar system. During a functional check, a single MH-60R helicopter would transit to an area designated for dipping sonar testing (i.e., a dip point usually close to shore) and would deploy the AN/AQS-22 sonar transducer assembly via a reel mechanism to a predetermined depth or series of depths while the helicopter hovers over the dip point. Once at the desired depth, the AN/AQS-22 sonar transducer would be activated and would transmit a pulsed, acoustic signal (i.e., ping) for approximately two to four minutes (enough time to check that all systems are functioning properly). After the check is completed, the AN/AQS-22 sonar transducer assembly would be reeled in, and in some instances the helicopter would transit to a second dip point before the procedure is repeated. A kilo dip is a precursor to more comprehensive testing.	
Information Typical to the Event	**Platform:** Rotary-wing aircraft (e.g., MH-60R) **Systems:** Mid-frequency dipping sonar (AN/AQS-22) **Ordnance/Munitions:** None **Targets:** None **Duration:** 1.5 flight hours/event	**Location:** Hawaii Operating Area Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency sonar (MF4), aircraft noise **Energy:** None **Physical Disturbance and Strike:** Aircraft strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	None	

A.2.4.3 Sonobuoy Lot Acceptance Test

Activity Name	**Activity Description**	
Anti-Submarine Warfare		
Sonobuoy Lot Acceptance Test	Sonobuoys are deployed from surface vessels and aircraft to verify the integrity and performance of a lot or group of sonobuoys in advance of delivery to the Fleet for operational use.	
Long Description	Sonobuoys are deployed from surface vessels and aircraft to verify the integrity and performance of a lot or group of sonobuoys in advance of delivery to the Fleet for operational use. Lot acceptance testing would occur for the following types of sonobuoys: AN/SSQ-62 DICASS, AN/SSQ-110 Improved Extended Echo Ranging, AN/SSQ-125 MAC, MK-61 SUS, MK-64 SUS, MK-82 SUS, MK-84 SUS, and Mini Source. Some sonobuoys are high explosive.	
Information Typical to the Event	**Platform:** Surface combat vessels, fixed-wing aircraft, rotary-wing aircraft **Systems:** Sonobuoys (AN/SSQ-62x DICASS, AN/SSQ-110x Improved Extended Echo Ranging, AN/SSQ-125 MAC, MK-61 SUS, MK-64 SUS, MK-82 SUS, MK-84 SUS, Mini Source, and high duty cycle sonar **Ordnance/Munitions:** High explosive sonobuoy systems described above **Targets:** None **Duration:** 6 flight hours/event	**Location:** Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Sonar and other active acoustic sources (ASW2, MF5, MF6), underwater explosives (E3, E4), vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike, vessel strike, aircraft strike (birds only) **Entanglement:** Parachutes **Ingestion:** Parachutes, sonobuoy fragments	
Detailed Military Expended Material Information	Parachutes Sonobuoy fragments	
Assumptions used for Analysis	Assume one parachute per sonobuoy Assume an average of 80 non-explosive sonobuoys per event; however the number of sonobuoys used in each event may vary	

A.2.4.4 Anti-Submarine Warfare Tracking Test – Helicopter

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Anti-Submarine Warfare</td></tr>
<tr><td>Anti-Submarine Warfare Tracking Test – Helicopter</td><td colspan="2">This event is similar to the training event, Anti-Submarine Tracking Exercise–Helicopter. The test evaluates the sensors and systems used to detect and track submarines and to ensure that helicopter systems used to deploy the tracking systems perform to specifications.</td></tr>
<tr><td>Long Description</td><td colspan="2">Similar to an Anti-Submarine Tracking Exercise–Helicopter, an Anti-Submarine Tracking Test — Helicopter evaluates the sensors and systems used to detect and track submarines and to ensure that platform systems used to deploy the tracking systems perform to specifications. Typically, one MH-60R helicopter conducts Anti-Submarine testing using the AN/AQS-22 dipping sonar, tonal sonobuoys (e.g., AN/SSQ-62), passive sonobuoys (e.g., AN/SSQ-53D/E), or explosive sonobuoys (e.g., mini sound-source seeker buoys). Targets (e.g., MK-39 Expendable Mobile Anti-Submarine Warfare Training Target or MK-30) may also be employed during an Anti-Submarine event. If available, tests may be conducted using a submarine as the target. This activity would be conducted in shallow or deep waters and could initiate from a land base or from a surface ship. Helicopter Anti-Submarine tests are intended to evaluate the sensors and systems used to detect and track submarines and to ensure that platform systems used to deploy the tracking systems perform to specifications. Some Anti-Submarine Helicopter Tracking Test could be conducted as part of an Anti-Submarine Tracking Coordinated Event with Fleet training activities.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Rotary-wing aircraft (e.g., MH-60R)
Systems: Dipping sonar (e.g., AN/AQS-22), tonal sonobuoys (e.g., AN/SSQ-62), explosive sonobuoys (e.g., mini sound-source seeker buoys), passive sonobuoys (e.g., AN/SSQ-53),and new development of mid-frequency active sonar buoys (follow-on to DICASS)
Ordnance/Munitions: High explosive sonobuoys [mini sound-source seeker buoys (i.e., mini-buoys)]
Targets: MK-39 Expendable Mobile Anti-Submarine Warfare Training Target, MK-30 recoverable target, submarine
Duration: 2 flight hours/event</td><td>Location:
Hawaii Operating Area
Southern California Operating Area</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Mid-frequency sonar (MF4), sonobuoys (MF5), underwater explosives (E3), aircraft noise
Energy: None
Physical Disturbance and Strike: Military expended material strike, aircraft strike (birds only)
Entanglement: Parachutes
Ingestion: Parachutes, explosive sonobuoy fragments</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">Sonobuoy fragments, parachutes</td></tr>
<tr><td>Assumptions used for Analysis</td><td colspan="2">One MK-39 or MK-30 target (MK-30 is recovered and reused, MK-39 is not)
If target air dropped, one parachute/target
24 sonobuoys per event</td></tr>
</table>

A.2.4.5 Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft

Activity Name	Activity Description
Anti-Submarine Warfare	
Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft	This event is similar to the training event, Anti-Submarine Warfare Tracking Exercise–Maritime Patrol Aircraft. The test evaluates the sensors and systems used by maritime patrol aircraft to detect and track submarines and to ensure that aircraft systems used to deploy the tracking systems perform to specifications and meet operational requirements.
Long Description	Similar to an Anti-Submarine Warfare Tracking Exercise-Maritime Patrol Aircraft. Anti-Submarine Warfare Tracking Test—Maritime Patrol Aircraft evaluates the sensors and systems used to detect and track submarines and to ensure that platform systems used to deploy the tracking systems perform to specifications and meet operational requirements. P-3 or P-8A fixed-wing aircraft conduct Anti-Submarine Warfare testing using tonal sonobuoys (e.g., AN/SSQ-62 DICASS), explosive sonobuoys (e.g., AN/SSQ-110 Improved Extended Echo Ranging), passive sonobuoys (e.g., AN/SSQ-53), torpedoes (e.g., MK-46), smoke devices (e.g., MK-58), SUS devices (e.g., MK-61 SUS), missiles (e.g., harpoons), and chaff. Targets (e.g., MK-39 Expendable Mobile Anti-Submarine Warfare Training Target) may also be employed during an Anti-Submarine Warfare scenario. This activity would be conducted in deep waters and could initiate from a land base or from a surface ship. Some Anti-Submarine Warfare Maritime Patrol Aircraft Tracking Test could be conducted as part of a Coordinated Event with Fleet training activities.
Information Typical to the Event	**Platform:** Fixed-wing Maritime Patrol Aircraft (e.g., P-3, P-8A,) **Systems:** Tonal sonobuoys (e.g., AN/SSQ-62 DICASS); passive sonobuoys (e.g., AN/SSQ-53); Explosive sonobuoys (e.g., AN/SSQ-110 Improved Extended Echo Ranging), **Ordnance/Munitions:** Non-explosive, all recovered; other non-explosive class stores (1000 lbs.) torpedoes, smoke devices, chaff, missiles, SUS devices **Targets:** MK-39 or MK-30 **Duration:** 4 to 6 flight hours/event **Location:** Hawaii Operating Area Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency sonobuoys (ASW2, MF5, MF6), underwater explosives (E3), aircraft noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike, in-water device strike, aircraft strike (birds only) **Entanglement:** Parachutes **Ingestion:** Parachutes, sonobuoy fragments, torpedo fragments, chaff
Detailed Military Expended Material Information	One MK-39 or MK-30 target (MK-30 is recovered and reused, MK-39 is not) If target air dropped, one parachute per target 20-60 sonobuoys per event (one parachute per sonobuoy) Smoke device
Assumptions used for Analysis	Torpedo, missile, flare, and chaff use will be captured under Anti-submarine warfare Torpedo Test, Anti-Surface Warfare Missile Test, and Chaff Test, respectively: Analysis of these will not be conducted under this activity

A.2.5 MINE WARFARE TESTING

A.2.5.1 Airborne Mine Neutralization System Test

Activity Name	**Activity Description**	
Mine Warfare		
Airborne Mine Neutralization Systems Test-AN/AQS-235	Airborne mine neutralization tests of the AN/ASQ-235 evaluate the system's ability detect and destroy mines off of the MH-60 Airborne Mine Countermeasures capable helicopter. The AN/ASQ-235 uses up to four unmanned underwater vehicles equipped with high frequency sonar, video cameras, and explosive neutralizers.	
Long Description	Mine neutralization tests evaluate aircraft and aircraft systems intended to neutralize or otherwise destroy mines through the use of explosives or other munitions. For most neutralization tests, mine shapes or non-explosive mines are used to evaluate new or enhanced mine neutralization systems. The AN/ASQ-235 uses up to four unmanned underwater vehicles equipped with high frequency sonar and video cameras to detect submerged mines. The unmanned underwater vehicles are also equipped with explosives to neutralize the mines after they are located. Data from unmanned underwater vehicles are relayed to the operator in the helicopter through a fiber-optic cable enabling the operator to position the neutralizing charge onto the most vulnerable area of the mine. The explosive charge is then detonated to neutralize the mine. For most tests, recoverable non-explosive neutralizers are used. A mine shape, rather than a high explosive mine, serves as the target and a range support vessel recovers the non-explosive neutralizer and the mine shape following the test. Testing scenarios include a non-explosive neutralizer against an inert mine shape, or a high explosive neutralizer against an explosive mine.	
Information Typical to the Event	**Platform:** Rotary-wing aircraft (e.g., MH-60S) **Systems:** Airborne Mine Neutralization System (e.g. AN/ASQ-235) **Ordnance/Munitions:** Neutralizers (explosive and non-explosive), Mines (explosive and non-explosive) **Targets:** Floating/moored/bottom mine shapes **Duration:** 2.5 flight hours/event	**Location:** Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** High frequency sonar (HF4), underwater explosives (E4, E11), aircraft noise **Energy:** None **Physical Disturbance and Strike:** Aircraft strike (birds only), military expended material strike, seafloor device strike (mine shapes) **Entanglement:** Fiber optic cable **Ingestion:** Mine fragments, neutralizer fragments, fiber optic cable fragments	
Detailed Military Expended Material Information	Fiber-optic cable, plus additional expended material, such as the can that holds and deploys the cable Explosive and target residue (during 20 percent of testing and training when an explosive neutralizer is used) One to four neutralizers deployed per high explosive event Mine shapes are typically retrieved and reused, if they are not too badly damaged from neutralization attempt	
Assumptions used for Analysis	None	

A.2.5.2 Airborne Towed Minehunting Sonar System Test

Activity Name	Activity Description	
Mine Warfare		
Airborne Towed Minehunting Sonar System Test	A mine-hunting system that is towed from an MH-60S helicopter with sonar for detection and classification of bottom and moored mines. An electro-optical sensor allows for identification of bottom mines.	
Long Description	Tests of towed mine-hunting sonar systems (e.g., AN/AQS-20A) evaluate the search capabilities of this helicopter-towed, mine hunting, detection, and classification system. The sonar on the Q20 identifies mine-like objects in the deeper parts of the water column, but is not designed to identify near-surface mines.	
Information Typical to the Event	**Platform:** Rotary-wing (e.g., MH-60S) **Systems:** Towed mine-hunting sonar systems (e.g., AN/AQS-20A) **Ordnance/Munitions:** None **Targets:** Floating/moored/near surface mine or mine shape **Duration:** 2.5 flight hours/event	**Location:** Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** High frequency sonar (HF4), aircraft noise **Energy:** None **Physical Disturbance and Strike:** In-water device strike, aircraft strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	Anchors (moored mine targets only)	
Assumptions used for Analysis	None	

A.2.5.3 Airborne Towed Minesweeping System Test

Activity Name	Activity Description	
Mine Warfare		
Airborne Towed Minesweeping System Test	Airborne Towed Minesweeping Test (e.g., Organic Airborne and Surface Influence Sweep) would be conducted by a MH-60S helicopter to evaluate the functionality of towed minesweeping devices and the MH-60S at sea. The Organic Airborne and Surface Influence Sweep is towed from a forward flying helicopter and works by emitting an electromagnetic field and mechanically generated underwater sound to simulate the presence of a ship. The sound and electromagnetic signature cause nearby mines to explode.	
Long Description	Airborne Towed Minesweeping Test (e.g., Organic Airborne and Surface Influence Sweep) would be conducted by an Airborne Mine Countermeasures capable MH-60S helicopter to evaluate the functionality of Organic Airborne and Surface Influence Sweep and MH-60S at sea. For most tests, mine sweeping would be simulated using Versatile Exercise Mine System (non-explosive mine shapes that emit a plume of smoke rather than exploding) and high explosive mines at the culmination of testing, approximately one per event. The Organic Airborne and Surface Influence Sweep works by emitting an electromagnetic field and underwater sound generated from a mechanical source to simulate a vessel's sound signature. The Organic Airborne and Surface Influence Sweep serves to "sweep" or cause live mines to detonate when exposed to the electromagnetic field and simulated ship sound signature. The sound generated from the Organic Airborne and Surface Influence Sweep is not sonar, but rather a mechanically-generated sound to simulate a vessel prop.	
Information Typical to the Event	**Platform:** Rotary-wing aircraft (e.g., MH-60S) **Systems:** Towed minesweeping systems (e.g., Organic Airborne and Surface Influence Sweep) **Ordnance/Munitions:** Mines (explosive), Versatile Exercise Mine System **Targets:** Floating/moored/bottom mine shapes (non-explosive and explosive) **Duration:** 2.5 flight hours/event	**Location:** Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives (E11), aircraft noise **Energy:** Electromagnetic **Physical Disturbance and Strike:** In-water device strike, seafloor device strike (mine shapes), aircraft strike (birds only) **Entanglement:** None **Ingestion:** Mine fragments	
Detailed Military Expended Material Information	Mine fragments	
Assumptions used for Analysis	Non-explosive mine shapes will be recovered	

A.2.5.4 Airborne Laser-Based Mine Detection System Test

Activity Name	Activity Description	
Mine Warfare		
Airborne Laser-Based Mine Detection System Test	An airborne mine hunting test of the AN/AES-1 Airborne Laser Mine Detection System, that is operated from the MH-60S helicopter and evaluates the system's ability to detect, classify, and fix the location of floating and near-surface, moored mines. The system uses a laser to locate mines and may operate in conjunction with an airborne projectile-based mine detection system to neutralize mines.	
Long Description	During an Airborne Mine Countermeasures test, a MH-60S helicopter evaluates the search capabilities of the AN/AES-1 Airborne Laser Mine Detection System Airborne Laser Mine Detection System is a mine hunting system designed to detect, classify, and localize floating and near-surface, moored sea mines using a laser system. The Airborne Laser Mine Detection System will be integrated into the MH-60S helicopter to provide a rapid wide-area reconnaissance and assessment of mine threats in littoral zones, confined straits, choke points, and amphibious objective areas for Carrier and Expeditionary Strike Groups. The Airborne Laser Mine Detection System uses pulsed laser light to image the entire near-surface volume potentially containing mines. Airborne Laser Mine Detection System is capable of day or night operations without stopping to deploy or recover equipment and without towing any equipment in the water. With un-tethered operations, it can attain high area search rates. This design uses the forward motion of the aircraft to generate image data negating the requirement for complex scanning mechanisms and ensuring high system reliability. Airborne Laser Mine Detection System also provides accurate target geo-location to support follow on neutralization of the detected mines. Airborne Laser Mine Detection System works in conjunction with the Airborne Projectile-Based Mine Clearance System.	
Information Typical to the Event	**Platform:** Rotary-wing aircraft (e.g., MH-60S) **Systems:** AN/AES-1 Airborne Laser Mine Detection System **Ordnance/Munitions:** None **Targets:** Floating/moored mine shapes **Duration:** 2.5 flight hours/event	**Location:** Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Aircraft noise **Energy:** None **Physical Disturbance and Strike:** Aircraft strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	None	

A.2.5.5 Airborne Projectile-Based Mine Clearance System

Activity Name	**Activity Description**	
Mine Warfare		
Airborne Projectile-Based Mine Clearance System	An MH-60S helicopter uses a laser-based detection system to search for mines and to fix mine locations for neutralization with an airborne projectile-based mine clearance system. The system neutralizes mines by firing a small- or medium-caliber inert, supercavitating projectile from a hovering helicopter.	
Long Description	During an airborne projectile-based mine clearance system test, an MH-60S helicopter evaluates the search capabilities of an Airborne Projectile-based Mine Clearance System (such as the AN/AWS-2 Rapid Airborne Mine Clearance System) to detect mines and fix mine locations using a laser. The airborne projectile-based mine clearance system can work in tandem with the Airborne Laser Mine Detection System by providing a mine neutralizing (destroying) capability for Airborne Laser Mine Detection System—detected, near-surface mines. The gun (e.g., Bushmaster) fires a medium-caliber (e.g., 30 mm) non-explosive, supercavitating projectile at the target from a hovering MH-60S. The projectile penetrates the target, rendering it non-functional. Mine shapes would almost always be used as the targets during a test. In the event a high explosive mine is used during the final testing phase, an underwater explosion may be generated as the mine is neutralized.	
Information Typical to the Event	**Platform:** Rotary-wing aircraft (e.g., MH-60S) **Systems:** Rapid Airborne Mine Clearance System or similar system **Ordnance/Munitions:** Medium-caliber supercavitating projectile (non-explosive), Mines (non-explosive and explosive) **Targets:** Floating/moored/bottom mine or mine shape **Duration:** 2.5 flight hours/event	**Location:** Southern California Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives (E11), aircraft noise **Energy:** In-air low energy laser **Physical Disturbance and Strike:** Military expended material strike (projectiles), seafloor device strike (mine shapes), aircraft strikes (birds only) **Entanglement:** None **Ingestion:** Projectiles (small- and medium-caliber), target fragments	
Detailed Military Expended Material Information	Projectiles (small- and medium-caliber) Target fragments Mine shapes are typically retrieved and reused, if they are not too badly damaged from neutralization attempt	
Assumptions used for Analysis	All mines under the No Action Alternative are non-explosive	

A.2.6 OTHER TESTING

A.2.6.1 Test and Evaluation – Catapult Launch

Activity Name	Activity Description	
Other Testing		
Test and Evaluation – Catapult Launch	Tests evaluate the function of aircraft carrier catapults at sea following enhancements, modifications, or repairs to catapult launch systems, including aircraft catapult launch tests. No weapons or other expendable materials would be released.	
Long Description	Aircraft catapults are systems used to assist aircraft take-off in aircraft carriers. Catapults consist of a track built into the flight deck, below which is a large piston or shuttle that is attached through the track to the nose gear of the aircraft. Navy aircraft launch systems are powered by steam or driven by an electromagnetic motor. Steam-powered catapults draw steam from the ship's boilers to the catapult steam receivers or accumulator, where it is stored at the desired pressure. From the receivers/accumulator, steam is directed to the launching valves, and provides the energy to launch aircraft. The most significant differences between the various types of steam catapults are the length and capacity. An electromagnetic launch system provides higher launch energy capability, reduced weight, volume, and maintenance, increased controllability, availability, reliability, and efficiency. The present electromagnetic aircraft launch system design centers around a linear synchronous motor and supplied power from pulsed disk alternators through a cycloconverter. Average power, obtained from an independent source on the host platform, is stored kinetically in the rotors of the disk alternators. It is then released in a two to three second pulse during a launch. This high-frequency power is fed to the cycloconverter which acts as a rising voltage, rising frequency source to the launch motor. The linear synchronous motor takes the power from the cycloconverter and accelerates the aircraft down the launch stroke, all the while providing "real time" closed loop control. Catapult launch tests would occur on Fleet aircraft carriers during deployment. The specific locations of carriers from 2014-2020 is unknown. No weapons or other expendable materials would be released during catapult tests.	
Information Typical to the Event	**Platform:** Aircraft Carrier (e.g., CVN 68-78), Fixed-wing aircraft (e.g., E-2/C-2) **Systems:** Catapult, Electromagnetic aircraft launch system **Ordnance/Munitions:** None **Targets:** None **Duration:** Fixed-wing aircraft 2 to 6 flight hours/event	**Location:** Throughout HSTT Study Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, aircraft strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	None	

A.2.6.2 Air Platform Shipboard Integration Test

Activity Name	Activity Description	
Other Testing		
Air Platform Shipboard Integration Test	Tests evaluate the compatibility of aircraft and aircraft systems with ships and shipboard systems. Tests involve physical operations and verify and evaluate communications and tactical data links. This test function also includes an assessment of carrier-shipboard suitability, such as Hazards of Electromagnetic Radiation to Ordnance, Hazard of Electromagnetic Radiation to Personnel, and High Energy Radio Frequency.	
Long Description	The Air Platform Shipboard Integration Test is performed to evaluate the compatibility of an aircraft to operate from designated shipboard platforms, perform shipboard physical operations, and to verify and evaluate communications and tactical data links. This test function also includes an assessment of carrier-shipboard suitability, such as Hazards of Electromagnetic Radiation to Ordnance, Hazard of Electromagnetic Radiation to Personnel, and High Energy Radio Frequency.	
Information Typical to the Event	**Platform:** Aircraft carrier (e.g., CVN 68-78), Fixed-wing aircraft (e.g., E-2/C-2) **Systems:** Data link and communication systems, Hazards of Electromagnetic Radiation to Ordnance, Hazard of Electromagnetic Radiation to Personnel, High Energy Radio Frequency **Ordnance/Munitions:** None **Targets:** None **Duration:** 2 to 6 flight hours/event	**Location:** Throughout HSTT Study Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Aircraft noise **Energy:** None **Physical Disturbance and Strike:** vessel strike, aircraft strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions used for Analysis	None	

A.2.6.3 Shipboard Electronic Systems Evaluation

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Other Testing</td></tr>
<tr><td>Shipboard Electronic Systems Evaluation</td><td colspan="2">Tests measure ship antenna radiation patterns and test communication systems with a variety of aircraft.</td></tr>
<tr><td>Long Description</td><td colspan="2">Shipboard electronic systems evaluation tests measure ship antenna radiation patterns and evaluate communication systems linking vessels and aircraft. Aircraft capable of landing on a vessel (e.g. aircraft carrier or Littoral Combat Ship) temporarily deploy to a nearshore vessel and conduct a variety of tests over a period of days to test newly installed or modified systems onboard the aircraft for compatibility with shipboard electronic systems. Follow-on test and evaluation of unmanned aerial systems would consist of dynamic interface testing, shipboard electromagnetic testing, and envelope expansion tests intended to evaluate capability of the unmanned aerial system to conduct launch and recovery operations from a vessel at sea as well as perform missions in a maritime environment. Altitudes would range from mean seal level to 15,000 ft. above mean seal level with the majority of flights occurring between mean seal level and 3,000 ft. Unmanned aerial systems would include Small Tactical Unmanned Aerial System/Tier II tactical unmanned aerial system, Broad Area Maritime Surveillance System, Fire Scout vertical take-off and landing tactical unmanned air vehicle, and Unmanned Combat Air System; and Aircraft Carrier Demonstration testing.

Shipboard testing of the Joint Precision Approach and Landing System, test new technology systems to provide precision guidance to aircraft landing on air capable vessels. At-sea flight test of the CH-53K helicopter would consist of shipboard compatibility (dynamic interface/envelope expansion) and, during Operational Evaluation, amphibious assault scenarios. Shipboard electronic systems evaluation tests of the V-22 helicopter would involve flight and wind envelope expansion interface testing with Amphibious Assault Ships, Amphibious Transport Dock, and Dock Landing Ship class vessels.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Fixed-wing aircraft (e.g., E-2/C-2), rotary-wing aircraft (e.g., CH-53K, V-22), unmanned aerial systems, surface ships
Systems: Joint Precision Approach and Landing System; Broad Area Maritime Surveillance system; Fire Scout vertical take-off and landing tactical unmanned air vehicle; Unmanned Combat Air System; aircraft carrier demonstration; small tactical unmanned aerial system/Tier II
Ordnance/Munitions: None
Targets: None
Duration: 2 to 20 flight hours/event</td><td>Location:
Throughout HSTT Study Area</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Aircraft noise
Energy: None
Physical Disturbance and Strike: vessel strike, aircraft strike (birds only)
Entanglement: None
Ingestion: None</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">None</td></tr>
<tr><td>Assumptions used for Analysis</td><td colspan="2">None</td></tr>
</table>

A.3 Naval Sea Systems Command Testing Activities

Naval Sea Systems Command testing activities are aligned with its mission of new ship construction, life cycle support, and weapon systems development. Each major category of Naval Sea Systems Command activities is described below.

A.3.1 New Ship Construction

Ship construction activities include pierside testing events, a series of sea trials, and developmental and operational test and evaluation programs. Pierside and at-sea testing of systems aboard a ship may include activation of acoustic sources, acoustic countermeasures, radars, and radio equipment. Pierside events also consist of light-off and operational checks of the vessel's propulsion, weapons, and other combat systems prior to at-sea operations. However, for purposes of this EIS/OEIS, pierside testing at Navy contractor shipyards will consist only of tactical sonar systems. At sea, each new ship is operated at full power and subjected to high-speed runs and steering tests. At-sea test firing of shipboard weapons systems, including guns, are also conducted.

A.3.1.1 Surface Combatant Sea Trials – Pierside Sonar Testing

Activity Name	Activity Description	
New Ship Construction		
Surface Combatant Sea Trials – Pierside Sonar Testing	Tests vessel's sonar systems pierside to ensure proper operation.	
Long Description	Pierside sonar testing is one part of the total surface combatant sea trial activity. Surface combatant sonar is tested pierside to ensure proper operation prior to conducting the at-sea portion of the sea trial. Surface combatants included in this activity are the ARLEIGH BURKE class (DDG 51) and the ZUMWALT class (DDG 1000) destroyers.	
Information Typical to the Event	**Platform:** Surface combatant vessel (e.g., DDG 51 and DDG 1000) **Systems:** Mid-frequency sonar **Ordnance/Munitions:** None **Targets:** None **Duration:** Event duration is 3 weeks accumulative per ship, with each source run independently and not continuously during this time	**Location:** Pierside: Pearl Harbor, HI Pierside: San Diego, CA
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency sonar (e.g., MF1, MF1K, MF10), underwater communications (e.g., MF9) **Energy:** None **Physical Disturbance and Strike:** None **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	None	

A.3.1.2 Surface Combatant Sea Trials – Propulsion Testing

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">New Ship Construction</td></tr>
<tr><td>Surface Combatant Sea Trials – Propulsion Testing</td><td colspan="2">Vessel is run at high speeds in various formations (e.g., straight-line and reciprocal paths).</td></tr>
<tr><td>Long Description</td><td colspan="2">Propulsion testing is one part of the total surface combatant sea trial activity. Propulsion testing includes vessel maneuvering, including full power runs (speeds in excess of 30 knots) and endurance runs.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Surface combatant vessel (e.g., DDG 51 and DDG 1000)
Systems: None
Ordnance/Munitions: None
Targets: None
Duration: Full power runs are conducted for a total of 4 hours, and endurance runs are conducted for a total of 2 hours.</td><td>Location:
Hawaii Range Complex
Southern California Range Complex</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Vessel noise
Energy: None
Physical Disturbance and Strike: Vessel strike
Entanglement: None
Ingestion: None</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">None</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="2">Vessels may not be traveling in a straight line
Vessels will operate across the full spectrum of capable speeds
Vessels will not be conducting test constantly for the entire duration</td></tr>
</table>

A.3.1.3 Surface Combatant Sea Trials – Gun Testing

Activity Name	Activity Description	
New Ship Construction		
Surface Combatant Sea Trials – Gun Testing	Gun systems are tested using non-explosive rounds.	
Long Description	Gun testing is one part of the total surface combatant sea trial activity. Tests currently include firing of 5-inch, 0.62-caliber guns, and will potentially include a 155 mm gun for future DDG 1000 platforms.	
Information Typical to the Event	**Platform:** Surface combatant vessel (e.g., DDG 51 and DDG 1000) **Systems:** Large-caliber guns (5 inch, 155 mm), medium caliber guns (close-in weapons system) **Ordnance/Munitions:** Large- and medium-caliber projectiles (e.g., 5 inch, 155 mm, 20 mm cannon [non-explosive]) **Targets:** None **Duration:** The entire sea trial duration is 4 days, within which gun testing would occur.	**Location:** Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, weapons firing noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, military expended materials strike (non-explosive projectiles) **Entanglement:** None **Ingestion:** Projectiles, casings	
Detailed Military Expended Material Information	26 large-caliber non-explosive practice munitions per event; 700 medium-caliber non-explosive practice munitions per event Projectiles Casings	
Assumptions Used for Analysis	Vessels will not be conducting test constantly for the entire duration 26 large-caliber non-explosive practice munitions per event, 700 medium-caliber non-explosive practice munitions per event	

A.3.1.4 Surface Combatant Sea Trials – Missile Testing

Activity Name	Activity Description	
New Ship Construction		
Surface Combatant Sea Trials – Missile Testing	Non-explosive or explosive missiles are fired at target drones to test the launching system.	
Long Description	Missile testing is one part of the total surface combatant sea trial activity. During the event, support craft launch target drones, upon which two explosive or non-explosive missiles are fired.	
Information Typical to the Event	**Platform:** Surface combatant vessel (e.g., DDG 51 and DDG 1000) **Systems:** Missile launch system **Ordnance/Munitions:** Missiles (explosive and non-explosive) **Targets:** Retrievable mobile targets (e.g., drones) **Duration:** The entire sea trial duration is 4 days, within which missile testing would occur.	**Location:** Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, weapons firing noise, in-air explosives **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (non-explosive practice munitions), vessel strike, munitions fragments **Entanglement:** None **Ingestion:** Munitions fragments	
Detailed Military Expended Material Information	Two missiles (explosive or non-explosive)/event	
Assumptions Used for Analysis	Vessels will not be conducting test constantly for the entire duration Two Missiles per event (explosive or non-explosive) Target drones are recovered by supporting craft	

A.3.1.5 Surface Combatant Sea Trials – Decoy Testing

Activity Name	Activity Description	
New Ship Construction		
Surface Combatant Sea Trials – Decoy Testing	Includes testing of the MK-36 Decoy Launching system	
Long Description	Testing of the MK-36 Decoy Launching system is one part of the total surface combatant sea trial activity. During the event, chaff cartridges are launched to ensure proper operation of the system.	
Information Typical to the Event	**Platform:** Surface combatant vessel (e.g., DDG 51 and DDG 1000) **Systems:** MK-36 Decoy Launching system **Ordnance/Munitions:** None **Targets:** None **Duration:** The entire sea trial duration is 4 days, within which decoy launching testing would occur.	**Location:** Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel Noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, expended material other than munitions (concrete slugs) **Entanglement:** None **Ingestion:** End caps, pistons, chaff	
Detailed Military Expended Material Information	36 chaff cartridges (end caps, pistons, and chaff) or concrete slugs/event	
Assumptions Used for Analysis	Vessels will not be conducting test constantly for the entire duration 36 chaff cartridges or concrete slugs per event	

A.3.1.6 Surface Combatant Sea Trials – Surface Warfare Testing

Activity Name	Activity Description	
New Ship Construction		
Surface Combatant Sea Trials – Surface Warfare Testing – Large Caliber	Vessels defend against surface targets with large-caliber guns.	
Long Description	Surface warfare testing is one part of the total surface combatant sea trial activity. During this event, a high speed maneuverable surface target would run a weaving pattern towards the vessel at speeds in excess of 20 knots. The surface combatant would fire non-explosive large-caliber rounds at the incoming target.	
Information Typical to the Event	**Platform:** Surface combatant vessel (e.g., DDG 51 and DDG 1000) **Systems:** Large-caliber weapons systems **Ordnance/Munitions:** Large-caliber projectiles (e.g., 5 inch, 155 mm [non-explosive]) **Targets:** Surface targets (e.g., High Speed Maneuverable Surface Target) **Duration:** The entire sea trial duration is 4 days, within which surface warfare testing would occur.	**Location:** Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, weapons firing noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, in-water device strike, military expended material strike (non-explosive practice munitions) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	Large-caliber projectiles, target fragments	
Assumptions Used for Analysis	Vessels will not be conducting test constantly for the entire duration 48 rounds/event	

A.3.1.7 Surface Combatant Sea Trials – Anti-Submarine Warfare Testing

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">New Ship Construction</td></tr>
<tr><td>Surface Combatant Sea Trials – Anti-Submarine Warfare Testing</td><td colspan="2">Vessels demonstrate capability of countermeasure systems and underwater surveillance and communications systems.</td></tr>
<tr><td>Long Description</td><td colspan="2">Anti-submarine warfare testing is one part of the total surface combatant sea trial activity. During this event, hull-mounted sonar systems are operated to test the capability of the systems. Mid- and high-frequency acoustic sources are used during this activity.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Surface combatant vessel (e.g., DDG 51 and DDG 1000)
Systems: Surface ship sonar, Countermeasure systems, Underwater surveillance and communications systems
Ordnance/Munitions: None
Targets: Motorized Autonomous Targets (e.g., Expendable Mobile Anti-Submarine Warfare Training Target)
Duration: The entire sea trial duration is 4 days, within which anti-submarine warfare testing would occur.</td><td>Location:
Hawaii Range Complex
Southern California Range Complex</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Mid-frequency sonar (e.g., MF1, MF1K, MF10), acoustic countermeasures (e.g., ASW3), underwater communications (e.g., MF9), vessel noise
Energy: None
Physical Disturbance and Strike: Vessel and in-water device strike
Entanglement: None
Ingestion: None</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">None</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="2">Vessels will not be conducting test constantly for the entire duration</td></tr>
</table>

A.3.1.8 Other Ship Class Sea Trials – Propulsion Testing

Activity Name	Activity Description	
New Ship Construction		
Other Class Ship Sea Trials – Propulsion Testing	Vessel is run at high speeds in various formations (e.g., straight-line and reciprocal paths).	
Long Description	Propulsion testing is one part of the total sea trial activity. During this event, the vessel is tested for maneuverability, including full power and endurance runs.	
Information Typical to the Event	**Platform:** Amphibious warfare vessels, surface combatant vessels (e.g., Littoral Combat Ship), support craft/other – specialized high speed vessels **Systems:** None **Ordnance/Munitions:** None **Targets:** None **Duration:** Propulsion testing occurs during one day of a 5-day sea trial.	**Location:** Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	Vessels will not be conducting test constantly for the entire duration Vessels may not be traveling in a straight line Vessels will operate across the full spectrum of capable speeds	

A.3.1.9 Other Ship Class Sea Trials – Gun Testing – Small Caliber

Activity Name	Activity Description	
New Ship Construction		
Other Class Ship Sea Trials – Gun Testing – Small Caliber	Vessels defend against surface targets with small-caliber guns.	
Long Description	Small-caliber gun testing is included as part of the total sea trial activity. Small-caliber gun testing includes 0.50-caliber guns.	
Information Typical to the Event	**Platform:** Amphibious warfare vessels, surface combatant vessel (e.g., Littoral Combat Ship), support craft/other – specialized high speed, **Systems:** Small-caliber weapon systems **Ordnance/Munitions:** Small-caliber projectiles (e.g., 0.50 caliber [non-explosive]) **Targets:** None **Duration:** Small-caliber gun testing would occur within the 5-day sea trials	**Location:** Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (non-explosive projectiles), vessel strike **Entanglement:** None **Ingestion:** Small-caliber projectiles, casings	
Detailed Military Expended Material Information	Small-caliber projectiles Casings	
Assumptions Used for Analysis	Vessels will not be conducting test constantly for the entire duration	

A.3.1.10 Anti-Submarine Warfare Mission Package Testing

Activity Name	Activity Description	
New Ship Construction		
Anti-Submarine Warfare Mission Package Testing	Ships and their supporting platforms (e.g., helicopters, unmanned aerial vehicles) detect, localize, and prosecute submarines.	
Long Description	Vessels conduct detect-to-engage operations against modern diesel-electric and nuclear submarines using airborne and surface assets (both manned and unmanned). Active and passive acoustic systems are used to detect and track submarine targets, culminating in the deployment of lightweight torpedoes to engage the threat.	
Information Typical to the Event	**Platform:** Surface Combatant Vessels (e.g., Littoral Combat Ship); Rotary-wing aircraft, Submarines **Systems:** Surface ship sonar, helicopter-deployed sonar, active sonobuoys, torpedo sonar **Ordnance/Munitions:** Non-explosive torpedoes **Targets:** Motorized Autonomous Targets (e.g., Expendable Mobile Anti-Submarine Warfare Training Target) **Duration:** Event duration is approximately 1 to 2 weeks, with 4 to 8 hours of active sonar use with intervals of non-activity in between.	**Location:** Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency sonar (e.g., MF12), helicopter-deployed sonar (e.g., MF4), active sonobuoys (e.g., MF5), torpedo sonar (e.g., TORP1); Anti-submarine sonar (e.g., ASW1); acoustic countermeasures (e.g., ASW3), vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Vessel and in-water device strike, military expended material strike (sonobuoys), towed device strike, aircraft strike (birds only) **Entanglement:** Parachutes **Ingestion:** Parachutes	
Detailed Military Expended Material Information	Torpedo launch accessories Sonobuoys and parachutes	
Assumptions Used for Analysis	One target per event Two sonobuoys expended per event; all sonobuoys have a parachute unless otherwise noted	

A.3.1.11 Surface Warfare Mission Package – Gun Testing – Small Caliber

Activity Name	Activity Description	
New Ship Construction		
Surface Warfare Mission Package Testing – Gun Testing – Small Caliber	Vessels defend against surface targets with small-caliber guns.	
Long Description	Vessels conduct surface warfare by detecting, tracking, and prosecuting small-boat threats. The Surface Warfare Mission Package provides a layered strike/defensive capability by use of its embarked support aircraft, medium range surface-to-surface missiles, and 30 mm gun weapon system.	
Information Typical to the Event	**Platform:** Surface combatant vessels (e.g., Littoral Combat Ship) **Systems:** Small-caliber gun systems **Ordnance/Munitions:** Small-caliber projectiles (e.g., 0.50 caliber) (non-explosive) **Targets:** None **Duration:** Event duration is approximately 1 to 2 weeks, with intervals of surface warfare mission package use during this time.	**Location:** Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (non-explosive projectiles), vessel strike **Entanglement:** None **Ingestion:** Small projectile, casing	
Detailed Military Expended Material Information	Small projectiles Casings	
Assumptions Used for Analysis	500 rounds per event	

A.3.1.12 Surface Warfare Mission Package – Gun Testing – Medium Caliber

Activity Name	Activity Description	
New Ship Construction		
Surface Warfare Mission Package Testing – Gun Testing Medium Caliber	Vessels defend against surface targets with medium-caliber guns.	
Long Description	Vessels conduct surface warfare by detecting, tracking, and prosecuting small-boat threats. The surface warfare Mission Package provides a layered strike/defensive capability by use of its embarked support aircraft, medium range surface-to-surface missiles, and 30 mm gun weapon system.	
Information Typical to the Event	**Platform:** Surface Combatant Vessels **Systems:** Medium-caliber gun systems **Ordnance/Munitions:** Medium-caliber projectiles (explosive and non-explosive) **Targets:** None **Duration:** Event duration is approximately 1 to 2 weeks, with intervals of surface warfare mission package use during this time.	**Location:** Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Weapons firing noise, vessel noise, underwater explosives (E1), **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (non-explosive projectiles), vessel strike **Entanglement:** None **Ingestion:** Projectiles, casings, fragments	
Detailed Military Expended Material Information	Projectiles Casings, Fragments	
Assumptions Used for Analysis	700 explosive and 700 non-explosive rounds per event	

A.3.1.13 Surface Warfare Mission Package – Gun Testing – Large Caliber

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">New Ship Construction</td></tr>
<tr><td>Surface Warfare Mission Package Testing – Gun Testing Large Caliber</td><td colspan="2">Vessels defend against surface targets with large-caliber guns.</td></tr>
<tr><td>Long Description</td><td colspan="2">Vessels conduct surface warfare by detecting, tracking, and prosecuting small-boat threats. The Surface Warfare Mission Package provides a layered strike/defensive capability by use of its embarked support aircraft, medium range surface-to-surface missiles, and 57 mm gun weapon system.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Surface Combatant Vessels
Systems: Large-caliber weapon systems
Ordnance/Munitions: Large-caliber projectiles (explosive and non-explosive)
Targets: None
Duration: Event duration is approximately 1 to 2 weeks, with intervals of surface warfare mission package use during this time.</td><td>Location:
Hawaii Range Complex
Southern California Range Complex</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Weapons firing noise, vessel noise, in-air explosives
Energy: None
Physical Disturbance and Strike: Military expended material strike (non-explosive projectiles, fragments), vessel strike
Entanglement: None
Ingestion: Projectiles, fragments</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">Casings
Projectiles</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="2">980 explosive and 420 non-explosive rounds per event</td></tr>
</table>

A.3.1.14 Surface Warfare Mission Package Testing – Missile/Rocket Testing

Activity Name	Activity Description
New Ship Construction	
Surface Warfare Mission Package Testing – Missile/Rocket Testing	Vessels defend against surface targets with medium range missiles or rockets.
Long Description	Vessels conduct surface warfare by detecting, tracking, and prosecuting small-boat threats. The surface warfare Mission Package provides a layered strike/defensive capability by use of its embarked support aircraft, medium range missiles or rockets, and gun weapon system.
Information Typical to the Event	**Platform:** Surface Combatant Vessels, rotary-wing aircraft, unmanned aircraft **Systems:** None **Ordnance/Munitions:** Missiles (e.g., anti-surface) or rockets (non-explosive and explosive) **Targets:** None **Duration:** Event duration is approximately 1 to 2 weeks, with intervals of surface warfare mission package use during this time. **Location:** Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Underwater explosives (e.g., E6), weapons firing noise, aircraft noise, vessel noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (non-explosive projectiles and explosive fragments), aircraft strike (birds only), vessel strike **Entanglement:** None **Ingestion:** Missile or rocket fragments
Detailed Military Expended Material Information	Missile or rocket fragments
Assumptions Used for Analysis	Two missiles or rockets per event

A.3.1.15 Mine Countermeasure Mission Package Testing

Activity Name	Activity Description	
New Ship Construction		
Mine Countermeasure Mission Package Testing	Vessels and associated aircraft conduct mine countermeasure operations.	
Long Description	Littoral Combat Ships conduct mine detection using unmanned submersible and aerial vehicles, magnetic and acoustic sensor systems deployed by vessel or support helicopters, and laser systems. Mines are then neutralized using magnetic, acoustic, and supercavitating systems.	
Information Typical to the Event	**Platform:** Littoral Combat Ship, Unmanned Underwater Vehicles, Rotary aircraft **Systems:** Towed sonar system **Ordnance/Munitions:** Mine neutralization systems (e.g., Airborne Mine Neutralization System) **Targets:** Floating/moored/bottom non-explosive, mines or passive mine simulation systems **Duration:** 1 to 2 weeks with intervals of mine countermeasure mission package use during this time.	**Location:** Hawaii Range Complex, Southern California Range Complex: Camp Pendleton Amphibious Assault Area; Pyramid Cove; Tanner Bank Minefield
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Towed sonar systems (e.g., HF4), underwater explosives (e.g., E4), aircraft noise, vessel noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, in-water device strike; aircraft strike (birds only) **Entanglement:** None **Ingestion:** Fragments	
Detailed Military Expended Material Information	Fragments	
Assumptions Used for Analysis	For Alternative 1: 9 events using 96 neutralizers (48 HE) For Alternative 2: 12 events using 128 neutralizers (64 HE)	

A.3.1.16 Post-Homeporting Test (All Classes)

Activity Name	Activity Description	
New Ship Construction		
Post-Homeporting Testing (All classes)	Tests electronic, navigation, and refueling capabilities.	
Long Description	Post-Homeporting testing includes Shipboard Electronic Systems Evaluation Facility measurements of antenna radiation patterns, Tactical Air Navigation certification, Identification Friend of Foe Verification, Dynamic Interface test (to validate helicopter operations), and underway replenishments.	
Information Typical to the Event	**Platform:** All classes of surface vessels **Systems:** Electronic and navigation systems **Ordnance/Munitions:** None **Targets:** None **Duration:** 1 to 5 days, depending upon the test being conducted (e.g., Shipboard Electronic Systems Evaluation Facility testing is 1 day; dynamic interface testing is 5 days).	**Location:** Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	None	

A.3.2 Lifecycle Activities

Testing activities are conducted throughout the lifecycle of a Navy ship to verify performance and mission capabilities. Tactical sonar system testing occurs pierside during maintenance, repair and overhaul availabilities, and at sea immediately following most major industrial periods. A Combat System Ship Qualification Trial is conducted for new ships and for ships that have undergone modification or overhaul of their combat systems.

Radar cross signature testing of surface ships is accomplished on new vessels and periodically throughout a ship's life cycle to measure how detectable the ship is to radar. Additionally, new construction, post availability, and lifecycle electromagnetic measurements of off-board electromagnetic signature are conducted for submarines.

A.3.2.1 Ship Signature Testing

Activity Name	Activity Description
Lifecycle Activities	
Ship Signature Testing	Tests vessel and submarine radar signatures and electromagnetic countermeasures.
Long Description	Radar cross signature testing of surface vessels is accomplished on new vessels and periodically throughout a vessel's lifecycle to measure how detectable the vessel is to radar. For example, Assessment Identification of Mine Susceptibility measurements are specific electromagnetic and passive acoustical tests performed on mine countermeasure vessels and on the Littoral Combat Ship mine countermeasure modules to determine their mine susceptibility. Additionally, measurements of deployed electromagnetic countermeasures are conducted during the new construction, post-delivery, and lifecycle phases of the acquisition process for submarines. Signature testing of all surface vessels and submarines verifies that each vessel's signature is within specifications, and may include the use of helicopter-deployed instrumentation, ship-mounted safety and navigation systems, fathometers, tracking devices, radar systems, and underwater communications equipment. Event duration includes all systems checks, including those that do not have active sonar.
Information Typical to the Event	**Platform:** All surface vessel and submarine classes **Systems:** None **Ordnance/Munitions:** None **Targets:** None **Duration:** Up to 20 days **Location:** Hawaii Range Complex Pierside: Pearl Harbor, HI Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike **Entanglement:** None **Ingestion:** None
Detailed Military Expended Material Information	None
Assumptions Used for Analysis	None

A.3.2.2 Surface Ship Sonar Testing/Maintenance (in Operating Areas and Ports)

Activity Name	Activity Description	
Lifecycle Activities		
Surface Ship Sonar Testing/Maintenance (in Operating Areas and Ports)	Pierside and at-sea testing of surface vessel systems occurs periodically following major maintenance periods and for routine maintenance.	
Long Description	Following major and routine maintenance periods, pierside and at-sea testing and maintenance is required. Multiple systems with active and passive acoustic sources such as tactical sonar, navigation systems, fathometers, underwater communications systems, underwater distress beacons, range finders, and other similar systems, would be tested.	
Information Typical to the Event	**Platform:** All surface vessel classes **Systems:** Surface ship sonar, underwater communications **Ordnance/Munitions:** None **Targets:** None **Duration:** Event duration for each test can be up to 3 weeks, with intermittent use of active sonar.	**Location:** Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency sonar (e.g., MF1, MF1K), underwater communications (e.g., MF9, MF10), acoustic countermeasures (e.g., ASW3), vessel noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	Sonar would not be continuously active for the duration of the test	

A.3.2.3 Submarine Sonar Testing/Maintenance (in Operating Areas and Ports)

Activity Name	Activity Description	
Lifecycle Activities		
Submarine Sonar Testing/Maintenance (in Operating Areas and Ports)	Pierside and at-sea testing of submarine systems occurs periodically following major maintenance periods and for routine maintenance.	
Long Description	Following major and routine maintenance periods, pierside and at-sea testing and maintenance is required. Multiple systems with active and passive acoustic sources such as navigation systems, fathometers, underwater communications systems, underwater distress beacons, range finders, and other similar systems, would be tested.	
Information Typical to the Event	**Platform:** Submarine **Systems:** Submarine sonar, underwater communications, tracking pingers **Ordnance/Munitions:** None **Targets:** None **Duration:** Event duration for each test can be up to 3 weeks, with intermittent use of active sonar.	**Location:** Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** High-frequency sonar (e.g. , HF1, HF3), mid-frequency sonar (e.g., MF3) underwater communications (e.g., M3), vessel noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	Sonar would not be used continuously throughout duration of test	

A.3.2.4 Combat System Ship Qualification Trial – In-Port Maintenance Period

Activity Name	Activity Description	
Lifecycle Activities		
Combat System Ship Qualification Trial – In-Port Maintenance Period	Each combat system is tested to ensure they are functioning in a technically acceptable manner and are operationally ready to support at-sea Combat System Ship Qualification Trial events.	
Long Description	Each combat system is tested to ensure they are functioning in a technically acceptable manner and are operationally ready to support at-sea Combat System Ship Qualification Trial events. The ship's test plans and procedures, Maintenance Repair/Requirements Cards, and computerized planned maintenance system are used in establishing testing standards for each system and pieces of equipment. Vessel's crew, under supervision of subject matter experts, complete all actions and receive remedial training where required. Trouble Observation Reports are written on noted discrepancies.	
Information Typical to the Event	**Platform:** Surface combatant vessel, amphibious warfare vessel **Systems:** All combat systems **Ordnance/Munitions:** None **Targets:** None **Duration:** 3 weeks	**Location:** Pierside: Pearl Harbor, HI Pierside: San Diego, CA
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency sonar (e.g., MF1) **Energy:** None **Physical Disturbance and Strike:** None **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	Sonar would not be continuously active for the duration of the test.	

A.3.2.5 Combat System Ship Qualification Trial – Air Defense

Activity Name	**Activity Description**	
Lifecycle Activities		
Combat System Ship Qualification Trial – Air Defense	Tests the vessel's capability to detect, identify, track, and successfully engage live and simulated targets.	
Long Description	Air Defense events are conducted in clear and varied electronic attack environments, using a mix of missile firings to verify the vessel's capability to detect, identify, track, and successfully engage live and simulated targets. The tests include testing the radar's track load in the presence of debris, long range engagement processing, low-elevation detection and tracking, track load in the presence of electronic attack and chaff, and missile performance.	
Information Typical to the Event	**Platform:** Surface combatant vessel, Amphibious warfare vessel **Systems:** All combat systems **Ordnance/Munitions:** Missiles (e.g., anti-air) (non-explosive and explosive), medium-caliber projectiles (non-explosive), large-caliber projectiles (explosive and non-explosive) **Targets:** Retrievable mobile targets (e.g., drones) and towed targets **Duration:** 1 week	**Location:** Hawaii Range Complex: Pacific Missile Range Facility. Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** In-air explosions, weapons firing noise, vessel noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (non-explosive practice munitions, munition fragments), aircraft strike (birds only), vessel strike **Entanglement:** None **Ingestion:** Chaff, target fragments, medium-caliber projectiles, end caps, pistons, casings	
Detailed Military Expended Material Information	Projectiles Munition fragments Target fragments Chaff, end caps, pistons Targets Surface-to-air missiles	
Assumptions Used for Analysis	2,000 medium-caliber projectiles/event non-explosive; 20 large-caliber projectiles/event (explosive and non-explosive) 14 missiles/event (7 high-explosive) 24 canisters per event	

A.3.2.6 Combat System Ship Qualification Trial – Surface Warfare

Activity Name	Activity Description	
Lifecycle Activities		
Combat System Ship Qualification Trial – Surface Warfare	Tests shipboard sensors capabilities to detect and track surface targets, relay the data to the gun weapon system, and engage targets.	
Long Description	Surface warfare events are gun weapons system tests conducted in a clear environment to demonstrate shipboard sensors capabilities to detect and track surface targets, relay the data to the gun weapon system, and engage targets. The event qualified the vessel's surface warfare gun capability to receive track data from the sensors, filter it, calculate ballistics, recommend aim-point corrections (spots), generate gun orders, select ammunition properly for targets at differing ranges, and deliver surface direct fire on the surface targets.	
Information Typical to the Event	**Platform:** Surface combatant vessel, Amphibious warfare vessel **Systems:** Gun weapons system, Missile systems **Ordnance/Munitions:** Large-caliber projectiles (e.g., 155 mm, 5 inch) (non-explosive and explosive), medium-caliber projectiles (non-explosive), missiles (non-explosive) **Targets:** Mobile surface targets (e.g., High-Speed Maneuvering Surface Target), towed surface targets (e.g., low cost modular target) **Duration:** 1 week	**Location:** Hawaii Range Complex: Pacific Missile Range Facility Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** In-air explosives (E5), weapons firing noise, vessel noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (non-explosive practice munitions, projectile fragments), vessel strike, in-water device strike **Entanglement:** None **Ingestion:** Medium-caliber projectiles, fragments	
Detailed Military Expended Material Information	Projectiles, munition fragments	
Assumptions Used for Analysis	Up to 300 large-caliber gun rounds/event (113 high-explosive) One surface-to-surface missile/event Up to 2,000 medium-caliber rounds/event Explosive large-caliber rounds are air-burst	

A.3.2.7 Combat System Ship Qualification Trial – Undersea Warfare

Activity Name	Activity Description	
Lifecycle Activities		
Combat System Ship Qualification Trial – Undersea Warfare	Tests vessel's ability to track and engage undersea targets.	
Long Description	Undersea warfare events are comprised of a series of tracking and firing exercises. The events ensure the operability of the undersea warfare suite and its interface with the Light Airborne Multi-Purpose System helicopter. Approximately one week of in-port training precedes exercises on an instrumented underwater range, where vessel's force becomes familiar with operation and maintenance of the undersea warfare system. Personnel then demonstrate the capability to establish the data link between the helicopter and vessel's undersea warfare system.	
Information Typical to the Event	**Platform:** Surface combatant vessel, rotary-wing aircraft **Systems:** Surface ship sonar, underwater communication systems, sonobuoys, missile systems **Ordnance/Munitions:** Non-explosive torpedoes **Targets:** Motorized autonomous targets (e.g., Expendable Mobile Anti-Submarine Warfare Training Target) **Duration:** 1 week	**Location:** Hawaii Range Complex: Pacific Missile Range Facility Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency sonar (e.g., MF1, MF2), high-frequency sonar (e.g., HF4), helicopter-deployed dipping sonar (e.g., MF4), active sonobuoys (e.g., MF5), torpedo sonar (e.g., TORP1), vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, In-water device strike, aircraft strike (birds only), military expended material strike (sonobuoys, torpedo launch accessories) **Entanglement:** Parachutes **Ingestion:** Parachutes and torpedo launch accessories	
Detailed Military Expended Material Information	Torpedo launch accessories (nose cap, suspension bands, air stabilizer, sway brace pad, arming wire, fahnstock clip, parachute) Sonobuoys Expendable targets Parachutes	
Assumptions Used for Analysis	Five targets per event All sonobuoys have a parachute unless otherwise noted Lightweight torpedoes only; no guidance wires Sonobuoys: 8 DICASS + 75 DIFAR/event	

A.3.3 SURFACE WARFARE/ANTI-SUBMARINE WARFARE TESTING

A.3.3.1 Missile Testing

Activity Name	Activity Description	
Surface Warfare/Anti-Submarine Warfare Testing		
Missile Testing	Missile testing includes various missiles fired from submarines and surface combatants.	
Long Description	Missile testing includes various missiles (e.g., standard missiles, Water Piercing Missile Launch) fired from submarines and surface combatants.	
Information Typical to the Event	**Platform:** Surface combatant vessels, submarines **Systems:** None **Ordnance/Munitions:** Missiles (e.g. anti-surface[non-explosive]) **Targets:** Unmanned surface vehicles, drones **Duration:** 1 to 2 hours	**Location:** Hawaii Range Complex: Pacific Missile Range Facility Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Weapons firing noise, vessel noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (non-explosive practice munition), vessel strike, in-water device strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	Missiles	
Assumptions Used for Analysis	All targets will be recovered One surface-to-surface missile/event	

A.3.3.2 Kinetic Energy Weapon Testing

Activity Name	Activity Description	
Anti-Surface Warfare/Anti-Submarine Warfare Testing		
Kinetic Energy Weapon Testing	A kinetic energy weapon uses stored energy released in a burst to accelerate a non-explosive projectile.	
Long Description	A kinetic energy weapon uses stored energy released in a burst to accelerate a non-explosive projectile to more than seven times the speed of sound to a range of up to 200 miles.	
Information Typical to the Event	**Platform:** Surface combatant vessel **Systems:** Kinetic energy weapon **Ordnance/Munitions:** Large-caliber projectile (non-explosive) **Targets:** Recoverable or expendable floating target **Duration:** 1 day	**Location:** Hawaii Range Complex: Pacific Missile Range Facility
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Weapons firing noise, vessel noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (non-explosive projectile), vessel strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	Expended targets and target fragments	
Assumptions Used for Analysis	40 large-caliber projectile per event Assume one expendable target/per event One event with 5,000 projectiles would occur only once before 2019.	

A.3.3.3 Electronic Warfare Testing

Activity Name	Activity Description	
Surface Warfare/Anti-Submarine Warfare Testing		
Electronic Warfare Testing	Testing will include radiation of military and commercial radar and communication systems (or simulators).	
Long Description	Testing will include radiation of military and commercial radar and communication systems (or simulators). No subsurface transmission would occur during this testing.	
Information Typical to the Event	**Platform:** Submarines **Systems:** None **Ordnance/Munitions:** None **Targets:** None **Duration:** 3 hours per day over 7 days	**Location:** Pierside: Pearl Harbor, HI Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** None **Energy:** None **Physical Disturbance and Strike:** Vessel strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	None	

A.3.3.4 Torpedo (Non-Explosive) Testing

Activity Name	Activity Description
Surface Warfare/Anti-Submarine Warfare Testing	
Torpedo (Non-explosive) Testing	Air, surface, or submarine crews employ non-explosive torpedoes against submarines or surface vessels.
Long Description	Aerial, surface, and subsurface assets fire exercise torpedoes against surface or subsurface targets. Torpedo testing evaluates the performance and the effectiveness of hardware and software upgrades of heavyweight or lightweight torpedoes.
Information Typical to the Event	**Platform:** Submarines, Surface combatant vessels, Fixed-wing aircraft, Rotary-wing aircraft, Support Craft/Other **Systems:** Surface vessel and submarine sonar, sonobuoys, dipping sonar **Ordnance/Munitions:** Non-explosive lightweight torpedoes, heavyweight explosive torpedoes **Targets:** Submarines, surface vessels, motorized autonomous targets (e.g., Expendable Mobile Anti-Submarine Warfare Training Target), stationary artificial targets (e.g., fleet training target) **Duration:** Up to 2 weeks **Location:** Hawaii Range Complex: Hawaii Area Tracking System; Test area north of Maui or Penguin Bank Hawaii Range Complex: Pacific Missile Range Facility Hawaii Range Complex: Shallow Water Training Range Southern California Range Complex: Tanner/Cortes, or Southern California Anti-Submarine Warfare Range; Shore Bombardment Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** High-frequency sonar (e.g., HF1), mid-frequency sonar (e.g., MF1, MF3), helicopter-deployed sonar (e.g., MF4), active sonobuoy (e.g., MF5), torpedo sonar (e.g., TORP1, TORP2), acoustic countermeasure (e.g., ASW3, ASW4), vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, in-water device strike, aircraft strike (birds only), military expended material strike **Entanglement:** Parachutes (sonobuoy and torpedo), guidance wire **Ingestion:** Parachutes (sonobuoy and torpedo), torpedo launch accessories
Detailed Military Expended Material Information	Sonobuoys Parachutes Expendable targets Acoustic countermeasures Torpedo launch accessories o Lightweight/heavyweight torpedo launch accessories ▪ Nose cap, suspension bands, air stabilizer, sway brace pad, arming wire,Fahnstock clip, wing kit, rocket booster, parachute, lead weights o Expended material is dependent upon torpedo fired and firing platform. o Heavyweight torpedo launch accessories ▪ Guidance wire, flex hose
Assumptions Used for Analysis	Sonobuoys – 384 sonobuoys per year Expendable targets – one target per event Acoustic countermeasures – 356 countermeasures per year All torpedoes are recovered Assume all lightweight torpedo launch accessories have all listed material All sonobuoys have a parachute unless otherwise noted Typically, no more than eight torpedoes are fired per day during daylight hours.

A.3.3.5 Torpedo (Explosive) Testing

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Surface Warfare/Anti-Submarine Warfare Testing</td></tr>
<tr><td>Torpedo (Explosive) Testing</td><td colspan="2">Air, surface, or submarine crews employ explosive torpedoes against artificial targets.</td></tr>
<tr><td>Long Description</td><td colspan="2">Non-explosive and explosive torpedoes (carrying a warhead) would be launched at a suspended target by a submarine and fixed- or rotary-winged aircraft or surface combatants. Torpedoes would detonate on an artificial target located at a depth between 200 and 700 ft. below the water’s surface.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Submarine, Surface combatant vessel, fixed-wing aircraft, rotary-wing aircraft, support craft/other
Systems: None
Ordnance/Munitions: Torpedoes (heavyweight and lightweight) (explosive and non-explosive)
Targets: Stationary artificial targets (e.g., MK-28)
Duration: 1 to 2 days during daylight hours. Only one heavyweight torpedo test could occur in 1 day; two heavyweight torpedo tests could occur on consecutive days. Two lightweight torpedo tests could occur in a single day.</td><td>Location:
Hawaii Range Complex
Southern California Range Complex</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Underwater explosion (e.g., E8, E11), torpedo sonar (e.g., TORP1, TORP2), vessel noise, aircraft noise
Energy: None
Physical Disturbance and Strike: Vessel strike, in-water device strike, aircraft strike (birds only), military expended material strike
Entanglement: Parachutes (sonobuoy and torpedo), guidance wire
Ingestion: Target and torpedo fragments, parachutes (sonobuoy and torpedo), torpedo launch accessories</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">Parachutes
Target fragments
Sonobuoys
Torpedo launch accessories
o Lightweight/heavyweight torpedo launch accessories
▪ Nose cap, suspension bands, air stabilizer, sway brace pad, arming wire,Fahnstock clip, wing kit, rocket booster, parachute, lead weights
o Expended material is dependent upon torpedo fired and firing platform.
o Heavyweight torpedo launch accessories
• Guidance wire, flex hose</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="2">All sonobuoys have a parachute unless otherwise noted
28 torpedoes per year (Alternatives 1 and 2)
8 high-explosive torpedoes/year
210 passive sonobuoys per event</td></tr>
</table>

A.3.3.6 Countermeasure Testing

Activity Name	**Activity Description**	
Anti-Surface Warfare/Anti-Submarine Warfare Testing		
Countermeasure Testing	Various acoustic systems (e.g., towed arrays and surface ship torpedo defense systems) are employed to detect, localize, track, and neutralize incoming weapons.	
Long Description	Countermeasure testing involves the testing of systems that would detect, localize, and track incoming weapons. At-sea testing of the Surface Ship Torpedo Defense systems include towed acoustic systems, torpedo warning systems, and countermeasure subsystems. Some countermeasure scenarios would employ non-explosive or explosive torpedoes against targets released by secondary platforms (e.g., helicopter or submarine). While surface vessels are in transit, countermeasure systems will be used to identify false alert rates.	
Information Typical to the Event	**Platform:** Aircraft Carrier, surface combatant, submarine, fixed-wing aircraft **Systems:** Countermeasure systems **Ordnance/Munitions:** Lightweight torpedoes (non-explosive and explosive) **Targets:** Torpedo test vehicle **Duration:** Up to 7 days	**Location:** Transit Corridor Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency sonar (e.g., MF1), high-frequency sonar (e.g., HF5), acoustic countermeasure (e.g., ASW3), torpedo sonar (e.g., TORP1, TORP2), underwater explosives (E7), vessel noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, In-water device strike, aircraft strike (birds only) **Entanglement:** Parachute (torpedo) **Ingestion:** Torpedo launch accessories/fragments, parachutes, sonobuoys	
Detailed Military Expended Material Information	Light-weight torpedo launch accessories (nose covers, parachutes, ram plates)/fragments	
Assumptions Used for Analysis	None	

A.3.3.7 Pierside Sonar Testing

Activity Name	Activity Description	
Anti-Surface Warfare (ASUW)/Anti-Submarine Warfare (ASW) Testing		
Pierside Sonar Testing	Pierside testing to ensure systems are fully functional in a controlled pierside environment prior to at-sea test activities.	
Long Description	Ships and submarines would activate mid- and high-frequency tactical sonars, underwater communications systems, and navigational devices to ensure they are fully functional prior to at-sea test events. Event duration is 2 weeks with active sonar used intermittently over 2 days during the total event duration.	
Information Typical to the Event	**Platform:** Submarine, surface combatant **Systems:** Mid- and high-frequency sonars, underwater communications systems, countermeasure systems **Ordnance/Munitions:** None **Targets:** None **Duration:** Event duration is up to 2 weeks.	**Location:** Pearl Harbor, Hawaii San Diego, CA
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency sonar (e.g., MF3), high-frequency sonar (e.g., HF1, HF3), acoustic countermeasure (e.g., ASW3) **Energy:** None **Physical Disturbance and Strike:** None **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Materials Information	None	
Assumptions Used for Analysis	Event duration is 2 weeks with active sonar used intermittently over 2 days during the total event duration.	

A.3.3.8 At-Sea Sonar Testing

Activity Name	Activity Description	
Surface Warfare/Anti-Submarine Warfare Testing		
At-sea Sonar Testing	At-sea testing to ensure systems are fully functional in an open ocean environment.	
Long Description	At-sea sonar testing is required to calibrate sonar systems while the vessel or submarine is in an open ocean environment. Tests consist of electronic support measurement, photonics, and sonar sensor accuracy testing. In some instances, a submarine's passive detection capability is tested when a second submarine utilizes its active sonar or is equipped with a noise augmentation system in order to replicate acoustic or electromagnetic signatures of other vessel types or classes.	
Information Typical to the Event	**Platform:** Surface combatant vessels, Submarines **Systems:** Tactical sonar **Ordnance/Munitions:** None **Targets:** None **Duration:** 4 hours to 11 days	**Location:** Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency sonar (e.g., MF3), high-frequency sonar (e.g., HF1, HF3), acoustic countermeasure (e.g., ASW4), vessel noise, acoustic modem (e.g., M3) **Energy:** None **Physical Disturbance and Strike:** Vessel strike, military expended material strike (acoustic countermeasures) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	Acoustic countermeasures	
Assumptions Used for Analysis	Active sonar use is intermittent throughout the duration of the event Acoustic countermeasures – 10 per event	

A.3.4 Mine Warfare Testing

A.3.4.1 Mine Detection and Classification

Activity Name	Activity Description	
Mine Warfare Testing		
Mine Detection and Classification Testing	Air, surface, and subsurface vessels detect and classify mines and mine-like objects.	
Long Description	Mine detection and classification systems require testing to evaluate the capability of generating underwater magnetic and acoustic signature fields capable of sweeping a wide range of threat mines at tactically significant water depths, ranging from the surf zone to deep water. In order to develop better and safer methods of minesweeping, the Navy is currently testing new systems to detect, locate, and identify mines including a laser airborne mine detection system that uses laser illumination coupled with sensitive electro-optic receivers to find mines in the upper part of the water column. This type of equipment is currently designed for operation from a manned helicopter; however, the next generation of such equipment is expected to operate from unmanned aerial vehicles.	
Information Typical to the Event	**Platform:** Rotary-wing aircraft, unmanned aerial systems, surface combatant vessels, amphibious warfare vessels, remotely operated vehicles **Systems:** Mine detection and classification systems **Ordnance/Munitions:** None **Targets:** Floating/moored/bottom non-explosive mines or passive mine simulation systems **Duration:** Up to 10 days	**Location:** Hawaii Range Complex Hawaii Range Complex: Kahoolawe Training Minefield Southern California Range Complex Southern California Range Complex: Mission Bay Training Minefield
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** High-frequency sonar (e.g., HF1), vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, in-water device strike, aircraft strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	Laser systems also used during testing	

A.3.4.2 Mine Countermeasure/Neutralization Testing

Activity Name	Activity Description	
Mine Warfare (MIW) Testing		
Mine Countermeasure/ Neutralization Testing	Air, surface, and subsurface vessels neutralize threat mines that would otherwise restrict passage through an area.	
Long Description	Mine countermeasure/neutralization testing is required to ensure systems can effectively neutralize threat mines that would otherwise restrict passage through an area. Countermeasure systems are deployed from surface ships and helicopters to neutralize mines a number of ways: cutting mooring cables of buoyant mines, producing medium- to high-frequency acoustic energy that fires acoustic-influence mines, producing electrical energy to replicate the magnetic signatures of surface ships in order to detonate threat mines, detonation of mines using remotely-operated vehicles such as the Archerfish Common Neutralizer, and using explosive charges or supercavitating projectiles to destroy threat mines.	
Information Typical to the Event	**Platform:** Surface combatant ship, rotary-wing aircraft, remotely operated vehicles **Systems:** Mine neutralization systems **Ordnance/Munitions:** Mine neutralization systems; explosive mines **Targets:** Floating/moored/bottom non-explosive and explosive mines and mine simulation systems **Duration:** Event duration ranges from 1 to 10 days, with intermittent use of countermeasure/neutralization systems during this period.	**Location:** Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mine countermeasure systems (e.g., HF4, M3), underwater explosives (e.g., E4, E8), vessel noise, aircraft noise **Energy:** Electromagnetic minesweeping systems **Physical Disturbance and Strike:** Vessel strike, aircraft strike (birds only), seafloor device strike (mine shapes) **Entanglement:** Fiber-optic cable **Ingestion:** Target fragments	
Detailed Military Expended Material Information	Target fragments, fiber-optic cable	
Assumptions Used for Analysis	**Other Sensors:** Mine countermeasures systems (e.g., AN/AWS-2 Rapid Airborne Mine Clearance System, AN/ALQ-220 Organic Airborne and Surface Influence Sweep)	

A.3.4.3 Pierside Systems Health Checks

Activity Name	Activity Description	
Mine Warfare Testing		
Pierside Systems Health Checks	Mine warfare systems are tested in pierside locations to ensure acoustic and electromagnetic sensors are fully functional prior to at-sea test activities.	
Long Description	Mine warfare systems are tested in pierside locations to ensure acoustic and electromagnetic sensors are fully functional prior to at-sea test activities. Systems that are tested pierside include mine hunting and localization sonar, electromagnetic mine neutralization systems, and navigation systems.	
Information Typical to the Event	**Platform:** Surface combatant vessel **Systems:** Mine detection systems **Ordnance/Munitions:** None **Targets:** None **Duration:** Event duration is up to 5 days, with systems being tested independently and periodically (not continuously) during the total event duration.	**Location:** Pierside: San Diego, CA
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** None **Energy:** None **Physical Disturbance and Strike:** None **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	None	

A.3.5 Shipboard Protection Systems and Swimmer Defense Testing

A.3.5.1 Pierside Integrated Swimmer Defense

Activity Name	Activity Description	
Shipboard Protection Systems and Swimmer Defense Testing		
Pierside Integrated Swimmer Defense	Swimmer defense testing ensures that systems can effectively detect, characterize, verify, and engage swimmer/diver threats in harbor environments.	
Long Description	Swimmer defense testing includes testing of systems to determine if they can effectively detect, characterize, verify, and engage swimmer/diver threats in harbor environments. Swimmer and diver threats are detected with high frequency sonar. The threats are then warned to exit the water through the use of underwater voice communications. If the threat does not comply, non-lethal diver deterrent air guns are used against the threat. Surface loudhailers are also used during the test.	
Information Typical to the Event	**Platform:** Support Craft/Other **Systems:** High-frequency sonar; airguns surface loudhailers **Ordnance/Munitions:** None **Targets:** None **Duration:** 14 days with intermittent periods of use for each system during this time.	**Location:** Pierside: San Diego, CA
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Low-frequency sonar (e.g., LF4), mid-frequency sonar (e.g., MF8), swimmer defense sonar (e.g., SD1), airguns (e.g., AG) **Energy:** None **Physical Disturbance and Strike:** Seafloor device strike (swimmer defense tripod) **Entanglement:** None **Ingestion:** None	
Military Expended Material	None	
Assumptions Used for Analysis	**Other Sensors:** Surface ship protection systems (e.g., communications systems, loudhailers, swimmer deterrents)	

A.3.5.2 Shipboard Protection Systems Testing

Activity Name	Activity Description	
Shipboard Protection Systems and Swimmer Defense Testing		
Shipboard Protection Systems Testing	Various systems are used to protect surface combatants from various threats.	
Long Description	Surface vessels engage small boat threats through the use of spotlights and loudhailers (pierside) but can also include the use of 0.50 cal guns (at-sea).	
Information Typical to the Event	**Platform:** Surface combatant vessels **Systems:** None **Ordnance/Munitions:** Small-caliber projectiles (e.g., 0.50 caliber [non-explosive]) **Targets:** Floating target, rigid-hull inflatable boat **Duration:** 10 days	**Location:** Pierside: San Diego, CA Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, weapons firing noise **Energy:** None **Physical Disturbance and Strike:** Military expended material strike (non-explosive projectiles), vessel strike **Entanglement:** None **Ingestion:** Small-caliber projectiles, casings	
Detailed Military Expended Material Information	Casings Projectiles Target fragments	
Assumptions Used for Analysis	Small-caliber rounds will not be used pierside	

A.3.5.3 Chemical/Biological Simulant Testing

Activity Name	Activity Description	
Shipboard Protection Systems and Swimmer Defense Testing		
Chemical/Biological Simulant Testing	Chemical/biological agent simulants are deployed against surface ships.	
Long Description	Chemical or biological agent simulants are deployed against surface vessels to verify the integrity of the vessel's defense system including installed detection, protection, and decontamination systems. Methods of simulant delivery include aerial dispersal and by hand-held spray.	
Information Typical to the Event	**Platform:** Surface combatant vessels, fixed-wing aircraft **Systems:** None **Ordnance/Munitions:** None **Targets:** None **Duration:** 3 days	**Location:** Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Vessel noise, aircraft noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike, aircraft strike (birds only) **Entanglement:** None **Ingestion:** Simulants	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	Examples of Chemical Simulants: glacial acetic acid, triethyl phosphate Examples of Biological Simulants: spore-forming bacteria, non-spore-forming bacteria, the protein ovalbumin, MS2 bacteriophages, and the fungus *Aspergillus niger*	

A.3.6 Unmanned Vehicle Testing

A.3.6.1 Underwater Deployed Unmanned Aerial Vehicle Testing

Activity Name	Activity Description	
Unmanned Vehicle Testing		
Underwater Deployed Unmanned Aerial Vehicle Testing	Submarines launch unmanned aerial vehicles while submerged.	
Long Description	During testing, a negatively buoyant capsule is deployed underwater and descends to a programmed depth. The capsule then drops a weight, inflates a flotation collar, rises to the surface, and launches an unmanned aerial system. Personnel use radio frequency communications to control and communicate with the unmanned aerial system during its flight.	
Information Typical to the Event	**Platform:** Submarine **Systems:** Unmanned aerial systems **Ordnance/Munitions:** None **Targets:** None **Duration:** 8 hours (4 hours/day over 2 days)	**Location:** Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** None **Energy:** None **Physical Disturbance and Strike:** Vessel strike, in-water device strike (unmanned aerial system launch), aircraft strike (birds only) **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	Expandable capsule (with flotation collar) Ballast weights	
Assumptions Used for Analysis	None	

A.3.6.2 Unmanned Vehicle Development and Payload Testing

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Unmanned Vehicle Testing</td></tr>
<tr><td>Unmanned Vehicle Development and Payload Testing</td><td colspan="2">Vehicle development involves the production and upgrade of new unmanned platforms on which to attach various payloads used for different purposes.</td></tr>
<tr><td>Long Description</td><td colspan="2">Vehicle development involves the production and upgrade of new unmanned platforms on which to attach various payloads used for different purposes. Platforms can include unmanned underwater vehicles, unmanned surface vehicles, and unmanned aerial systems. Payload testing assesses various systems that can be incorporated onto unmanned platforms for mine warfare, bottom mapping, and other missions. Tests range from basic remote control and autonomous navigation tests to deployment and activation of onboard systems which may include hydrodynamic instruments, launchers, and recovery capabilities. These vehicles are capable of expanding the communication and surveillance capabilities of submarines, surface vessels, and terrestrial commands.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Unmanned vehicles (underwater, surface, and aerial), Support Craft/Other
Systems: Unmanned vehicle sonar systems
Ordnance/Munitions: None
Targets: None
Duration: Event duration for unmanned vehicles with traditional propulsion typically lasts up to 40 hours. Some propulsion systems (e.g., gliders) could operate continuously for multiple months.</td><td>Location:
Hawaii Range Complex
Southern California Range Complex</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Mid-frequency sonar (e.g., MF9), high-frequency sonar (e.g., SAS2), vessel noise
Energy: None
Physical Disturbance and Strike: In-water device strike, seafloor device (bottom crawling vehicles), vessel strike
Entanglement: None
Ingestion: None</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">None</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="2">None</td></tr>
</table>

A.3.7 OTHER TESTING

A.3.7.1 Special Warfare

Activity Name	Activity Description	
Other Testing		
Special Warfare	Special warfare includes testing of submersibles capable of inserting and extracting personnel and payloads into denied areas from strategic distances.	
Long Description	Special warfare includes testing of submersibles capable of inserting and extracting personnel and payloads into denied areas from strategic distances. Testing could include the use of special operations forces deployed from submerged submarines while at sea.	
Information Typical to the Event	**Platform:** Surface craft/other, submarines **Systems:** Submarine sonar, Doppler sonar, side scan sonar, underwater communications **Ordnance/Munitions:** None **Targets:** None **Duration:** Up to 30 days	**Location:** Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** High-frequency sonar (e.g., HF1), acoustic modem (M3), underwater communications (e.g., MF9), vessel noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	Test will not occur constantly throughout duration	

A.3.7.2 Acoustic Communications Testing

Activity Name	Activity Description	
Other Testing		
Acoustic Communications Testing	Acoustic modems, submarines, and surface vessels transmit signals to communicate.	
Long Description	Acoustic communications testing can include transmission of low-, mid-, and high-frequency signals between acoustic modems, submarines, sub and surface vessels, vessels and shore, and between surface vessels and mines.	
Information Typical to the Event	**Platform:** Surface ships, submarines **Systems:** None **Ordnance/Munitions:** None **Targets:** None **Duration:** 12 hours	**Location:** Hawaii Range Complex Southern California Range Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** High-frequency sonar (e.g., HF1), acoustic communication (e.g., M3), vessel noise **Energy:** None **Physical Disturbance and Strike:** Vessel strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	None	

A.4 SPACE AND NAVAL WARFARE SYSTEMS COMMAND TESTING EVENTS

The mission of Space and Naval Warfare Systems Command is to acquire, develop, deliver, and sustain decision superiority for the warfighter at the right time and for the right cost. Space and Naval Warfare Systems Center Pacific is the research and development part of Space and Naval Warfare Systems Command focused on developing and transitioning technologies in the area of command, control, communications, computers, intelligence, surveillance, and reconnaissance for the Navy. Space and Naval Warfare Systems Command and Space and Naval Warfare Systems Center Pacific conduct research, development, test, and evaluation projects to support emerging technologies for intelligence, surveillance, and reconnaissance, anti-terrorism and force protection, mine countermeasures, anti-submarine warfare, oceanographic research, remote sensing, and communications. These activities include, but are not limited to, the testing of unmanned undersea and surface vehicles, a wide variety of sensor systems, underwater surveillance technologies, and underwater communications.

A.4.1 RESEARCH, DEVELOPMENT, TEST, AND EVALUATION

A.4.1.1 Autonomous Undersea Vehicle Anti-Terrorism/Force Protection Mine Countermeasures

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Autonomous Undersea Vehicle Anti-Terrorism/Force Protection Mine Countermeasures</td></tr>
<tr><td>Autonomous Undersea Vehicle Anti-Terrorism/Force Protection Mine Countermeasures</td><td colspan="2">Testing of unmanned undersea vehicles with mine hunting sensors in marine environments in and around rocky outcroppings. Anti-terrorism/force protection mine countermeasures testing is focused on mine countermeasure missions in confined areas between piers and pilings.</td></tr>
<tr><td>Long Description</td><td colspan="2">Autonomous undersea vehicle shallow water mine countermeasure testing is focused on the testing of unmanned undersea vehicles with mine hunting sensors in marine environments in and around rocky outcroppings. Anti-terrorism/force protection mine countermeasures testing are focused on mine countermeasure missions in confined areas between piers and pilings. It provides training to Navy personnel on how to deploy, detect, and defend against mine systems and underwater improvised explosive devices.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Autonomous Undersea Vehicle
Systems: Mine hunting sensors, synthetic aperture sonar (e.g., SAS1, SAS2, SAS3)
Ordnance/Munitions: None
Targets: Mine Shapes
Duration: Typically 5 days of daily operations for 6 hours per day</td><td>Location:
Hawaii Range Complex: Oahu, Hawaii
Southern California Range Complex : San Diego Bay, Camp Pendleton Amphibious Assault Area, San Clemente Island Operating Areas
Silver Strand Training Complex</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Synthetic aperture sonar; (e.g., SAS1, SAS2, SAS3)
Energy: None
Physical Disturbance and Strike: None
Entanglement: None
Ingestion: None</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">None</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="2">San Diego Bay vehicle depth shallow and slow moving. All other areas are deeper water with the vehicle moving approximately 3 to 4 knots near the sea floor. It may also include glider operations in the San Clemente Island Operating Area and open ocean. Conducted in multiple marine environments within HSTT study to include San Clemente Island Operating Area, Silver Strand Training Complex, and in and around rocky outcroppings and between Naval piers, pilings, and ships.</td></tr>
</table>

A.4.1.2 Autonomous Undersea Vehicle Underwater Communications

Activity Name	Activity Description	
Underwater Communications		
Autonomous Undersea Vehicle Underwater Communications	This testing is focused on providing two-way networked communications below the ocean surface while maintaining mission profile.	
Long Description	This testing is focused on providing two-way networked communications below the ocean surface while maintaining mission profile. The goal of this testing is to enable two-way communications during missions that require Autonomous Underwater Vehicles to remain submerged to minimize counter-detection and maximize tactical positioning.	
Information Typical to the Event	**Platform:** Autonomous Underwater Vehicle **Systems:** Acoustic modems (e.g., M3) **Ordnance/Munitions:** None **Targets:** Mine Shapes **Duration:** Typically 5 days of daily operations for 6 hours per day	**Location:** Hawaii Range Complex: Oahu, Hawaii Southern California Range Complex: San Diego Bay, Camp Pendleton Amphibious Assault Area, San Clemente Island Operating Areas Silver Strand Training Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Acoustic modems (e.g., M3) **Energy:** None **Physical Disturbance and Strike:** None **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	San Diego Bay vehicle depth shallow and slow moving. All other areas are deeper water with the vehicle moving approximately 3 to 4 knots near the sea floor. It may also include glider operations in the San Clemente Island Operating Area and open ocean. Conducted in multiple marine environments within HSTT study to include San Clemente Island Operating Area, Silver Strand Training Complex, and in and around rocky outcroppings and between Naval piers, pilings, and ships.	

A.4.1.3 Fixed System Underwater Communications

Activity Name	Activity Description	
Underwater Communications		
Fixed System Underwater Communications	Fixed underwater communications systems testing is focused on testing stationary or free floating equipment that provides two-way networked communications below the ocean surface while maintaining mission profile.	
Long Description	Fixed underwater communications systems testing is focused on testing stationary or free floating equipment that provides two-way networked communications below the ocean surface while maintaining mission profile. The goal of this testing is to enable two-way communications during missions that require the fixed sensor to remain submerged to minimize counter-detection and maximize tactical positioning. Typical tests last 5 days of 8 hours testing per day.	
Information Typical to the Event	**Platform:** Fixed systems **Systems:** Acoustic modem (e.g., M3) **Ordnance/Munitions:** None **Targets:** None **Duration:** Typically 5 days of daily operations for 6–8 hours per day	**Location:** SOCAL Range Complex: San Diego Bay, San Clemente Island Operating Areas Silver Strand Training Complex
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Acoustic modem (e.g., M3) **Energy:** None **Physical Disturbance and Strike:** Military expended material strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	Clump anchors and/or sand bags Expendable communications buoys	
Assumptions Used for Analysis	Fixed or free floating, stationary source	

A.4.1.4 Autonomous Oceanographic Research and Meteorology and Oceanography

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Autonomous Oceanographic Research and Meteorology and Oceanography</td></tr>
<tr><td>Autonomous Oceanographic Research and Meteorology and Oceanography (METOC)</td><td colspan="2">The research is comprised of ocean gliders and autonomous undersea vehicles. Gliders are portable, long-endurance buoyancy driven vehicles that provide a means to sample and characterize ocean water properties. Autonomous undersea vehicles are larger, shorter endurance vehicles.</td></tr>
<tr><td>Long Description</td><td colspan="2">The research is comprised of ocean gliders and autonomous undersea vehicles. Gliders are portable, long-endurance (weeks to months), buoyancy driven vehicles that provide a low-cost, semi-autonomous, and highly persistent means to sample and characterize the ocean water column properties at spatial and temporal resolutions.
Autonomous undersea vehicles are larger, shorter endurance (hours to days), conventionally powered (typically electric motor) vehicles that will increase the spatial extent and resolution of the bathymetry, imagery data, conductivity, temperature and depth data, and optical data.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Ocean glider, Autonomous Undersea Vehicles
Systems: Vehicle tracking systems (e.g., HF6)
Ordnance/Munitions: None
Targets: None
Duration: Typically 5 days of daily operations for 6 hours per day</td><td>Location:
Hawaii Range Complex: Oahu, Hawaii
SOCAL Range Complex: San Diego Bay, Camp Pendleton Amphibious Assault Area, San Clemente Island Operating Area
Silver Strand Training Complex</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Vehicle tracking systems (e.g., HF6)
Energy: None
Physical Disturbance and Strike: In-water device strike
Entanglement: None
Ingestion: None</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">None</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="2">San Diego Bay vehicle depth shallow and slow moving. All other areas are deeper water with the vehicle moving approximately 3 to 4 knots near the sea floor. It may also include glider operations in the San Clemente Island Operating Area and open ocean. Conducted in multiple marine environments within HSTT study to include San Clemente Island Operating Area, Silver Strand Training Complex, and in and around rocky outcroppings and between Naval piers, pilings, and ships.</td></tr>
</table>

A.4.1.5 Fixed Autonomous Oceanographic Research and Meteorology and Oceanography

<table>
<tr><th>Activity Name</th><th colspan="2">Activity Description</th></tr>
<tr><td colspan="3">Autonomous Oceanographic Research and Meteorology and Oceanography</td></tr>
<tr><td>Fixed Autonomous Oceanographic Research and Meteorology and Oceanography</td><td colspan="2">The goal of these systems is to develop, integrate, and demonstrate deployable autonomous undersea technologies that improve the Navy's capability to conduct effective anti-submarine warfare and intelligence, surveillance, and reconnaissance operations in littoral waters.</td></tr>
<tr><td>Long Description</td><td colspan="2">The goal of these systems is to develop, integrate, and demonstrate deployable autonomous undersea technologies that improve the Navy's capability to conduct effective anti-submarine warfare and intelligence, surveillance, and reconnaissance operations in littoral waters. Fixed systems are portable, long-endurance (weeks to months), that provide a low-cost, semi-autonomous, and highly persistent means to sample and characterize the ocean water column properties at spatial and temporal resolutions. Acoustic releases would be used for the recovery of the hardware.</td></tr>
<tr><td>Information Typical to the Event</td><td>Platform: Fixed systems
Systems: Acoustic releases
Ordnance/Munitions: None
Targets: None
Duration: Typically 5 days of daily operations for 8 hours per day</td><td>Location:
Silver Strand Training Complex/Imperial Beach/Point Loma
San Clemente Island Operating Area</td></tr>
<tr><td>Potential Impact Concerns
(Information regarding deconstruct categories and stressors)</td><td colspan="2">Acoustic: Acoustic releases (e.g., R R3)
Energy: None
Physical Disturbance and Strike: None
Entanglement: None
Ingestion: None</td></tr>
<tr><td>Detailed Military Expended Material Information</td><td colspan="2">Clump anchors and/or sand bags</td></tr>
<tr><td>Assumptions Used for Analysis</td><td colspan="2">Fixed stationary source</td></tr>
</table>

A.4.1.6 Passive Mobile Intelligence, Surveillance, and Reconnaissance Sensor Systems

Activity Name	Activity Description	
Intelligence, Surveillance, and Reconnaissance (ISR) Sensor Systems		
Passive Mobile Intelligence, Surveillance, and Reconnaissance Sensor Systems	These systems use passive arrays hosted by surface and subsurface vehicles and vessels for conducting submarine detection and tracking experiments and demonstrations.	
Long Description	These systems use passive arrays hosted by surface and subsurface vehicles and vessels for conducting submarine detection and tracking experiments and demonstrations. The arrays, which are composed of hydrophones to receive acoustic energy radiated by targets of interest, are deployed by surface ships. The unmanned undersea vehicles and associated systems are monitored and controlled by operators stationed aboard another vessel or at a land-based remote host station. The arrays are tested to evaluate various system performance parameters and requirements. Surrogate quiet submarine threats are provided by low-frequency towed projectors as well as existing Fleet assets such as underwater autonomous mobile acoustic sources.	
Information Typical to the Event	**Platform:** Surface or subsurface vehicle **Systems:** Towed sound projector with passive towed arrays **Ordnance/Munitions:** None **Targets:** sub-surface vessels **Duration:** Typically 5 days of daily operations for 8 hours per day	**Location:** Silver Strand Training Complex/Imperial Beach/Point Loma San Clemente Island Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Towed sound projector (e.g., LF5) **Energy:** None **Physical Disturbance and Strike:** In-water device strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	Towed moving source in the water column	

A.4.1.7 Fixed Intelligence, Surveillance, and Reconnaissance Sensor Systems

Activity Name	Activity Description	
Intelligence, Surveillance, and Reconnaissance (ISR) Sensor Systems		
Fixed Intelligence, Surveillance, and Reconnaissance Sensor Systems	These systems use stationary fixed arrays for conducting submarine detection and tracking experiments and demonstrations.	
Long Description	These systems use stationary fixed passive arrays for conducting submarine detection and tracking experiments and demonstrations. The arrays are composed of passive hydrophones to receive acoustic energy radiated by targets of interest. Surrogate threats are provided by low frequency towed projectors. This type of testing may also include free floating sensor systems such as buoys, sonobuoys, and other types of sensors floating on the surface or suspended in the water column.	
Information Typical to the Event	**Platform:** Fixed and free floating arrays **Systems:** Towed sound source and free floating buoys **Ordnance/Munitions:** None **Targets:** sub-surface vessels **Duration:** Typically 5 days of daily operations for 6–8 hours per day	**Location:** Hawaii Operating Area Silver Strand Training Complex/Imperial Beach/Point Loma San Clemente Island Operating Area
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Towed sound source and free floating buoys (e.g., MF9, HF6, LF4, LF5, LF6 **Energy:** None **Physical Disturbance and Strike:** In-water device strike **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	Steel framework in deep water only (one per every 5 years)	
Assumptions Used for Analysis	Towed moving and free floating source in the water column	

A.4.1.8 Anti-Terrorism/Force Protection Fixed Sensor Systems

Activity Name	**Activity Description**	
Anti-Terrorism/Force Protection		
Fixed Sensor Systems	These systems are for Anti-Terrorism/Force Protection operations in navy ports and bays	
Long Description		
Information Typical to the Event	**Platform:** Fixed system **Systems:** Mid-frequency active source **Ordnance/Munitions:** None **Targets:** Sub-surface objects of interest **Duration:** Typically 5 days of daily operations for 8 hours per day	**Location:** San Diego Bay
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Mid-frequency active source (e.g., MF 9) **Energy:** None **Physical Disturbance and Strike:** None **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	Fixed stationary source above sea bottom	

A.5 OFFICE OF NAVAL RESEARCH AND NAVAL RESEARCH LABORATORY TESTING ACTIVITIES

As the Department of the Navy's Science and Technology provider, the Office of Naval Research and the Naval Research Laboratory provide technology solutions for Navy and Marine Corps needs. The Office of Naval Research's mission, as defined by law, is to plan, foster, and encourage scientific research in recognition of its paramount importance as related to the maintenance of future naval power, and the preservation of national security. Further, the Office of Naval Research manages the Navy's basic, applied, and advanced research to foster transition from science and technology to higher levels of research, development, test and evaluation.

The Ocean Battlespace Sensing Department explores science and technology in the areas of oceanographic and meteorological observations, modeling and prediction in the battlespace environment; submarine detection and classification (anti-submarine warfare); and mine warfare applications for detecting and neutralizing mines in both the ocean and littoral environment. Office of Naval Research events include: research, development, test and evaluation activities; surface processes acoustic communications experiments; shallow water acoustic communications experiments; sediment acoustics experiments; shallow water acoustic propagation experiments; and long range acoustic propagation experiments.

A.5.1 RESEARCH, DEVELOPMENT, TEST, AND EVALUATION

A.5.1.1 Kauai Acoustic Communications Experiment (Coastal)

Activity Name	Activity Description	
RDT&E Testing		
Kauai Acoustic Communications Experiment (Coastal)	The primary purpose of the Kauai Acoustic Communications Experiment is to collect acoustic and environmental data appropriate for studying the coupling of oceanography, acoustics, and underwater communications.	
Long Description	The primary purpose of the Kauai acoustic communications experiment is to collect acoustic and environmental data appropriate for studying the coupling of oceanography, acoustics, and underwater communications. A specific experimental interest is obtaining data that would relate the impact of a fluctuating oceanographic environment and source/receiver motion to fluctuations in the waveguide acoustic impulse response between multiple sources and receivers. These data would ultimately provide insight into the design and performance of shallow underwater systems for acoustic digital data communications. The focus is on fluctuations over scales of a few seconds to a few tens of seconds that directly affect the reception of a data packet and the variability of packet-to-packet reception. These experiments involve the use of underwater acoustic sources to collect acoustic and environmental data appropriate for studying the coupling of oceanography, acoustics, and underwater communications.	
Information Typical to the Event	**Platform:** UNOLS ship R/V Kilo Moana **Systems:** Research and Enviro Sensing **Ordnance/Munitions:** None **Targets:** None **Duration:** 1-2 weeks	**Location:** Hawaii Range Complex: Pacific Missile Range Facility (Warning Areas -72B, and 386 [Air D, G, H, and K])
Potential Impact Concerns *(Information regarding deconstruct categories and stressors)*	**Acoustic:** Acoustic Doppler Current Profiler (ADCP [DS1]) Upward-looking RDI Workhorse Sentinel 300 kHz ADCP. ITC-1001 transducers, ITC-1032 transducers, ITC-1007 transducers **Energy:** None **Physical Disturbance and Strike:** None **Entanglement:** None **Ingestion:** None	
Detailed Military Expended Material Information	None	
Assumptions Used for Analysis	None	

Appendix B: Federal Register Notices

APPENDIX B

FEDERAL REGISTER NOTICES

This Page Intentionally Left Blank

41162 Federal Register / Vol. 75, No. 135 / Thursday, July 15, 2010 / Notices

proposed information collection; (c) ways to enhance the quality, utility, and clarity of the information to be collected; and (d) ways to minimize the burden of the information collection on respondents, including the use of automated collection techniques or other forms of information technology. The Office of Management and Budget (OMB) has approved this information collection requirement for use through November 30, 2010. DoD proposes that OMB extend its approval for these collections to expire three years after the approval date.

DATES: DoD will consider all comments received by September 13, 2010.

ADDRESSES: You may submit comments, identified by OMB Control Number 0704–0252, using any of the following methods:

○ *Federal eRulemaking Portal: http://www.regulations.gov.* Follow the instructions for submitting comments.

○ *E-mail: dfars@acq.osd.mil.* Include OMB Control Number 0704–0252 in the subject line of the message.

○ *Fax:* (703) 602–0350.

○ *Mail:* Defense Acquisition Regulations System, Attn: Ms. Meredith Murphy, OUSD(AT&L)DPAP(DARS), 3060 Defense Pentagon, Room 3B855, Washington, DC 20301–3060.

Comments received generally will be posted without change to *http://www.regulations.gov*, including any personal information provided.

FOR FURTHER INFORMATION CONTACT: Ms. Meredith Murphy, 703–602–1302. The information collection requirements addressed in this notice are available electronically via the Internet at: *http://www.acq.osd.mil/dp/dars/dfars.html.*

Paper copies are available from Ms. Meredith Murphy, OUSD(AT&L)DPAP(DARS), 3060 Defense Pentagon, Room 3B855, Washington, DC 20301–3060.

SUPPLEMENTARY INFORMATION:

Title, Associated Form, and OMB Number: Defense Federal Acquisition Regulation Supplement (DFARS) Part 251, Contractor Use of Government Supply Sources, and the associated clauses at DFARS 252.251–7000, Ordering from Government Supply Sources; and 252.251–7001, Use of Interagency Fleet Management System (IFMS) Vehicles and Related Services; OMB Control Number 0704–0252.

Needs and Uses: This information collection permits contractors to—

• Place orders under Federal Supply Schedule contracts and requirements contracts or for Government stock. The information enables DoD to evaluate whether a contractor is authorized to place such orders.

• Submit requests for use of Government vehicles under the Interagency Fleet Management System (IFMS) and obtain related services. The information submitted enables DoD to evaluate whether the contractor is authorized such use.

Affected Public: Businesses or other for-profit and not-for-profit institutions.

Annual Burden Hours: 5,250.

Number of Respondents: 3,500.

Responses per Respondent: approximately 3.

Annual Responses: 10,500.

Average Burden per Response: approximately 30 minutes.

Frequency: On occasion.

Summary of Information Collection

The clause at DFARS 252.251–7000, Ordering from Government Supply Sources, requires a contractor to provide a copy of an authorization when placing an order under a Federal Supply Schedule, a Personal Property Rehabilitation Price Schedule, or an Enterprise Software Agreement.

The clause at DFARS 252.251–7001, Use of Interagency Fleet Management System Vehicles and Related Services, requires a contractor to submit a request for use of Government vehicles when the contractor is authorized to use such vehicles in the performance of Government contracts.

Ynette R. Shelkin,

Editor, Defense Acquisition Regulations System.

[FR Doc. 2010–17256 Filed 7–14–10; 8:45 am]

BILLING CODE 5001–08–P

DEPARTMENT OF DEFENSE

Department of the Navy

Notice of Intent To Prepare an Environmental Impact Statement and Overseas Environmental Impact Statement for Navy Hawaii-Southern California Training and Testing and To Announce Public Scoping Meetings

AGENCY: Department of the Navy, DoD.

ACTION: Notice.

SUMMARY: Pursuant to section 102 of the National Environmental Policy Act (NEPA) of 1969, as implemented by the Council on Environmental Quality Regulations (40 Code of Federal Regulations [CFR] Parts 1500–1508), and Executive Order 12114, the Department of the Navy (DON) announces its intent to prepare an Environmental Impact Statement (EIS) and Overseas EIS (OEIS) to evaluate the potential environmental effects associated with military readiness training and research, development, testing, and evaluation (RDT&E) activities (hereinafter referred to as "training and testing" activities) conducted within the Hawaii-Southern California Training and Testing (HSTT) study area. The HSTT study area combines the at-sea portions of the Hawaii Range Complex, the Southern California Range Complex (including the San Diego Bay); the Silver Strand Training Complex; areas where vessels transit between the Hawaii Range Complex and the Southern California Range Complex; and select Navy pierside locations. This EIS and OEIS is being prepared to renew and combine current regulatory permits and authorizations; address current training and testing not covered under existing permits and authorizations; and to obtain those permits and authorizations necessary to support force structure changes and emerging and future training and testing requirements.

The DON will invite the National Marine Fisheries Service to be a cooperating agency in preparation of this EIS and OEIS.

DATES AND ADDRESSES: Six public scoping meetings will be held between 4 p.m. and 8 p.m., unless otherwise stated, on the following dates and at the following locations:

1. Wednesday, August 4, 2010, 3:30 p.m. to 7:30 p.m., Point Loma/Hervey Branch Library, Community Room, 3701 Voltaire Street, San Diego, CA.
2. Thursday, August 5, 2010, Lakewood High School, Room 922/924, 4400 Briercrest Avenue, Lakewood, CA.
3. Tuesday, August 24, 2010, Kauai Community College Cafeteria, 3–1901 Kaumuali'i Highway, Lihue, HI.
4. Wednesday, August 25, 2010, Disabled American Veterans Hall, Weinberg Hall, 2685 North Nimitz Highway, Honolulu, HI.
5. Thursday, August 26, 2010, Hilo High School Cafeteria, 556 Waianuenue Avenue, Hilo, HI.
6. Friday, August 27, 2010, Maui Waena Intermediate School Cafeteria, 795 Onehee Avenue, Kahului, HI.

Each of the six scoping meetings will consist of an informal, open house session with informational stations staffed by DON representatives. Meeting details will be announced in local newspapers. Additional information concerning meeting times is available on the EIS and OEIS Web page located at: *http://www.HawaiiSOCALEIS.com.*

FOR FURTHER INFORMATION CONTACT: Kent Randall, Naval Facilities Engineering Command, Southwest. Attention: HSTT EIS/OEIS, 1220 Pacific Highway, Building 1, Floor 5, San Diego, CA

Federal Register / Vol. 75, No. 135 / Thursday, July 15, 2010 / Notices **41163**

92132, or Meghan Byrne, Naval Facilities Engineering Command, Pacific. Attention: HSTT EIS/OEIS, 258 Makalapa Dr, Ste 100, Building 258, Floor 3, Room 258C210, Pearl Harbor, HI 96860–3134.

SUPPLEMENTARY INFORMATION: The DON's proposed action is to conduct training and testing activities that include the use of active sonar and explosives within the at-sea portions of existing DON training range complexes around the Hawaiian Islands and off the coast of Southern California (known as the HSTT study area). While the majority of these training and testing activities take place in operating and warning areas and/or on training and testing ranges, some training activities, such as sonar maintenance and gunnery exercises, are conducted concurrent with normal transits and may occur outside of DON operating and warning areas.

The HSTT study area combines the at-sea portions of the following range complexes: Hawaii Range Complex, Southern California Range Complex, and Silver Strand Training Complex. The existing western boundary of the Hawaii Range Complex is being expanded 60 miles to the west to the International Dateline. The HSTT study area also includes the transit route between Hawaii and Southern California as well as DON and commercial piers at Pearl Harbor, HI and San Diego, CA where sonar may be tested.

The proposed action is to conduct military training and testing activities in the HSTT study area. The purpose of the proposed action is to achieve and maintain Fleet Readiness to meet the requirements of Title 10 of the U.S. Code, which requires DON to "maintain, train, and equip combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas." The proposed action would also allow DON to attain compliance with applicable environmental authorizations, consultations, and other associated environmental requirements, including those associated with new platforms and weapons systems, for example, the Low Frequency Anti-Submarine Warfare capability associated with the Littoral Combat Ship.

The alternatives that will be analyzed in the HSTT EIS and OEIS meet the purpose and need of the proposed action by providing the level of training that meets the requirements of Title 10, thereby ensuring that Sailors and Marines are properly prepared for operational success. Similarly, the level of RDT&E proposed for the HSTT study area is necessary to ensure that Sailors and Marines deployed overseas have the latest proven military equipment. Accordingly, the alternatives to be addressed in the HSTT EIS and OEIS are:

1. No Action—The No Action Alternative continues baseline training and testing activities and force structure requirements as defined by existing DON environmental planning documents. This documentation includes the Records of Decision for the Hawaii and Southern California range complexes and the Preferred Alternative for the Silver Strand Training Complex Draft EIS and OEIS.

2. Alternative 1—This alternative consists of the No Action alternative, plus expansion of the overall study area boundaries, and updates and/or adjustments to locations and tempo of training and testing activities. This alternative also includes changes to training and testing requirements necessary to accommodate force structure changes, and the development and introduction of new vessels, aircraft, and weapons systems.

3. Alternative 2—Alternative 2 consists of Alternative 1 with an increased tempo of training and testing activities. This alternative also allows for additional range enhancements and infrastructure requirements.

Resource areas that will be addressed because of the potential effects from the proposed action include, but are not limited to: Ocean and biological resources (including marine mammals and threatened and endangered species); air quality; airborne soundscape; cultural resources; transportation; regional economy; recreation; and public health and safety.

The scoping process will be used to identify community concerns and local issues to be addressed in the EIS and OEIS. Federal agencies, state agencies, local agencies, Native American Indian Tribes and Nations, the public, and interested persons are encouraged to provide comments to the DON to identify specific issues or topics of environmental concern that the commenter believes the DON should consider. All comments provided orally or in writing at the scoping meetings, will receive the same consideration during EIS and OEIS preparation. Written comments must be postmarked no later than September 14, 2010, and should be mailed to: Naval Facilities Engineering Command, Southwest, 2730 McKean Street, Building 291, San Diego, CA 92136–5198, Attention: Mr. Kent Randall—HSTT EIS/OEIS.

Dated: July 9, 2010.

D.J. Werner

Lieutenant Commander, Office of the Judge Advocate General, U.S. Navy, Federal Register Liaison Officer.

[FR Doc. 2010–17234 Filed 7–14–10; 8:45 am]

BILLING CODE 3810–FF–P

DEPARTMENT OF DEFENSE

Department of the Navy

Notice of Intent To Prepare an Environmental Impact Statement and Overseas Environmental Impact Statement for Navy Atlantic Fleet Training and Testing and To Announce Public Scoping Meetings

AGENCY: Department of the Navy, DoD.

ACTION: Notice.

SUMMARY: Pursuant to section 102 of the National Environmental Policy Act (NEPA) of 1969, as implemented by the Council on Environmental Quality Regulations (40 Code of Federal Regulations [CFR] Parts 1500–1508), and Executive Order 12114, the Department of the Navy (DON) announces its intent to prepare an Environmental Impact Statement (EIS) and Overseas EIS (OEIS) to evaluate the potential environmental effects associated with military readiness training and research, development, testing, and evaluation (RDT&E) activities (hereinafter referred to as "training and testing" activities) conducted within the Atlantic Fleet Training and Testing (AFTT) study area. The AFTT study area includes the western North Atlantic Ocean along the east coast of North America (including the area where the Undersea Warfare Training Range will be used), the Chesapeake Bay, and the Gulf of Mexico. Also included are select Navy pierside locations and channels. The AFTT study area does not include the Arctic. This EIS and OEIS is being prepared to renew and combine current regulatory permits and authorizations; address current training and testing not covered under existing permits and authorizations; and to obtain those permits and authorizations necessary to support force structure changes and emerging and future training and testing requirements.

The DON will invite the National Marine Fisheries Service to be a cooperating agency in preparation of this EIS and OEIS.

DATES AND ADDRESSES: Five public scoping meetings will be held between 4 p.m. and 8 p.m. on the following dates and at the following locations:

Federal Register / Vol. 77, No. 92 / Friday, May 11, 2012 / Notices 27771

waters, states are required to establish TMDLs according to a priority ranking.

EPA's Water Quality Planning and Management regulations include requirements related to the implementation of Section 303(d) of the CWA (40 CFR 130.7). The regulations require states to identify water-quality-limited waters still requiring TMDLs every two years. The lists of waters still needing TMDLs must also include priority rankings, identify the pollutants causing the impairment, and must identify the waters targeted for TMDL development during the next two years (40 CFR 130.7).

Consistent with EPA's regulations, Utah submitted to EPA its listing decisions under Section 303(d)(2) in correspondence dated March 31, 2011 and April 21, 2011. On February 10, 2012, EPA partially approved with further review pending for Kanab Creek and tributaries, Utah's 2008 and 2010 listings of waters and associated priority rankings. On April 11, 2012, EPA disapproved Utah's decision to not include Kanab Creek and tributaries, from state line to irrigation diversion at confluence with Reservoir Canyon on the 2008 and 2010 lists. EPA solicits public comment on the addition of these waters to the State's list, as required by 40 CFR 130.7(d)(2).

Authority: Clean Water Act, 33 U.S.C. 1251 *et seq.*

Dated: April 26, 2012.

Martin Hestmark,

Acting Assistant Regional Administrator, Office of Ecosystems Protection and Remediation.

[FR Doc. 2012–11428 Filed 5–10–12; 8:45 am]

BILLING CODE 6560–50–P

ENVIRONMENTAL PROTECTION AGENCY

[ER–FRL–9002–9]

Environmental Impacts Statements; Notice of Availability

Responsible Agency: Office of Federal Activities, General Information (202) 564–7146 or *http://www.epa.gov/compliance/nepa/*.

Weekly receipt of Environmental Impact Statements

Filed 04/30/2012 Through 05/04/2012

Pursuant to 40 CFR 1506.9.

Notice

Section 309(a) of the Clean Air Act requires that EPA make public its comments on EISs issued by other Federal agencies. EPA's comment letters on EISs are available at: *http://www.epa.gov/compliance/nepa/eisdata.html.*

Supplementary Information: EPA is seeking agencies to participate in its e-NEPA electronic EIS submission pilot. Participating agencies can fulfill all requirements for EIS filing, eliminating the need to submit paper copies to EPA Headquarters, by filing documents online and providing feedback on the process. To participate in the pilot, register at: *https://cdx.epa.gov.*

EIS No. 20120136, Final Supplement, APHIS, NY, Bird Hazard Reduction Program, John F. Kennedy International Airport, Updated Information on the Efficacy and Impacts of the Gull Hazard Reduction Program and All Other Bird Hazard Management Activities, Queens County, NY, Review Period Ends: 06/13/2012, Contact: Martin S. Lowney 518–477–4837.

EIS No. 20120137, Draft EIS, USFS, 00, Mountain Pine Beetle Response Project, Implementing Multiple Resource Management Activities, Black Hills National Forest, Custer, Fall River, Lawrence, Meade, and Pennington Counties, SD and Crook and Weston Counties, WY, Comment Period Ends: 06/25/2012, Contact: Katie Van Alstyne 605–343–1567.

EIS No. 20120138, Draft EIS, USACE, FL, Tarmac King Road Limestone Mine, Construction, Issuance of Permit, Levy County, FL, Comment Period Ends: 07/11/2012, Contact: Edward Sarfert 850–439–9533.

EIS No. 20120139, Draft EIS, NPS, GA, Fort Pulaski National Monument General Management Plan and Wilderness Study, Implementation, Chatham County, GA, Comment Period Ends: 07/09/2012, Contact: David Libman 404–507–5701.

EIS No. 20120140, Final EIS, USAF, OH, Wright-Patterson Air Force Base (WPAFB) Project, Reconfigure and Relocate Facilities and Base Perimeter Fence Relocation in Area A, Fairborn, OH, Review Period Ends: 06/11/2012, Contact: Estella Holmes 937–522–3522.

EIS No. 20120141, Final EIS, USFS, CO, Beaver Creek Mountain Improvements Project, Special Use Permit, White River National Forest, Eagle County, CO, Review Period Ends: 06/11/2012, Contact: Don Dressler 970–827–5157.

EIS No. 20120142, Draft EIS, USN, 00, Atlantic Fleet Training and Testing Activities, To Support and Conduct Current, Emerging, and Future Training and Testing Activities along the Eastern Coast of the U.S. and Gulf of Mexico, Comment Period Ends: 06/25/2012, Contact: Jene Nissen 757–836–5221.

EIS No. 20120143, Draft EIS, USN, 00, Hawaii-Southern California Training and Testing Activities, To Support and Conduct Current, Emerging, and Future Training and Testing Activities off Southern California and around the Hawaiian Islands, CA, HI, Comment Period Ends: 06/25/2012, Contact: Alex Stone 619–545–8128.

EIS No. 20120144, Draft EIS, USAF, CA, F–15 Aircraft Conversion, 144th Fighter Wing, California National Guard, To Convert the Unit from the F–16 Fighting Falcon Aircraft and Operations to the F–15 Eagle Aircraft and Operations at Fresno-Yosemite International Airport, Fresno County, CA, Comment Period Ends: 06/25/2012, Contact: Robert Dogan 240–612–8859.

EIS No. 20120145, Draft EIS, BR, CA, Water Transfer Program for the San Joaquin River Exchange Contractors Water Authority, 2014–2038, To Execute Agreements for Water Transfers/or Exchanges, San Joaquin Valley, Fresno, Madera, Merced, and Stanislaus Counties, CA, Comment Period Ends: 07/03/2012, Contact: Bradley Hubbard 916–978–5204.

Dated: May 8, 2012.

Cliff Rader,

Director, NEPA Compliance Division, Office of Federal Activities.

[FR Doc. 2012–11467 Filed 5–10–12; 8:45 am]

BILLING CODE 6560–50–P

FEDERAL COMMUNICATIONS COMMISSION

Information Collection Being Reviewed by the Federal Communications Commission

AGENCY: Federal Communications Commission.

ACTION: Notice and request for comments.

SUMMARY: As part of its continuing effort to reduce paperwork burden and as required by the Paperwork Reduction Act (PRA) of 1995 (44 U.S.C. 3501–3520), the Federal Communications Commission invites the general public and other Federal agencies to take this opportunity to comment on the following information collection(s). Comments are requested concerning: (a) Whether the proposed collection of information is necessary for the proper performance of the functions of the Commission, including whether the information shall have practical utility; (b) the accuracy of the Commission's burden estimate; (c) ways to enhance the quality, utility, and clarity of the information collected; (d) ways to

Federal Register / Vol. 77, No. 92 / Friday, May 11, 2012 / Notices 27743

Alternatives 1 and 2 analyze adjustments to Study Area boundaries and the location, type, and level of training and testing activities necessary to support current and planned DoN training and testing requirements through 2019. The analysis addresses force structure changes, including those resulting from the development, testing, and ultimate introduction of new vessels, aircraft and weapons systems into the fleet.

No significant adverse impacts are identified for any resource area in any geographic location within the Study Area that cannot be mitigated. Additionally, due to the exposure of marine mammals to underwater sound, NMFS has received an application from DoN for a Marine Mammal Protection Act Letter of Authorization and governing regulations to authorize incidental take of marine mammals that may result from the implementation of the activities analyzed in the Draft EIS/OEIS. In accordance with Section 7 of the Endangered Species Act, the DoN is consulting with NMFS and U.S. Fish and Wildlife Service, as appropriate, for potential impacts to federally listed species. In accordance with the Magnuson-Stevens Fishery Conservation and Management Act, the DoN is consulting with NMFS on federally managed species and their essential fish habitat. The DoN will initiate consultation under the National Historic Preservation Act regarding impacts to historic properties, and will comply with other applicable laws and regulations.

The Draft EIS/OEIS was distributed to Federal, State, and local agencies, elected officials, and other interested individuals and organizations. Copies of the Draft EIS/OEIS are available for public review at the following libraries:

1. Anne Arundel County Public Library, Annapolis Area Branch, 1410 West Street, Annapolis, MD 21401.
2. Bay County Public Library, 898 West 11th Street, Panama City, FL 32401.
3. Ben May Main Library, 701 Government Street, Mobile, AL 36602.
4. Boston Public Library, Central Library, 700 Boylston Street, Boston, MA 02116.
5. Camden County Public Library, 1410 Highway 40 E, Kingsland, GA 31548.
6. Carteret County Public Library, 1702 Live Oak Street, Suite 100, Beaufort, NC 28516.
7. Charleston County Public Library, Main Library, 68 Calhoun Street, Charleston, SC 29401.
8. Corpus Christi Public Library, La Retama Library, 805 Comanche, Corpus Christi, TX 78401.
9. East Bank Regional Library, 4747 West Napoleon Avenue, Metairie, LA 70001.
10. Hatteras Library, 57709 Highway 12, Hatteras, NC 27943.
11. Havelock-Craven County Public Library, 301 Cunningham Boulevard, Havelock, NC 28532.
12. Houston Public Library, 500 McKinney Street, Houston, TX 77002.
13. Jacksonville Public Library, Main Library, 303 North Laura Street, Jacksonville, FL 32202.
14. Kill Devil Hills Branch Library, Main Library, 400 Mustian Street, Kill Devil Hills, NC 27948.
15. Meridian-Lauderdale County Public Library, 2517 7th Street, Meridian, MS 39301.
16. New Hanover County Public Library, 201 Chestnut Street, Wilmington, NC 28401.
17. New Orleans Public Library, Main Library, 219 Loyola Avenue, New Orleans, LA 70112.
18. Mary D. Pretlow Anchor Branch Library, 111 West Ocean View Avenue, Norfolk, VA 23503.
19. Onslow County Public Library, 58 Doris Avenue East, Jacksonville, NC 28540.
20. Portland Public Library, 5 Monument Square, Portland, ME 04101.
21. Providence Public Library, 150 Empire Street, Providence, RI 02903.
22. Public Library of New London, 63 Huntington Street, New London, CT 06320.
23. Southmost Branch Library, 4320 Southmost Boulevard, Brownsville, TX 78521.
24. Walton County Coastal Branch Library, 437 Greenway Trail, Santa Rosa Beach, FL 32459.
25. Webb Memorial Library and Civic Center, 812 Evans Street, Morehead City, NC 28557.
26. West Florida Public Library, Main Library, 200 West Gregory Street, Pensacola, FL 32502.
27. West Florida Public Library, Southwest Branch, 12248 Gulf Beach Highway, Pensacola, FL 32507.
28. West Palm Beach Public Library, 411 Clematis Street, West Palm Beach, FL 33401.

Copies of the AFTT Draft EIS/OEIS are available for electronic viewing or download at *http://www.AFTTEIS.com*. A paper copy of the Executive Summary or a single compact disc of the Draft EIS/OEIS will be made available upon written request by contacting: Naval Facilities Engineering Command Atlantic, Attn Code EV22 (AFTT EIS Project Managers), 6506 Hampton Boulevard, Norfolk, VA 23508–1278.

Dated: May 4, 2012.

J.M. Beal,

Lieutenant Commander, Office of the Judge Advocate General, U.S. Navy, Federal Register Liaison Officer.

[FR Doc. 2012–11410 Filed 5–10–12; 8:45 am]

BILLING CODE 3810–FF–P

DEPARTMENT OF DEFENSE

Department of the Navy

Notice of Public Meetings for the Draft Environmental Impact Statement/Overseas Environmental Impact Statement for Navy Hawaii-Southern California Training and Testing

AGENCY: Department of the Navy, DoD.

ACTION: Notice.

SUMMARY: Pursuant to section 102(2)(c) of the National Environmental Policy Act of 1969, and regulations implemented by the Council on Environmental Quality regulations (40 Code of Federal Regulations parts 1500–1508), and Presidential Executive Order 12114, the Department of the Navy (DoN) has prepared and filed with the U.S. Environmental Protection Agency a Draft Environmental Impact Statement (EIS)/Overseas EIS (OEIS). The Draft EIS/OEIS evaluates the potential environmental effects associated with military readiness training and research, development, test and evaluation activities (training and testing) conducted within the Hawaii-Southern California Training and Testing (HSTT) Study Area. The National Marine Fisheries Service (NMFS) is a Cooperating Agency for the EIS/OEIS.

The HSTT Study Area is comprised of established operating and warning areas across the north-central Pacific Ocean, from Southern California west to Hawaii and the International Date Line. The Study Area combines the at-sea portions of the Hawaii Range Complex; the Southern California Range Complex; the Silver Strand Training Complex; transit corridors on the high seas that are not part of the range complexes where training and sonar testing may occur during vessel transit between the Hawaii Range Complex and the Southern California Range Complex; and Navy pierside locations where sonar maintenance and testing activities occurs. The HSTT Study Area includes only the at-sea components of the range complexes and testing ranges. The land-based portions of the range complexes are not a part of the Study Area and will be or already have been addressed under separate DoN environmental planning documentation.

With the filing of the Draft EIS/OEIS, the DoN is initiating a 60-day public comment period, beginning on May 11, 2012 and ending on July 10, 2012. During this period the DoN will conduct five public meetings to receive oral and written comments on the Draft EIS/OEIS. This notice announces the dates and locations of the public meetings and provides supplementary information about the environmental planning effort.

DATES AND ADDRESSES: Public information and comment meetings will be held at each of the locations listed below between 5:00 p.m. and 8:00 p.m. The meetings will provide individuals with information on the Draft EIS/OEIS in an open house format. DoN and NMFS representatives at informational poster stations will be available during the public meetings to clarify information related to the Draft EIS/OEIS.

The public meetings will be held between 5:00 p.m. and 8:00 p.m. on the following dates and at the following locations:

1. June 12, 2012 (Tuesday) at the Wilcox Elementary School Cafeteria, 4319 Hardy Street, Lihue, HI.
2. June 13, 2012 (Wednesday at Maui Waena Intermediate School Cafeteria, 795 Onehee Avenue, Kahului, HI.
3. June 14, 2012 (Thursday) at East Hawaii Cultural Center, 141 Kalakaua Street, Hilo, HI.
4. June 15, 2012 (Friday) at McKinley High School Cafeteria, 1039 South King Street, Honolulu, HI.
5. June 20, 2012 (Wednesday) at Marina Village Conference Center, Starboard Room, 1936 Quivira Way, San Diego, CA.

Federal, State and local agencies and officials, interested groups and individuals are encouraged to provide oral comments in person at any of the public meetings or in writing anytime during the public comment period. Oral testimony from the public will be recorded by a court reporter. In the interest of available time, and to ensure all who wish to give an oral statement to the court reporter have the opportunity to do so, each speaker's comments will be limited to three (3) minutes, which may be extended if meeting attendance permits. Comments may also be submitted via the U.S. Postal Service to Naval Facilities Engineering Command, Southwest, Attention: HSTT EIS/OEIS Project Manager—EV21.CS; 1220 Pacific Highway, Building 1, Floor 3, San Diego, CA 92132–5190 or electronically via the project Web site (*http://www.HSTTEIS.com*). All statements, oral or written, submitted during the public review period will become part of the public record on the Draft EIS/OEIS and will be responded to in the Final EIS/OEIS. Equal weight will be given to oral and written statements. All public comments must be postmarked or received by July 10, 2012 to ensure they become part of the official record.

FOR FURTHER INFORMATION CONTACT: Naval Facilities Engineering Command, Southwest, Attention: HSTT EIS/OEIS Project Manager—EV21.CS; 1220 Pacific Highway, Building 1, Floor 3, San Diego, CA 92132–5190.

SUPPLEMENTARY INFORMATION: A Notice of Intent to prepare this Draft EIS/OEIS was published in the **Federal Register** on July 15, 2010 (75 FR 41162).

The DoN's Proposed Action is to conduct training and testing activities—which may include the use of active Sound Navigation and Ranging (sonar) and explosives—primarily within existing range complexes and testing ranges throughout the in-water areas around the Hawaiian Islands and off the coast of Southern California, Navy pierside locations, and the ocean transit corridor between Hawaii and Southern California. The purpose of the Proposed Action is to conduct training and testing activities to ensure that the DoN accomplishes its mission to maintain, train, and equip combat-ready U.S. naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas. This Draft EIS/OEIS will also support the renewal of federal regulatory permits and authorizations for current training and testing activities and to propose future training and testing activities requiring environmental analysis.

The Draft EIS/OEIS evaluates the potential environmental impacts of three alternatives, including the No Action Alternative and two action alternatives. The No Action Alternative continues baseline training and testing activities, as defined by existing DoN environmental planning documents. Alternatives 1 and 2 analyze adjustments to Study Area boundaries and the location, type, and level of training and testing activities necessary to support current and planned DoN training and testing requirements through 2019. The analysis addresses force structure changes, including those resulting from the development, testing, and ultimate introduction of new vessels, aircraft and weapons systems into the fleet.

No significant adverse impacts are identified for any resource area in any geographic location within the Study Area that cannot be mitigated. Additionally, due to the exposure of marine mammals to underwater sound, NMFS has received an application from DoN for a Marine Mammal Protection Act Letter of Authorization and governing regulations to authorize incidental take of marine mammals that may result from the implementation of the activities analyzed in the Draft EIS/OEIS. In accordance with Section 7 of the Endangered Species Act, the DoN is consulting with NMFS and U.S. Fish and Wildlife Service, as appropriate, for potential impacts to federally listed species. In accordance with the Magnuson-Stevens Fishery Conservation and Management Act, the DoN is consulting with NMFS on Federally managed species and their essential fish habitat.

The Draft EIS/OEIS was distributed to Federal, State and local agencies, elected officials, as well as other interested individuals and organizations. Copies of the Draft EIS/OEIS are also available for public review at the following libraries:

1. Lihue Public Library, 4344 Hardy Street, Lihue, HI 96766.
2. Wailuku Public Library, 251 High Street, Wailuku, HI 96793.
3. Hilo Public Library, 300 Waianuenue Avenue, Hilo, HI 96720.
4. Kailua-Kona Public Library, 75–138 Hualalai Road, Kailua-Kona, HI 96740.
5. Hawaii State Library, Hawaii and Pacific Section Document Unit, 478 South King Street, Honolulu, HI 96813.
6. San Diego Central Library, 820 E Street, San Diego, CA 92101.
7. Long Beach Main Library, 101 Pacific Avenue, Long Beach, CA 90822.

In addition, copies of the HSTT Draft EIS/OEIS are available for electronic viewing or download at *http://www.HSTTEIS.com.* A paper copy of the Executive Summary or a single compact disc of the Draft EIS/OEIS will be made available upon written request by contacting: Naval Facilities Engineering Command, Southwest, Attention: HSTT EIS/OEIS Project Manager—EV21.CS; 1220 Pacific Highway, Building 1, Floor 3, San Diego, CA 92132–5190.

Dated: May 7, 2012.

J.M. Beal,

Lieutenant Commander, Office of the Judge Advocate General, U.S. Navy, Federal Register Liaison Officer.

[FR Doc. 2012–11387 Filed 5–10–12; 8:45 am]

BILLING CODE 3810–FF–P

Current, Emerging, and Future Training and Testing Activities along the Eastern Coast of the U.S. and Gulf of Mexico, Comment Period Ends: 07/10/2012, Contact: Jene Nissen 757–836–5221.

Revision to FR Notice Published 05/11/2012; Extending Comment Period from 06/25/12 to 07/10/2012.

EIS No. 20120143, Draft EIS, USN, 00, Hawaii-Southern California Training and Testing Activities, To Support and Conduct Current, Emerging and Future Training and Testing Activities off Southern California and around the Hawaiian Islands, CA, HI, Comment Period Ends: 07/10/2012, Contact: Alex Stone 619–545–8128.

Revision to FR Notice Published 05/11/2012; Extending Comment Period from 06/25/12 to 07/10/2012.

Dated: May 15, 2012.

Cliff Rader,

Director, NEPA Compliance Division, Office of Federal Activities.

[FR Doc. 2012–12112 Filed 5–17–12; 8:45 am]

BILLING CODE 6560–50–P

ENVIRONMENTAL PROTECTION AGENCY

[EPA–HQ–OPP–2012–0003; FRL–9348–6]

SFIREG Full Committee; Notice of Public Meeting

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: The Association of American Pesticide Control Officials (AAPCO)/State FIFRA Issues Research and Evaluation Group (SFIREG), Full Committee will hold a 2-day meeting, beginning on June 18, 2012 and ending June 19, 2012. This notice announces the location and times for the meeting and sets forth the tentative agenda topics.

DATES: The meeting will be held on Monday, June 18, 2012 from 8:30 a.m. to 5:00 p.m. and 8:30 a.m. to 12 noon on Tuesday June 19, 2012.

To request accommodation of a disability, please contact the person listed under **FOR FURTHER INFORMATON CONTACT**, preferably at least 10 days prior to the meeting, to give EPA as much time as possible to process your request.

ADDRESSES: The meeting will be held at EPA. One Potomac Yard (South Bldg.), 2777 S. Crystal Dr., Arlington, VA, 22202, 1st Floor South Conference Room.

FOR FURTHER INFORMATION CONTACT: Ron Kendall, Field External Affairs Division, Office of Pesticide Programs, Environmental Protection Agency, 1200 Pennsylvania Ave. NW., Washington, DC 20460–0001; telephone number: (703) 305–5561; fax number: (703) 305–1850; email address: *kendall.ron@epa.gov.* or Grier Stayton, SFIREG Executive Secretary, P.O. Box 466, Milford, DE 19963; telephone number (302) 422–8152; fax (302) 422–2435; email address: *stayton.grier@aapco-sfireg@comcast.net.*

SUPPLEMENTARY INFORMATION:

I. General Information

A. Does this action apply to me?

You may be potentially affected by this action if you are interested in pesticide regulation issues affecting States and any discussion between EPA and SFIREG on FIFRA field implementation issues related to human health, environmental exposure to pesticides, and insight into EPA's decision-making process. You are invited and encouraged to attend the meetings and participate as appropriate. Potentially affected entities may include, but are not limited to:

Those persons who are or may be required to conduct testing of chemical substances under the Federal Food, Drug and Cosmetics Act (FFDCA), or the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and those who sell, distribute or use pesticides, as well as any Non Government Organization.

This listing is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this action. Other types of entities not listed in this unit could also be affected. The North American Industrial Classification System (NAICS) codes have been provided to assist you and others in determining whether this action might apply to certain entities. If you have any questions regarding the applicability of this action to a particular entity, consult the person listed under **FOR FURTHER INFORMATION CONTACT.**

B. How can I get copies of this document and other related information?

EPA has established a docket for this action under docket ID number EPA–HQ–OPP–2012–0003. Publicly available docket materials are available either in the electronic docket at *http://www.regulations.gov,* or, if only available in hard copy, at the Office of Pesticide Programs (OPP) Regulatory Public Docket in Rm. S–4400, One Potomac Yard (South Bldg.), 2777 S. Crystal Dr., Arlington, VA. The hours of operation of this Docket Facility are from 8:30 a.m. to 4 p.m., Monday through Friday, excluding legal holidays. The Docket Facility telephone number is (703) 305–5805.

II. Tentative Agenda Topics

1. Office of Pesticide Programs update
2. Office of Compliance and Enforcement update
3. Responses to SFIREG Bed Bug and Endangered Species Act Consultation letters
4. Pollinator Protection issues
5. Methomyl fly bait restricted use classification
6. Pyrethroid Label Changes
7. Regional issues/responses to pre-SFIREG questionnaire
8. Report on "State Regulator in Residence" program—issues and opportunities
9. Tribal certification policy implementation—Issues and information exchange
10. Performance Measures Development
11. Imprelis update/discussion on "down stream" effects of pesticides outside control of applicator (e.g. hot compost, treated irrigation water)
12. Interactions of EPA Regions and State Lead Agencies on:
    a. Support for/involvement with
    b. Enforcement/compliance efforts
    c. Certification/training efforts
    d. Environmental programs
    e. Registration issues
13. Grant Negotiation Procedures
14. Distributor Label Enforcement coordination
15. Update on progress of referred cases

III. How can I request to participate in this meeting?

This meeting is open for the public to attend. You may attend the meeting without further notification.

List of Subjects Environmental protection.

Dated: May 5, 2012.

R. McNally,

Director, Field External Affairs Division, Office of Pesticide Programs.

[FR Doc. 2012–11971 Filed 5–17–12; 8:45 am]

BILLING CODE 6560–50–P

FEDERAL COMMUNICATIONS COMMISSION

[MB Docket No. 12–122; File No. CSR–8529–P; DA 12–739]

Game Show Network, LLC v. Cablevision Systems Corp.

AGENCY: Federal Communications Commission.

Appendix C: Agency Correspondence

APPENDIX C

AGENCY CORRESPONDENCE

This Page Intentionally Left Blank

TABLE OF CONTENTS

DEPARTMENT OF THE NAVY
COMMANDER
UNITED STATES PACIFIC FLEET
250 MAKALAPA DRIVE
PEARL HARBOR, HAWAII 96860-3131

IN REPLY REFER TO:
5090
Ser N01CE1/0715
14 Jul 10

Dear Sir or Madam:

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT (EIS/OEIS) FOR NAVY MILITARY READINESS ACTIVITIES IN THE HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT) STUDY AREA

This letter is to inform you that the U.S. Navy is preparing an EIS/OEIS for Navy training and testing activities in the HSTT study area. The study area combines the at-sea portions of the Hawaii Range Complex (HRC); the Southern California (SOCAL) Range Complex (including the San Diego Bay); the Silver Strand Training Complex (SSTC); areas where vessels transit between the HRC and the SOCAL Range Complex; and select Navy pierside location (see Enclosure 1). The Navy is requesting your comments on the scope, content and issues to be considered during the development of the HSTT EIS/OEIS.

The Navy's mission is to organize, train, equip and maintain combat-ready naval forces capable of winning wars, deterring aggression and maintaining freedom of the seas. This mission is mandated by federal law (Title 10 U.S. Code (U.S.C.) § 5062), which charges the Chief of Naval Operations (CNO) with the responsibility for ensuring the readiness of the nation's naval forces. The CNO meets that directive, in part, by establishing and executing training programs and ensuring naval forces have access to the ranges, operating areas and airspace needed to develop and maintain skills for the conduct of operations.

The Navy proposes to conduct military readiness training activities and research, development, testing and evaluation (RDT&E) activities (hereinafter referred to as "training and testing") in areas currently used by the Navy in the HSTT study area. To both achieve and maintain Fleet readiness, the Navy proposes to:

- Adjust baseline training and testing activities from current levels to match levels required to support Navy training and testing requirements beginning in 2014.
- Accommodate evolving mission requirements associated with force structure changes, including those resulting from the development, testing and ultimate introduction of new platforms (vessels, aircraft and weapons systems) into the Fleet.

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT (EIS/OEIS) FOR NAVY MILITARY READINESS ACTIVITIES IN THE HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT) STUDY AREA

The HSTT EIS/OEIS will address Navy activities that occur in the air, under the ocean surface and on the ocean surface for the following range complexes: HRC, SOCAL Range Complex, and SSTC. Land activities occurring at SOCAL installations and within the HRC have been analyzed in other EIS documents and will be incorporated by reference in this EIS/OEIS.

Environmental issues that will be addressed in the EIS/OEIS include, but are not limited to, the following resource areas: oceanography; air quality; airborne soundscape; biological resources, including threatened and endangered species; cultural resources; transportation; regional economy; recreation; and public health and safety. Your input in identifying specific issues and concerns that should be assessed, in these areas and any additional areas, is important to the process.

In compliance with the National Environmental Policy Act (NEPA) of 1969, the Navy is holding open house public scoping meetings to support an early and open process for determining the scope of issues to be addressed and for identifying significant issues related to the proposed action. Scoping meetings will inform the public of the Navy's proposed action and give community members an opportunity to make comments. Input from scoping meetings will be used to help identify potentially significant issues to be analyzed in the Draft EIS/OEIS.

Six public open house scoping meetings will be held in SOCAL and Hawaii. Members of the public can arrive anytime during the scoping meetings. Representatives from the Navy will be available to provide information and answer questions about the proposed action. There will be no formal presentation. The public scoping meeting schedule is as follows:

Wednesday, August 4, 2010
3:30 to 7:30 p.m.
Point Loma/Hervey Branch Library
Community Room
3701 Voltaire St.
San Diego, Calif.

Thursday, August 5, 2010
4:00 to 8:00 p.m.
Lakewood High School
Room 922/924
4400 Briercrest Ave.
Lakewood, Calif.

- 2 -

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT (EIS/OEIS) FOR NAVY MILITARY READINESS ACTIVITIES IN THE HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT) STUDY AREA

Tuesday, August 24, 2010
4:00 to 8:00 p.m.
Kauai Community College
Cafeteria
3-1901 Kaumualii Highway
Lihue, Hawaii

Wednesday, August 25, 2010
4:00 to 8:00 p.m.
Keehi Lagoon – Disabled American Veterans Hall
Weinberg Hall
2685 North Nimitz Highway
Honolulu, Hawaii

Thursday, August 26, 2010
4:00 to 8:00 p.m.
Hilo High School
Cafeteria
556 Waianuenue Ave.
Hilo, Hawaii

Friday, August 27, 2010
4:00 to 8:00 p.m.
Maui Waena Intermediate School
Cafeteria
795 Onehee Ave.
Kahului, Hawaii

Regardless of whether you are able to participate in the public scoping meetings, you may send written comments to the following address:

Naval Facilities Engineering Command, Southwest
ATTN: Mr. Kent Randall – HSTT EIS/OEIS
1220 Pacific Hwy. Bldg. 1, Floor 5
San Diego, CA 92132

You may also submit comments online at www.HSTTEIS.com. All comments must be postmarked or received by September 14, 2010, to be considered in the Draft EIS/OEIS.

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT (EIS/OEIS) FOR NAVY MILITARY READINESS ACTIVITIES IN THE HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT) STUDY AREA

For more information about the HSTT EIS/OEIS, please visit the project website. If you would like additional information or to receive a project briefing, please contact Kent Randall at (619)532-3331.

Sincerely,

D. A. MCNAIR
Captain, U. S. Navy
Deputy Fleet Civil Engineer

Enclosure: 1. U.S. Navy Hawaii-Southern California Training and Testing EIS/OEIS Study Area

Distribution:

Federal

- U.S. Senators (Hawaii, California)
- U.S. Representatives (California Districts 35, 36, 37, 44, 46, 48, 49, 50, 52, 54, 55 and Hawaii Districts 1 and 2)
- Federal Aviation Administration
  - Washington D.C. headquarters
  - Western Pacific Region
- U.S. Army Corps of Engineers
  - Pacific Ocean Division
    - Honolulu District
  - South Pacific Division
    - Los Angeles District
- U.S. Department of Commerce
  - National Oceanic and Atmospheric Administration
    - National Marine Fisheries Service
      - Washington, D.C. Headquarters
      - Southwest Regional Offices
      - Southwest Fisheries Science Center
      - Pacific Islands Regional Office
      - Pacific Islands Fisheries Science Center
      - Office of Habitat Conservation
        - Southwest and Pacific Islands Region
      - Office of Protected Resources
        - Headquarters and Pacific Islands Region
    - Channel Islands National Marine Sanctuary
    - Hawaiian Islands Humpback Whale National Marine Sanctuary
    - Papahanaumokuakea Marine National Monument
- U.S. Coast Guard
  - District 11
  - District 14
  - Office of Operating and Environmental Standards
- U.S. Department of the Interior

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT (EIS/OEIS) FOR NAVY MILITARY READINESS ACTIVITIES IN THE HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT) STUDY AREA

Bureau of Indian Affairs
Pacific Regional Office
Southern California Agency
Bureau of Land Management
California Coastal National Monument
Bureau of Ocean Energy Management, Regulation and Enforcement
National Offshore Office
Pacific OCS Region
Western Fisheries Research Center
National Park Service
Pacific West Region
Channel Islands National Park
Office of Environmental Policy and Compliance
Oakland Region
U.S. Environmental Protection Agency
Washington, D.C. Headquarters
Region 9
NEPA Compliance Division
U.S. Fish and Wildlife Service
Carlsbad Office
Ventura Office
Pacific Regional Office
Pacific Southwest Regional Office
San Diego Bay National Wildlife Refuge
San Diego National Wildlife Refuge
Hanalei National Wildlife Refuge
Kilauea Point National Wildlife Refuge
Huleia National Wildlife Refuge
James Campbell National Wildlife Refuge
Pearl Harbor National Wildlife Refuge
Kealia Pond National Wildlife Refuge
Marine Mammal Commission
U.S. Geological Survey
Western Region Offices
California Water Science Center
Hawaii Water Science Center

State of California

Office of the Governor
Office of Planning and Research, Military Affairs
State Senators (Districts 27, 33, 35, 38, 39)
State Assemblymembers (Districts 54, 55, 74, 75, 76, 77, 78, 79)
California Coastal Commission
Office of Historic Preservation
Department of Conservation
Department of Environmental Protection
Division of Air Quality
Division of Environmental Health
Division of Information and Administrative Services
Division of Water
Department of Fish and Game

5

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT (EIS/OEIS) FOR NAVY MILITARY READINESS ACTIVITIES IN THE HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT) STUDY AREA

Region 5, Marine Region
Division of Wildlife Conservation
Marine Life Protection Act Blue Ribbon Task Force
Department of Military & Veterans Affairs
Department of Conservation
Division of Land Resource Protection
Department of Transportation & Public Facilities
Division of Airports
Division of Ports & Harbors
Department of Health Services
Department of Parks and Recreation
Department of Toxic Substance Control, Region 4
State Water Resources Control Board
Los Angeles Regional Water Quality Control Board
San Diego Regional Water Quality Control Board
Santa Ana Regional Water Quality Control Board
Natural Resources Agency
State Lands Commission
Wildlife Conservation Board

State of Hawaii

Office of the Governor
State Senators
State Representatives
Department of Hawaiian Home Lands
Department of Health
Department of Land and Natural Resources
Division of State Parks
Division of Aquatic Resources
Division of Conservation and Resource Enforcement
Historic Preservation Division
Division of Forestry and Wildlife
Office of Conservation and Coastal Lands
Department of Transportation
Airports Division
Harbors Division
Department of Business, Economic Development & Tourism
State Land Use Commission
Hawaii Coastal Zone Management Program
Island Burial Councils
Office of Hawaiian Affairs

Local - California

City of Avalon
City of Coronado
City of Dana Point
City of Huntington Beach
City of Imperial Beach
City of Laguna Beach
City of Long Beach

6

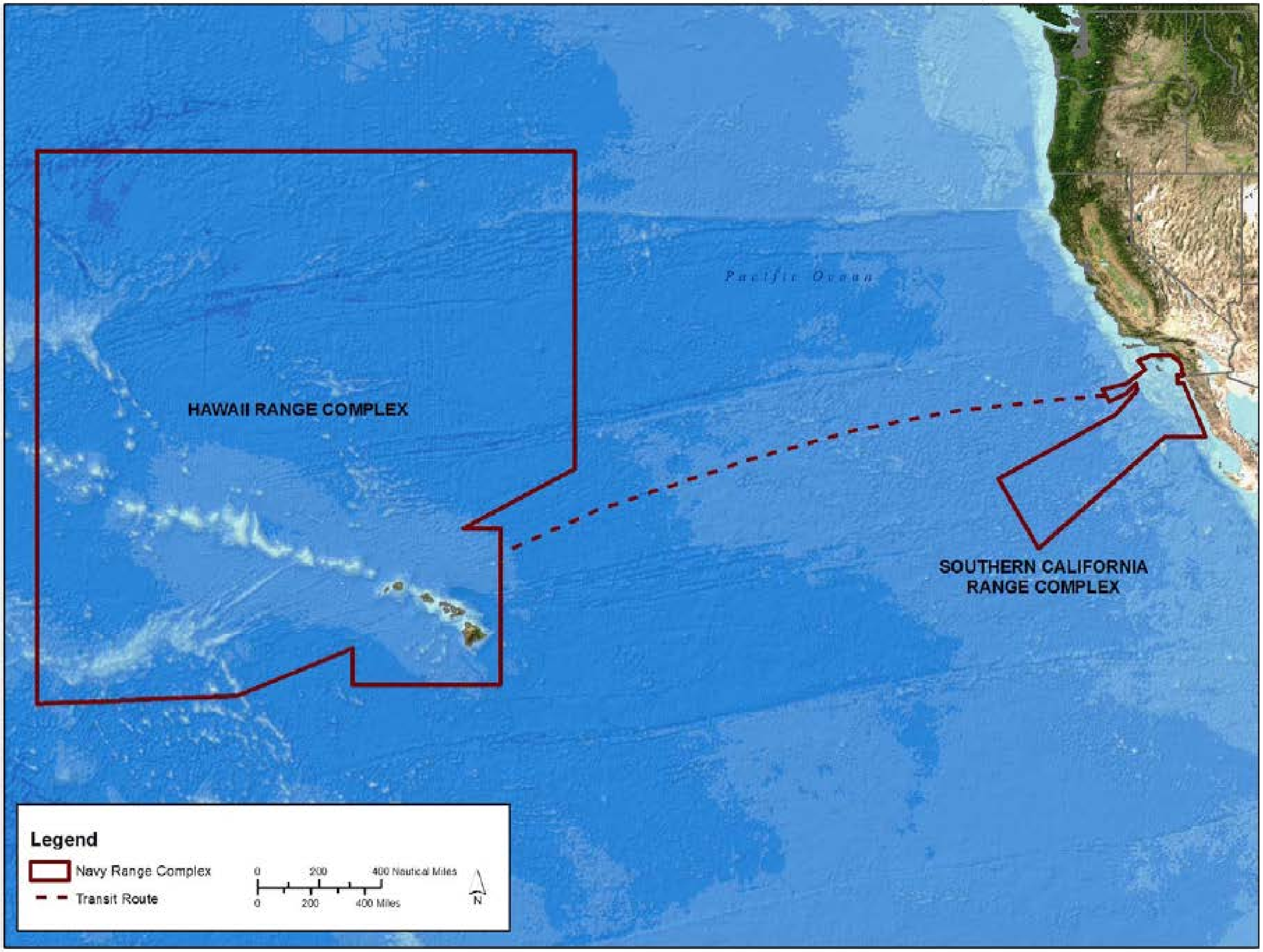
SUBJECT: ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT (EIS/OEIS) FOR NAVY MILITARY READINESS ACTIVITIES IN THE HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT) STUDY AREA

City of Los Angeles
City of Malibu
City of Newport Beach
City of Oceanside
City of San Diego
County of Los Angeles
County of Orange
County of San Diego
Port of Long Beach
Port of Los Angeles
San Diego Unified Port District

Local - Hawaii

City of Honolulu
County of Honolulu
County of Maui
County of Kauai
Hawaii County

Enclosure 1: U.S. Navy Hawaii-Southern California Training and Testing EIS/OEIS Study Area



8

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON, DC 20350-2000

IN REPLY REFER TO

5090
Ser N456D/10U158198
21 July 2010

Mr. Eric C. Schwaab
Assistant Administrator
National Marine Fisheries Service
1315 East West Highway
Silver Spring, MD 20910

Dear Mr. Schwaab: Eric

In accordance with the National Environmental Policy Act (NEPA), the Department of the Navy (Navy) is initiating the preparation of an Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement(OEIS) to evaluate the potential environmental effects associated with military readiness training and research, development, testing, and evaluation (RDT&E) activities that include the use of active sonar and explosives around the Hawaiian Islands and off the coast of Southern California (Hawaii-Southern California Training and Testing [HSTT] study area). The HSTT study area specifically combines the at-sea portions of existing Navy range complexes: Hawaii Range Complex (HRC), Southern California Range Complex (SOCAL), and Silver Strand Training Complex (SSTC). The study area also includes those areas where vessels transit between the Hawaii Range Complex and the Southern California Range Complex and select Navy pier-side locations. As a result, the separate analyses contained in the HRC, SOCAL, and SSTC EIS/OEISs will be consolidated into a single EIS/OEIS.

An important aspect of the HSTT EIS/OEIS will be the analysis of the acoustic effects to marine species protected under the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA). The HSTT EIS/OEIS is also intended to serve as a basis for the renewal of current regulatory permits and authorizations; address current training and testing not covered under the existing permits and authorizations; and obtain those permits and authorizations necessary to support force structure changes and emerging and future training and testing requirements. MMPA Final Rules and ESA Section 7 Programmatic Biological Opinions for HRC and SOCAL will expire in January 2014. The Navy anticipates receiving an Incidental Harassment Authorization (IHA) for the Silver Strand Training Complex in October 2010 and combining that IHA into the permitting and consultation effort for the HSTT study area.

To complete the analysis required by the permitting and consultation processes, the Navy and the National Marine Fisheries Service (NMFS) will need to work together. Therefore, in accordance with the Council on Environmental Quality's (CEQ) NEPA guidelines (specifically, 40 CFR Part 1501) and CEQ's 2002 guidance on cooperating agencies, Navy requests NMFS serve as a cooperating agency for the development of the HSTT EIS/OEIS.

As the lead agency, the Navy will be responsible for overseeing preparation of the EIS/OEIS that will include, but not be limited to, the following:

- Gathering all necessary background information and preparing the EIS/OEIS and all necessary permit applications associated with acoustic issues.
- Working with NMFS personnel to determine the method of estimating potential effects to protected marine species, including threatened and endangered species.
- Determining the scope of the EIS/OEIS, including the alternatives evaluated.
- Circulating the appropriate NEPA documentation to the general public and any other interested parties.
- Scheduling and supervising meetings held in support of the NEPA process, and compiling any comments received.
- Maintaining an administrative record and responding to any Freedom of Information Act requests relating to the EIS/OEIS.

Navy respectfully requests that NMFS, in its role as a cooperating agency, provide support as follows:

- Providing timely comments after the Agency Information Meeting (which will be held at the onset of the EIS/OEIS process) and on working drafts of the EIS/OEIS documents. The Navy requests that comments on draft EIS/OEIS documents (Version 2) be provided within 30 working days.
- Responding to Navy requests for information, in particular related to review of the acoustic effects analysis and evaluation of the effectiveness of protection and mitigation measures.
- Coordinating, to the maximum extent practicable, any public comment periods required in the MMPA permitting process with the Navy's NEPA public comment periods.
- Participating, as necessary, in meetings hosted by the Navy for discussion of issues related to the EIS/OEIS, including public hearings and meetings.

2

- Adhering to the overall schedule as set forth by the Navy.
- Providing a formal, written response to this request.

The Navy views this agreement as important to the successful completion of the environmental planning process for the HSTT EIS/OEIS. NMFS assistance will be invaluable in this endeavor.

My point of contact for this action is Ms. Dawn Roderique, (703) 604-1268, email: Dawn.Roderique@navy.mil.

Sincerely,

John Quinn

JOHN P. QUINN
Deputy Director, Energy and
Environmental Readiness
Readiness Division (OPNAV N45)

Copy to:
ASN (EI&E)
DASN (E)
OAGC (EI&E)
COMFLTFORCOM (N73, N77)
COMPACFLT (N01CE, N7)
CNIC (N45)
Commander, Navy Region Hawaii (N40)
Commander, Navy Region Southwest (N40)

Eric – I look forward to further outstanding cooperation and collaboration between NMFS and Navy on this – John

3

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1315 East-West Highway
Silver Spring, Maryland 20910

THE DIRECTOR

JUL 11 2013

Mr. John P. Quinn
Deputy Director, Energy and
Environmental Readiness Division
Department of the Navy
2000 Navy Pentagon
Washington, DC 20350-2000

Dear Mr. Quinn:

Thank you for your letter requesting that NOAA's National Marine Fisheries Service (NMFS) participate as a cooperating agency in the preparation of an Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS) to evaluate potential environmental effects of military readiness training and research, development, testing, and evaluation (RDT&E) activities conducted within the Hawaii-Southern California Training and Testing (HSTT) Study Area. We reaffirm our support of the Navy's decision to prepare an EIS/OEIS and agree to be a cooperating agency, due, in part, to our responsibilities under section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA) and section 7 of the Endangered Species Act.

In response to your letter, NMFS staff will continue to, to the extent possible,

- Provide timely review and comments, within 30 working days, after the Agency Information Meeting and on working drafts of the EIS/OEIS documents;
- Respond to Navy requests for information, in particular those related to the acoustic effects analysis and the evaluation of the effectiveness of protection and mitigation measures, in a timely manner;
- Participate in meetings, as necessary, hosted by the Navy to discuss issues related to the EIS/OEIS, including public hearings on the draft EIS/OEIS; and
- Adhere to the overall schedule as agreed upon by NMFS and the Navy.

If you need any additional information, please contact Ms. Jolie Harrison, NMFS Office of Protected Resources, at (301) 427-8401.

Sincerely,

Samuel D. Rauch, III
Deputy Assistant Administrator
for Regulatory Programs,
performing the functions and duties of the
Assistant Administrator for Fisheries

THE ASSISTANT ADMINISTRATOR
FOR FISHERIES

Printed on Recycled Paper

DEPARTMENT OF THE NAVY
COMMANDER
UNITED STATES PACIFIC FLEET
250 MAKALAPA DRIVE
PEARL HARBOR, HAWAII 96860-3131

IN REPLY REFER TO:
5090
Ser N01CE1/0397
April 4, 2012

Ms. Helen M. Golde
Acting Director, Office of Protected Resources
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
1315 East-West Highway
SSMC3, Room 13821
Silver Spring, MD 20910-3282

SUBJECT: REQUEST FOR MARINE MAMMAL PROTECTION ACT (MMPA) INCIDENTAL TAKE AUTHORIZATION AND REGULATIONS FOR U.S. HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT) ACTIVITIES

Dear Ms. Golde:

In accordance with MMPA, as amended and 50 C.F.R. Part 216, the U.S. Navy requests 5-year incidental take authorization and regulations for the incidental taking of marine mammals associated with HSTT activities occurring within the Pacific Ocean.

The Proposed Action may incidentally expose marine mammals that reside within the HSTT study area to sound and other environmental stressors associated with training and testing activities. The enclosed request further describes the HSTT activities and study area and provides the specific information required by National Marine Fisheries Service (NMFS) for consideration of an incidental take request.

The U.S. Navy requests the above regulations authorize, and the NMFS issue, two 5-year Letter of Authorizations; one issued to Commander, U.S. Pacific Fleet for training activities and one issued to Commander, Naval Sea Systems Command for testing activities. Addresses for these commands are provided below:

SUBJECT: REQUEST FOR MARINE MAMMAL PROTECTION ACT (MMPA) INCIDENTAL TAKE AUTHORIZATION AND REGULATIONS FOR U.S. HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT) ACTIVITIES

Commander, United States Pacific Fleet
Attn: N01CE1
250 Makalapa Drive
Honolulu, HI 96860-3131

Commander, Naval Sea Systems Command
Attn: Code SEA 04R
1333 Isaac Hull Avenue, SE
Washington Navy Yard, Washington DC 20376

We appreciate your continued support in helping the U.S. Navy to meet its environmental responsibilities.

Sincerely,

L. M. FOSTER
By direction

Enclosure: Request for Regulations and Letters of Authorization for the Incidental Taking of Marine Mammals Resulting From U.S. Navy Training and Testing Activities in the HSTT Study Area

Copy to:
Ms. Jolie Harrison, NMFS Office of Protected Resources
Ms. Gina Shultz, NMFS Office of Protected Resources

2

DEPARTMENT OF THE NAVY
COMMANDER
UNITED STATES PACIFIC FLEET
250 MAKALAPA DRIVE
PEARL HARBOR, HAWAII 96860-3131

IN REPLY REFER TO:
5090
Ser N01CE1/1266
24 Sep 2012

Ms. Helen M. Golde
Acting Director, Office of Protected Resources
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
1315 East-West Highway, SSMC3, Room 13821
Silver Spring, MD 20910-3282

SUBJECT: REVISED REQUEST FOR MARINE MAMMAL PROTECTION ACT INCIDENTAL TAKE AUTHORIZATION AND REGULATIONS FOR U.S. NAVY HAWAII AND SOUTHERN CALIFORNIA TRAINING AND TESTING ACTIVITIES

On April 4, 2012 the U.S. Navy submitted an application for a five-year incidental take authorization and regulations under the Marine Mammal Protection Act (MMPA) for the incidental taking of marine mammals associated with Hawaii and Southern California and Testing (HSTT) activities occurring within the Pacific Ocean. Since our submittal of the application we have continued to refine our proposed activities and the associated analysis of potential impacts on marine mammals. We have also discussed the initial application with your staff and incorporated additional information based on those discussions. In light of the above refinements and discussions, the U.S. Navy is submitting the enclosed revised application in accordance with the MMPA, as amended, and 50 C.F.R. Part 216, for a five-year incidental take authorization and regulations for HSTT activities.

The primary revisions to the initial application include: 1) corrections to errors, typos, and transcription mistakes; 2) addition of training and testing requirements that were not identified in time to incorporate into the initial application; 3) clarification of how events were modeled; and 4) the addition of post-model quantification to supplement the analysis of acoustic effects to include animal avoidance of sound sources, animal avoidance of areas of activity before use of a sound source or explosive, and implementation of mitigation.

As stated in our April 4, 2012 letter, the U.S. Navy requests the above regulations authorize, and National Marine Fisheries Service (NMFS) issue two five-year Letters of Authorization; one issued to Commander, United States Pacific Fleet for training activities, and one issued to Commander, Naval Sea Systems Command for testing activities.

5090
Ser N01CE1/1266
24 Sep 2012

Addresses for these commands are provided below.

- Commander, U.S. Pacific Fleet
  Attn: Code N01CE1 Fleet Environmental Readiness
  250 Makalapa Drive
  Pearl Harbor, HI 96860-3131

- Commander, Naval Sea Systems Command
  Attn: Code SEA 04R
  1333 Isaac Hull Avenue, SE
  Washington Navy Yard, DC 20376

If your staff has any technical questions regarding this application, the U.S. Pacific Fleet Point of Contact is Mr. Chip Johnson, (619) 767-1567.

Sincerely,

L. M. FOSTER
By direction

Enclosures: 1. Request for Regulations and Letters of Authorization for the Incidental Taking of Marine Mammals Resulting From U.S. NAVY Training and Testing Activities in the HSTT Study Area (September 2012)

Copy to:
Ms. Jolie Harrison, NMFS Office of Protected Resources
Ms. Ms. Gina Shultz, NMFS Office of Protected Resources

2

DEPARTMENT OF THE NAVY
COMMANDER
UNITED STATES PACIFIC FLEET
250 MAKALAPA DRIVE
PEARL HARBOR, HAWAII 96860-3131

IN REPLY REFER TO:
5090
Ser N01CE1/1251
24 Sep 2012

Ms. Helen Golde
Director, Office of Protected Resources
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
SSMC3, Room 13821
1315 East-West Highway
Silver Spring, MD 20910-3282

SUBJECT: REQUEST FOR INITIATION OF ENDANGERED SPECIES ACT SECTION 7 FORMAL CONSULTATION FOR COMMANDER, UNITED STATES PACIFIC FLEET TRAINING AND TESTING ACTIVITIES

Dear Ms. Golde:

In accordance with section 7 of the Endangered Species Act, the U.S. Navy requests initiation of formal consultation on Hawaii-Southern California Training and Testing (HSTT) activities occurring within the Pacific Ocean off the coast of Southern California and in the surrounding waters of the Hawaiian Islands.

The proposed action may affect listed species that reside within the HSTT Study Area by exposing them to sound and other environmental stressors associated with training and testing activities. The enclosed HSTT Draft Environmental Impact Statement (DEIS)/Draft Overseas Environmental Impact Statement (DOEIS) is the Navy's primary document that provides the required information pursuant to 50 C.F.R. §402.12(f). The U.S. Navy is requesting formal consultation on Alternative 2 within the EIS/OEIS. In addition, the enclosed Supplemental Information document serves as a roadmap for identifying the required information within the EIS/OEIS, and provides additional, supporting information not found within the EIS/OEIS.

5090
Ser N01CE1/1251
24 Sept 2012

The Navy is requesting formal consultation on ESA-listed species addressed in this consultation package including the humpback whale, (*Megaptera novaeangliae*), sei whale (*Balaenoptera borealis*), fin whale (*Balaenoptera physalus*), blue whale (*Balaenoptera musculus*), sperm whale (*Physeter macrocephalus*), Hawaiian monk seal (*Monachus schauinslandi*), green turtle (*Chelonia mydas)*, hawksbill turtle *(Eretmochelys imbricata*), olive ridley turtle (*Lepidochelys olivacea*), loggerhead turtle (*Caretta caretta*), and leatherback turtle (*Dermochelys coriacea*), as well as designated critical habitat for Hawaiian monk seal. The Navy is also requesting concurrence on our Not Likely to Adversely Affect determinations for black abalone (*Haliotis cracherodii*), white abalone (*Haliotis sorenseni*), and steelhead trout (*Oncorhynchus mykiss*) as well as designated critical habitat for steelhead trout and black abalone. In addition, the Navy is requesting a conference opinion on the Hawaiian insular stock of false killer whale (*Pseudorca crassidens*).

We appreciate your continued support in helping the U.S. Navy to meet its environmental responsibilities.

Sincerely,

L. M. FOSTER
Director, Environmental Readiness
By direction

Enclosures:
1) CD-ROM of the Draft EIS/OEIS for the Navy's HSTT Activities
2) HSTT ESA Consultation Supplemental Information
3) Excel file with 1dB and 6dB bin modeled exposure data by species
4) Excel file of master activity tables
5) HSTT Letter of Authorization under MMPA

Copy to: Ms. Kris Peterson, NMFS Office of Protected Resources
Mr. Stan Rogers, NMFS Office of Protected Resources

2

DEPARTMENT OF THE NAVY
COMMANDER
UNITED STATES PACIFIC FLEET
250 MAKALAPA DRIVE
PEARL HARBOR, HAWAII 96860-3131

IN REPLY REFER TO:
5090
Ser N01CE1/1494
15 Nov 2012

Loyal Mehrhoff, PhD
Field Supervisor
Pacific Islands Fish and Wildlife Office
300 Ala Moana Blvd., Suite 3-122
Honolulu, Hawaii 96850

SUBJECT: REQUEST FOR INFORMAL CONSULTATION UNDER SECTION 7 OF THE ENDANGERED SPECIES ACT (ESA) FOR SPECIES UNDER U.S. FISH AND WILDLIFE SERVICE (USFWS) JURISDICTION WITHIN THE HAWAII PORTION OF THE HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT) STUDY AREA

Dear Dr. Mehrhoff:

In accordance with section 7 of the ESA, the U.S. Navy requests informal consultation on HSTT activities occurring within the Pacific Ocean in the surrounding waters of the Hawaiian Islands.

The Proposed Action may affect listed species that reside within the HSTT Study Area by exposing them to sound and other environmental stressors associated with training and testing activities. The enclosed HSTT Draft Environmental Impact Statement (DEIS)/Overseas Environmental Impact Statement (OEIS) (Enclosure 1) is the Navy's primary document that provides the required information pursuant to 50 C.F.R. §402.12(f). Chapter 5 was revised after the DEIS release so the revised Chapter is provided as Enclosure 3.

The U.S. Navy is requesting informal consultation on Alternative 2 within the EIS/OEIS for species that occur within the Hawaii portion of the HSTT Study Area and are under the jurisdiction of the USFWS. Sea turtles are not included in this consultation as land-based activities are not being covered in the HSTT EIS. Those activities were covered in the Hawaii Range Complex (HRC) EIS and are not changing. Also, the Navy is consulting with National

SUBJECT: REQUEST FOR INFORMAL CONSULTATION UNDER SECTION 7 OF THE ENDANGERED SPECIES ACT (ESA) FOR SPECIES UNDER U.S. FISH AND WILDLIFE SERVICE (USFWS) JURISDICTION WITHIN THE HAWAII PORTION OF THE HAWAII-SOTHERN CALIFORNIA TRAINING AND TESTING (HSTT) STUDY AREA

Marine Fisheries Service under ESA for proposed at-sea training and testing activities that may affect listed species under their jurisdiction. Therefore, ESA-listed seabirds are the only species being covered in this informal consultation. In addition, the enclosed Supplemental Information (Enclosure 3) serves as a roadmap for identifying the required information within the EIS/OEIS.

The Navy requests concurrence that the described actions may affect, but are not likely to adversely affect the Hawaiian petrel (*Pterodroma sandwichensis*), short-tailed albatross (*Phoebastria albatrus*), and Newell's shearwater (*Puffinus auricularis newelli*).

Thank you for your assistance. Please contact Mr. Frans Juola at Naval Facilities Engineering Command, Pacific at email: frans.juola@navy.mil, (808)472-1433 or Ms. Julie Rivers at email julie.rivers@navy.mil, (808)474-6391 regarding this informal consultation request.

Sincerely,

L. M. FOSTER
Director, Fleet Environmental
Readiness Division
By direction

Enclosures:
1) CD-ROM of the DEIS/OEIS for the Navy's HSTT Activities
2) Revised EIS/OEIS Chapter 5 (Standard Operating Procedures, Mitigations)
3) HSTT ESA Consultation Supplemental Information and Monitoring

2

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
2013-I-0057

JUN 0 7 2013

Mr. Larry M. Foster
Director
Fleet Environmental Readiness Division
Department of the Navy
United States Pacific Fleet
250 Makalapa Drive
Pearl Harbor, Hawaii 96860-3131

Subject: Informal Consultation on the Hawaii Portion of the Proposed U.S. Navy Hawaii-Southern California Training and Testing Study Area within the Pacific Ocean

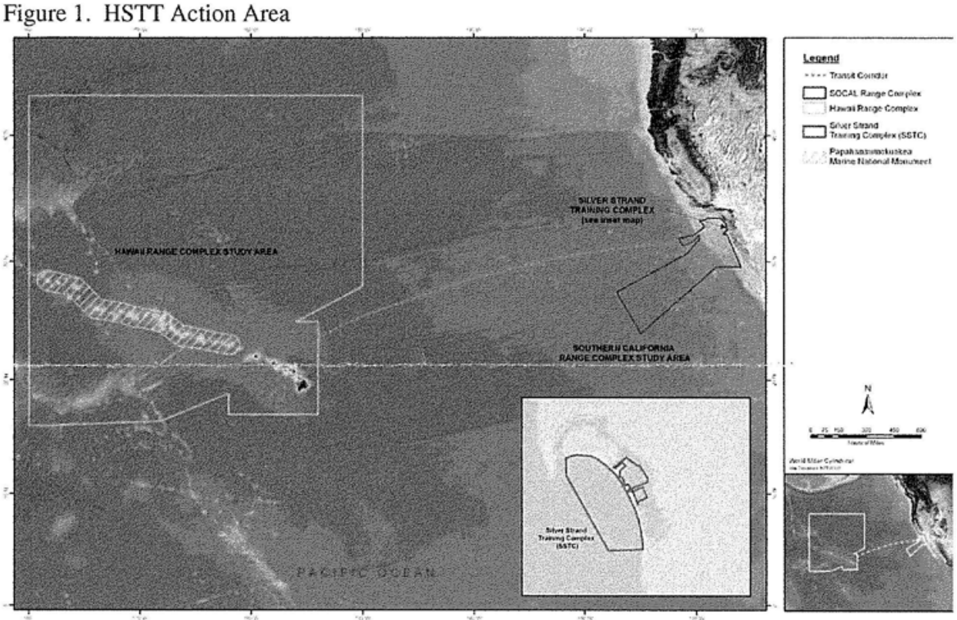
Dear Mr. Foster:

This letter is in response to your November 15, 2012, request for informal consultation for the proposed U.S. Navy Hawaii-Southern California Training and Testing (HSTT) activities occurring in waters off of the Hawaiian Islands. We received the letter on November 21, 2012. You determined the proposed action is not likely to adversely affect federally endangered short-tailed albatross (*Phoebastria albatrus*), Hawaiian petrel (*Pterodroma sandwichensis*), and the threatened Newell's shearwater (*Puffinus auricularis newelli*).

HSTT activities will be implemented as described in Alternative 2 of the HSTT Draft Environmental Impact Statement/Overseas Environmental Impact Statement (DEIS/OEIS). The HSTT action area includes established U.S. Navy (Navy) operating and warning areas across the north-central Pacific Ocean, from Southern California west to Hawaii and the International Date Line. The Study Area includes three existing Navy range complexes: the Hawaii Range Complex, SOCAL Range Complex and Silver Strand Training Complex (SSTC) (Figure 1). The HSTT action area also includes Navy vessel transit corridors and piers outside of the range complexes. HSTT will include: use of active sonar and explosives in the existing range complexes; sonar maintenance and gunnery exercises during ship transits between the range complexes; and sonar testing at Navy piers in Pearl Harbor, Hawaii and San Diego Bay, California. HSTT training and testing activities may occur year round.

HSTT will occur in areas under the jurisdiction of the U.S. Fish and Wildlife Service's Pacific Islands Field Office (PIFWO) and Carlsbad Field Office. This letter addresses only the portions of HSTT under the PIFWO's jurisdiction.

Figure 1. HSTT Action Area



It is likely that few seabirds would be affected by sonar and other underwater active acoustic sources because sources are used intermittently during a training event, training events are dispersed in space and time, most seabirds spend little time submerged, and exposures sufficiently intense (i.e., of a certain duration or within a close proximity) to cause physiological impacts are unlikely. Hawaiian petrels and short-tailed albatrosses do not submerge while foraging; therefore, they would not be exposed to underwater sound from sonar and other active acoustic sources. Newell's shearwater may briefly submerge while foraging, pursuit diving, so there is a remote chance that these species could be exposed to underwater sound sonar and other active acoustic sources.

The short-tailed albatross, Hawaiian petrel, and Newell's shearwater occur in oceanic and off shore waters within the HSTT action area at low frequencies (Navy 2012). HSTT activities could result in adverse effects to these species. Due to the widely dispersed, temporary and intermittent nature of the HSTT activities, and the low frequencies of these species within the HSTT action area, we consider such effects to short-tailed albatross, Hawaiian petrel, and Newell's shearwater possible, but unlikely.

Based on the above and implementation of mitigation measures outlined in detail within DEIS/OEIS, we concur with the Navy's determination that HSTT is not likely to adversely affect endangered short-tailed albatross, Hawaiian petrel, and the threatened Newell's shearwater. Unless the project description changes, or new information reveals that the effects of the proposed action may affect listed species in a manner or to an extent not considered, or a new species or critical habitat is designated that may be affected by the proposed action, no further action pursuant to the Act is necessary.

Mr. Larry M. Foster 3

We appreciate your continued efforts to address the conservation needs of wildlife that may be affected by military training activities. If you have questions regarding this consultation, please contact Aaron Nadig, Fish and Wildlife Biologist, at 808-792-9400.

Sincerely,

Crystal Leonetti
for

Loyal Mehrhoff
Field Supervisor

DEPARTMENT OF THE NAVY
COMMANDER
UNITED STATES PACIFIC FLEET
250 MAKALAPA DRIVE
PEARL HARBOR, HAWAII 96860-3131

IN REPLY REFER TO:
5090
Ser N01CE1/1667
26 Nov 2012

Karen Goebel
Assistant Field Supervisor
U.S. Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
6010 Hidden Valley Road, Suite 101
Carlsbad, CA 92011

SUBJECT: REQUEST FOR INFORMAL CONSULTATION UNDER SECTION 7 OF THE ENDANGERED SPECIES ACT (ESA) FOR SPECIES UNDER U.S. FISH AND WILDLIFE SERVICE (USFWS) JURISDICTION WITHIN THE SOUTHERN CALIFORNIA (SOCAL) PORTION OF THE HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT) STUDY AREA

Dear Mrs. Goebel:

In accordance with section 7 of the ESA, the U.S. Navy requests informal consultation on HSTT activities occurring within the Pacific Ocean off the coast of Southern California.

The Proposed Action may affect listed species that reside within the HSTT Study Area by exposing them to sound and other environmental stressors associated with training and testing activities. The enclosed HSTT Draft Environmental Impact Statement (DEIS)/Overseas Environmental Impact Statement (OEIS) (Enclosure 1) is the Navy's primary document that provides the required information pursuant to 50 C.F.R. §402.12(f). Chapter 5 was revised after the DEIS release so the revised Chapter is provided as Enclosure 2.

The U.S. Navy is requesting informal consultation on Alternative 2 within the EIS/OEIS for species that occur within the SOCAL portion of the HSTT Study Area and are under the jurisdiction of the USFWS. Land-based activities are not part of the HSTT EIS proposed activities. Those activities were addressed in the SOCAL and Silver Strand Training Complex (SSTC)

SUBJECT: REQUEST FOR INFORMAL CONSULTATION UNDER SECTION 7 OF THE ENDANGERED SPECIES ACT (ESA) FOR SPECIES UNDER U.S. FISH AND WILDLIFE SERVICE (USFWS) JURISDICTION WITHIN THE SOUTHERN CALIFORNIA (SOCAL) PORTION OF THE HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT) STUDY AREA

EISs, and associated Biological Opinions and are not proposed to change under the HSTT EIS Proposed Action. Also, the Navy is consulting with National Marine Fisheries Service under ESA for proposed at-sea training and testing activities that may affect listed species under their jurisdiction. Therefore, ESA-listed seabirds are the only species being covered in this informal consultation. In addition, the enclosed Supplemental Information (Enclosure 3) serves as a roadmap for identifying the required information within the EIS/OEIS.

The Navy requests concurrence that the described actions may affect, but are not likely to adversely affect the California least tern (*Sterna antillarum browni*), short-tailed albatross (*Phoebastria albatrus*), and marbled murrelet (*Brachyramphus marmoratus*).

Thank you for your assistance. Please contact Jacqueline Rice (jacqueline.rice@navy.mil, (619) 545-9339) regarding this informal consultation request.

Sincerely,

L. M. FOSTER
Director, Fleet Environmental Readiness
By direction

Enclosures:
1) CD-ROM of the Draft EIS/OEIS for the Navy's HSTT Activities
2) Revised EIS/OEIS Chapter 5 (Standard Operating Procedures, Mitigations and Monitoring)
3) HSTT ESA Consultation Supplemental Information

2

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Carlsbad Fish and Wildlife Office
6010 Hidden Valley Road, Suite 101
Carlsbad, California 92011

In Reply Refer To:
FWS-SDG-13B0130-13I0187

APR 25 2013

Mr. Larry M. Foster
Director, Fleet Environmental Readiness
U.S. Department of the Navy
Commander, United States Pacific Fleet
250 Makalapa Drive
Pearl Harbor, Hawaii 96860-3131

Subject: Informal Section 7 Consultation on the U.S. Navy's Hawaii-Southern California Training and Testing

Dear Mr. Foster:

This is in response to your letter dated November 26, 2012, requesting informal consultation on Hawaii-Southern California Training and Testing (HSTT), and its effects on the federally endangered California least tern (*Sterna antillarum browni*, least tern), short-tailed albatross (*Phoebastria albatrus*), and marbled murrelet (*Brachyramphus marmoratus*), in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.). We received your letter on January 4, 2013.

HSTT activities will be implemented as described in Alternative 2 of the HSTT Draft Environmental Impact Statement/Overseas Environmental Impact Statement (DEIS/OEIS). The HSTT action area includes established U.S. Navy (Navy) operating and warning areas across the north-central Pacific Ocean, from southern California to Hawaii and the International Date Line. The action area includes three existing Navy complexes: the Hawaii Range Complex, SOCAL Range Complex, and Silver Strand Training Complex (SSTC) (Figure 1). The HSTT action area also includes Navy vessel transit corridors and piers outside of the complexes. HSTT will include: use of active sonar and explosives in the existing complexes; sonar maintenance and gunnery exercises during ship transits between the complexes; and sonar testing at Navy piers in Pearl Harbor, Hawaii, and San Diego Bay, California. HSTT activities may occur year round.

HSTT will occur in areas under the jurisdiction of the U.S. Fish and Wildlife Service's Pacific Islands Fish and Wildlife Office and Carlsbad Fish and Wildlife Office (CFWO). This letter addresses only the portions of HSTT under the CWFO's jurisdiction.

Based on your letter, HSTT will not include land training and testing activities, nor result in a change to land or in-water training and testing activities identified in the biological opinion on the SSTC Operations (FWS-SDG-8B0503-09F0517), and the San Clemente Island Military

Operations and Fire Management Plan (FWS-LA-09B0027-09F0040). These previous biological opinions addressed potential adverse effects of some HSTT activities to the least tern and western snowy plover (*Charadrius alexandrinus nivosus*), and exempted take associated with the activities. Although the HSTT DEIS/OEIS includes tables that reflect an increase in training frequency for some significant training activities that were previously consulted on (e.g., Battalion sized landings; Table A-1 of HSTT DEI/OEIS, page 2-78), the Navy provided corrected tables that confirm no increase in training will occur on San Clemente Island or the SSTC as part of HSTT (Rice 2013). It is our understanding that these corrected tables will be incorporated into the final HSTT EIS/OEIS.

Figure 1. HSTT Action Area

The Navy will implement the conservation measures identified in biological opinion FWS-SDG-8B0503-09F0517 to avoid and minimize potential adverse effects to the least tern associated with HSTT activities conducted at the SSTC. Therefore, no further consultation on potential impacts to the least tern is necessary for activities already addressed in biological opinion FWS-SDG-8B0503-09F0517.

Additional training and testing activities included in HSTT and not previously addressed in biological opinion FWS-SDG-8B0503-09F0517 include gunnery exercises during ship transits between the range complexes, mine countermeasure exercises, and sonar testing/maintenance. These activities may affect least terns by exposing them to strikes or collisions with vessels, aircraft, or munitions; physical disturbance; and electromagnetic stressors (Navy 2012). Due to the low density of least terns anticipated within ship transit and at-sea training areas, the mobility of least terns that will allow them to depart from areas of disturbance, and the foraging strategy of least terns that results in little time spent under water, we expect potential effects to least tern to be discountable.

The marbled murrelet and short-tailed albatross occur in oceanic and/or near shore waters off the coast of California, and have been recorded within the HSTT action area at low frequencies (Navy 2012). HSTT activities could result in adverse effects to these species. Due to the widely dispersed, temporary and intermittent nature of the HSTT activities, and the low frequencies of these species within the HSTT action area, we expect potential effects to marbled murrelet and short-tailed albatross to also be discountable.

Based on the above, we concur with the Navy's determination that HSTT is not likely to adversely affect the least tern, marbled murrelet, and short-tailed albatross. Therefore, the interagency consultation requirements of section 7 of the Act have been satisfied. Should project plans change or if additional information on the distribution of listed or proposed species becomes available, this determination may be reconsidered and further section 7 consultation may be required.

We appreciate your continued efforts to address the conservation needs of wildlife that may be affected by military training activities. If you have any questions or concerns with regard to this consultation, please contact Sandy Vissman at 760-431-9440.

Sincerely,

Karen A. Goebel
Assistant Field Supervisor

cc:
Aaron Nadig, Honolulu Fish and Wildlife Office

REFERENCES

Rice, Jacqueline. 2013. ..ectronic mail message to Sanc., Vissman (Service) (February 11, 2013, regarding Tables A1-A4 from the Hawaii-Southern California Training and Testing Draft Environmer Impact Statement/Ov nmental Impact Statement.

U.S. D 1 : the Navy (Navy). ^)12. Hav 1 ..stir.g D..ft E.ivironmental Impact St 'erseas Environmental Impact Statement.

DEPARTMENT OF THE NAVY
COMMANDER
UNITED STATES PACIFIC FLEET
250 MAKALAPA DRIVE
PEARL HARBOR, HAWAII 96860-3131

IN REPLY REFER TO:
5090
Ser N01CE1/0039
January 13, 2013

Mr. Jesse K. Souki
Director
Hawaii Department of Business, Economic Development & Tourism,
Office of Planning
P.O. Box 2359
Honolulu, HI 96804

Dear Mr. Souki:

In accordance with 15 CFR §930, the U.S. Navy, Commander, U.S. Pacific Fleet is submitting the enclosed Consistency Determination (CD) for operations within the Hawaii-Southern California Training and Testing (HSTT) Study Area, which includes the Hawaii Range Complex (HRC). The CD addresses ongoing and future military training and testing within the HRC. The CD is being submitted for consideration by the Office of Planning. A separate CD was prepared and submitted to the California Coastal Commission for their consideration under the CZM Program for operations within the Southern California portion of the Study Area.

In addition to the CZMA Federal Consistency requirements addressed by the submission of the enclosed CD, the Navy is addressing compliance with other environmental laws as follows:

- National Environmental Policy Act and Executive Order 12114. Navy released a Draft Environmental Impact Statement for the HSTT in May, 2012.

- Marine Mammal Protection Act. Navy is seeking an Incidental Harassment Authorization request from the National Marine Fisheries Service (NMFS).

- Endangered Species Act (ESA). Navy is consulting with NMFS and U.S. Fish and Wildlife Service under Section 7 of the ESA.

Subj: HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING CONSISTENCY DETERMINATION

If you have any questions please contact Mr. John Van Name, U.S. Pacific Fleet, (808) 471-1714, John.Vanname@navy.mil and Ms. Rebecca Hommon, Commander Navy Region Hawaii, at (808) 473-4731, rebecca.hommon@navy.mil.

Sincerely,

L. M. Foster
By direction

Encl (1): Hawaii-Southern California Training and Testing Consistency Determination

Copy to: Chief of Naval Operations (N454) (w/o enclosure)
Commander, Navy Region Hawaii (N40) (w/o enclosure)
Mark Delaplaine, California Coastal Commission (w/enclosures)

2

OFFICE OF PLANNING
STATE OF HAWAII

NEIL ABERCROMBIE
GOVERNOR

JESSE K. SOUKI
DIRECTOR
OFFICE OF PLANNING

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://hawaii.gov/dbedt/op/

Ref. No. P-13924

March 20, 2013

Mr. Larry M. Foster, Director
Environmental Readiness
Department of the Navy
Commander
United States Pacific Fleet
250 Makalapa Drive
Pearl Harbor, Hawaii 96860-3131

Dear Mr. Foster:

Subject: Hawaii Coastal Zone Management (CZM) Program Federal Consistency Review for U.S. Navy Hawaii-Southern California Training and Testing (HSTT) Activities

The Office of Planning, CZM Program, State of Hawaii, has completed its review of the Navy's CZM Act federal consistency determination dated January 13, 2013 (received January 18, 2013), for operations and activities within the HSTT area. The Office of Planning conditionally concurs with the Navy's determination that the conduct of U.S. Navy HSTT activities is consistent to the maximum extent practicable with the enforceable policies of the Hawaii CZM Program.[1] The following condition shall apply to all HSTT operations and activities:

> Pursuant to Hawaii CZM Program enforceable policies Hawaii Revised Statutes (HRS) Chapter 195D, and Hawaii Administrative Rules (HAR) Chapter 13-124, HSTT operations or activities within the State of Hawaii CZM management area shall not harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect endangered or threatened species of aquatic life or wildlife, or cut, collect, uproot, destroy, injure, or possess endangered or threatened species of aquatic life or land plants, or attempt to engage in any such conduct. Endangered or threatened species referred to in this condition are those listed in HAR Chapter 13-124. This condition shall not apply to marine mammals.[2]

---

[1] Pursuant to 15 CFR 930.32(a)(1), "[t]he term 'consistent to the maximum extent practicable' means fully consistent with the enforceable policies of management programs unless full consistency is prohibited by existing law applicable to the Federal agency."

[2] *See* Letter from Jane C. Luxtion, NOAA General Counsel, to Frank R. Jimenez, General Counsel of the Navy, June 20, 2008.

Mr. Larry M. Foster
Page 2
March 20, 2013

The subject condition is based on two federally-approved enforceable policies of the Hawaii CZM Program: (1) HRS Chapter 195D, *Conservation of Aquatic Life, Wildlife, and Land Plants*, and (2) HAR Chapter 13-124, *Indigenous Wildlife, Endangered and Threatened Wildlife, and Introduced Wild Birds*. HRS §195D-4(e)(2) and HAR §13-124-3(b), prohibit the "take" of any threatened or endangered species within the State of Hawaii. Pursuant to HRS §195D-2, "take" is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect endangered or threatened species of aquatic life or wildlife, or to cut, collect, uproot, destroy, injure, or possess endangered or threatened species of aquatic life or land plants, or to attempt to engage in any such conduct." The State of Hawaii listing of threatened and endangered species is contained in HAR Chapter 13-124.

According to the Navy's "Coastal Zone Management Act Consistency Determination for Hawaii," dated January 2013 ("Consistency Determination"), impacts to threatened sea turtles are predicted to result from explosions during both training activities and testing activities. Table 3-4, page 35, shows that HSTT activities will cause 21 occurrences of permanent threshold shift (i.e., permanent hearing damage), 13 occurrences of lung injury, and 4 mortalities annually. Table 3-5, page 35, shows that HSTT activities will cause 5 permanent threshold shifts annually. Consequently, HSTT training and testing activities will "take" threatened sea turtles, contravening enforceable policies of the Hawaii CZM Program.

In addition, HSTT activities involving explosive detonations will likely "take" endangered or threatened seabirds. Page 44 of the Consistency Determination predicts that

> [w]hile the impacts of explosive detonations on seabirds under the Proposed Action cannot be quantified due to limited data on seabird density, lethal injury to some seabirds could occur. Lethal injuries would likely be associated with detonations of bombs with larger net explosive weights, although any event employing static targets may attract seabirds to the detonation site.

According to page 43 of the Consistency Determination, "[a] seabird close to an explosive detonation could be killed or injured." Based on this information, it is reasonably foreseeable that HSTT explosive detonations will cause the "take" of endangered or threatened seabirds, contravening enforceable policies of the Hawaii CZM Program.

If the requirements for conditional concurrences specified in 15 CFR §§930.4(a)(1) through (3) are not met, then all parties shall treat this conditional concurrence letter as an objection pursuant to 15 CFR Part 930, Subpart C. Furthermore, you are hereby notified that, pursuant to 15 CFR §930.63(e), you have an opportunity to appeal an objection resulting from not meeting the requirements of 15 CFR §§930.4(a)(1) through (3) to the Secretary of Commerce within 30 days after receiving this conditional concurrence letter.

Mr. Larry M. Foster
Page 3
March 20, 2013

CZM consistency concurrence does not represent an endorsement or favorable consideration of any of the Navy's HSTT operations and activities, nor does it convey approval with any regulations administered by any state or county agency. If you have any questions, please contact me at (808) 587-2846.

Sincerely,

Jesse K. Souki
Director

c: Mr. William Aila, Department of Land and Natural Resources, State of Hawaii

DEPARTMENT OF THE NAVY
COMMANDER
UNITED STATES PACIFIC FLEET
250 MAKALAPA DRIVE
PEARL HARBOR, HAWAII 96860-3131

IN REPLY REFER TO:
5090
Ser N01CE1/0513
April 25, 2013

Mr. Jesse K. Souki
Director
Hawaii Department of Business, Economic
Development & Tourism, Office of Planning
P.O. Box 2359
Honolulu, HI 96804

Dear Mr. Souki:

The Navy is in receipt of the State of Hawaii's Office of Planning (OP) letter (dated 18 April 2013) regarding the Hawaii-Southern California Training and Testing Consistency Determination, and the OP's request for clarification regarding our intentions.

The OP specifically asked if the Navy was suggesting that it would engage in consultation with the endangered species recovery committee and apply for a temporary license as part of a habitat conservation plan with the State Board of Land and Natural Resources.

The Navy wishes to make clear that it does not intend to engage in consultation with State offices. Rather, the Navy has initiated consultation with the National Marine Fisheries Service and the Fish and Wildlife Service to ensure that the population and future of endangered species are not put into jeopardy. Additionally, the Navy will minimize and mitigate to the maximum extent practicable the impacts to species of concern in order to ensure that the potential taking of the species are not "likely" to occur.

The Endangered Species Act, and the Navy's consultation under Section 7 of the act serves as the functional equivalent of the State programs and will ensure that Navy activities remain consistent with the enforceable policies of the Hawaii CZM Program.

5090
N01CE1/xxxx
April 23, 2013

The Navy thanks the Office of Planning for allowing us this opportunity to provide clarification and we look forward to continuing our professional relationship with you and your staff.

Sincerely,

L. M. FOSTER
By direction

Copy to: Chief of Naval Operations (N454)
Commander, Navy Region Hawaii (N40)

2

OFFICE OF PLANNING
STATE OF HAWAII

NEIL ABERCROMBIE
GOVERNOR

JESSE K. SOUKI
DIRECTOR
OFFICE OF PLANNING

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http:/planning.hawaii.gov/

Ref. No. P-13956

April 18, 2013

Mr. John Coronado
Department of the Navy
Commander
United States Pacific Fleet
250 Makalapa Drive
Pearl Harbor, Hawaii 96860-3131

Dear Mr. Coronado:

Subject: Hawaii-Southern California Training and Testing (HSTT) Consistency Determination

The Office of Planning (OP) has reviewed the Department of the Navy's letter, dated April 12, 2013, regarding its response to OP's Coastal Zone Management Act conditional concurrence regarding the subject activities.

OP seeks to better understand the Navy's position on this matter. According to the Navy's letter, "the proposed conditions [in OP's conditional concurrence letter dated March 20, 2013] are not necessary for the Navy's training and testing activities to be fully consistent with HRS 195-4(e) and (g) because any take would be incidental to, and not the purpose of, an otherwise lawful activity." Is the Navy suggesting that it will engage in consultation with the endangered species recovery committee and apply for a temporary license as a part of a habitat conservation plan with the State Board of Land and Natural Resources (BLNR)?

According to HRS §195-4(e), it is unlawful to take any threatened or endangered species of aquatic life. With regard to subsection (g), which the Navy cites in its letter, an exception to this general rule against taking may be allowed, but only as follows:

> **After consultation with the endangered species recovery committee, the [BLNR] may issue a temporary license as a part of a habitat conservation plan** to allow a take otherwise prohibited by subsection (e) if the take is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity[.]

See HRS §195-4(g) (emphasis added).

Mr. John Coronado
Page 2
April 18, 2013

Thank you for the Navy's willingness to address any remaining concerns using the remaining portion of the 90-day notice period. If you have any questions, please contact me at (808) 587-2846.

Sincerely,

Jesse K. Souki
Director

c: Mr. William Aila, Department of Land and Natural Resources, State of Hawaii

DEPARTMENT OF THE NAVY
COMMANDER
UNITED STATES PACIFIC FLEET
250 MAKALAPA DRIVE
PEARL HARBOR, HAWAII 96860-3131

IN REPLY REFER TO:
5090
Ser N01CE1/0038
January 13, 2013

Mr. Charles Lester
Executive Director
California Coastal Commission
45 Fremont Street, Suite 2000
San Francisco, California 94105-2219

Dear Mr. Lester:

In accordance with 15 CFR §930, the U.S. Navy, Commander, U.S. Pacific Fleet is submitting the enclosed Consistency Determination (CD) for operations within the Hawaii-Southern California Training and Testing (HSTT) Study Area, which includes the Southern California (SOCAL) Range Complex and the Silver Strand Training Complex (SSTC). The CD addresses ongoing and future military training and testing within the SOCAL Range Complex and SSTC. The CD is being submitted for consideration by the Coastal Commission at the March 6-8, 2013 hearing in San Diego. A separate CD was prepared and submitted to the Hawaii Department of Business, Economic Development & Tourism, Office of Planning for their consideration under the CZM Program for operations within the Hawaii Range Complex portion of the Study Area.

In addition to the CZMA Federal Consistency requirements addressed by the submission of the enclosed CD, the Navy is addressing compliance with other environmental laws as follows:

- National Environmental Policy Act and Executive Order 12114. Navy released a Draft Environmental Impact Statement for the HSTT in May, 2012.
- Marine Mammal Protection Act. Navy is seeking an Incidental Harassment Authorization request from the National Marine Fisheries Service (NMFS).
- Endangered Species Act (ESA). Navy is consulting with NMFS and U.S. Fish and Wildlife Service under Section 7 of the ESA.

Subj: HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING CONSISTENCY DETERMINATION

If you have any questions please contact Mr. Alex Stone, U.S. Pacific Fleet, (619) 545-8128, Alexander.Stone@navy.mil and Ms. Suzanne Smith, Commander Navy Region Southwest, at (619) 532-2284, Suzanne.M.Smith@navy.mil.

Sincerely,

L. M. FOSTER
By direction

Encl: 1. Hawaii-Southern California Training and Testing Consistency Determination

Copy to: Chief of Naval Operations (N454) (w/o enclosure)
Commander, Navy Region Southwest (N40) (w/o enclosure)
John Nakagawa, Hawaii Department of Business, Economic Development & Tourism, Office of Planning (w/enclosures)

2

STATE OF CALIFORNIA—NATURAL RESOURCES AGENCY EDMUND G. BROWN, *GOVERNOR*

CALIFORNIA COASTAL COMMISSION
45 FREMONT STREET, SUITE 2000
SAN FRANCISCO, CA 94105-2219
VOICE AND TDD (415) 904-5200

March 14, 2013

L.M. Foster
Department of the Navy
Commander
United States Pacific Fleet
250 Makalapa Drive
Pearl Harbor, HI 96860-3131

Attn: Alexander Stone

Re: **CD-008-13,** Department of the Navy, Consistency Determination, Southern California portion of the Hawaii-Southern California Training and Testing (HSTT) Program

Dear L.M. Foster:

On March 8, 2013, by a unanimous vote, the California Coastal Commission objected to the above-referenced consistency determination submitted by the Navy for the California portion of its Hawaii-Southern California Training and Testing Program (Program). The Commission's objection was based on lack of sufficient information to determine the Program's consistency to the maximum extent practicable with the marine resource protection policy (Section 30230) and the commercial fishing policies (Sections 30230, 30234, and 30234.5) of the California Coastal Act, all of which are enforceable policies under the California Coastal Management Program (CCMP).

In its deliberations the Commission determined that the consistency determination lacked sufficient information to enable it to determine consistency with the marine resource policy (Section 30230) for the following reasons:

1) The Navy's analysis relied on an incomplete analysis of the requirements of Section 30230, in that it only looked at one of the three tests (population-level effects), ignoring requirements of Section 30230 for the maintenance, enhancement, and, where feasible, restoration, of the overall marine environment, as well as for providing special protection for areas and species of special biological or economic significance.

2) The Navy arbitrarily limited its analysis to only 10 of the 34 marine mammals present in the southern California study area, when the preponderance of the evidence is that 32 of the 34 species are present in the coastal zone.

-2-

3) Even the Navy's population level effects analysis was questionable, as it was not supported by substantial evidence. Moreover, it did not include the type of analysis typically supplied in current-day marine mammal population analyses to estimate whether a proposed activity could result in marine mammal stocks falling below their optimal sustainable population levels, which was included in the analysis the Commission relied on in its recent review of the Pacific Gas and Electric Company's high energy seismic survey, and which compared "Level A takes" (under the Marine Mammal Protection Act) against residual "Potential Biological Removal" rates, and "Level B takes" for listed species against minimum population estimates.

4) The Navy provided no explanation as to why significant intensification of use of mid-frequency sonar was needed for military training and testing (e.g., an increase in "MF-1" sonar use (the loudest of the sonars) from 4,454 to 11,534 hours per year).

5) The Navy failed to analyze and consider alternatives such as implementing "time-area" closures, as well as other mitigation measures previously adopted by the Commission in reviewing past Navy consistency determinations for Southern California Training and Testing (CD-086-06 and CD-049-08), measures which the Commission staff requested the Navy to analyze in its July 10, 2012, comments on the HSTT DEIS.

The Commission determined that, without the above information, it was unable to determine whether feasible less damaging alternatives are available that would lessen adverse effects on marine resources, and whether the Program would be carried out: (a) in a manner that maintains, enhances, and, where feasible, restores marine resources; and (b) in a manner that provides special protection to areas of special biological or economic significance.

The Commission also:

1) noted that the Navy's refusal to consider avoiding state- and federally-designated Marine Protected Areas (MPAs) would undermine significant state and federal efforts establishing Marine Protected Areas, by potentially compromising the collection of accurate MPA baseline studies;

2) determined that the consistency determination lacked sufficient information to enable the Commission to determine consistency with the commercial fishing policies (Sections 30230, 30234, and 30234.5) of the Coastal Act, in the Navy's refusal to consider implementing its own 2009 commercial fishing survey recommendations to improve communications with the commercial fishing industry;

3) noted that the Navy had not raised any "practicability" issues in its consistency determination or its testimony before the Commission; and

4) noted and included in the record the attached letter from former NOAA Administrator Jane Lubchenco (sent to Council on Environmental Quality Chair Nancy Sutley) urging consideration of "time-area closures" and "new approaches" by the Navy.

Finally, the Commission urged the Navy to provide the above-requested information and bring back a modified consistency determination for the Program, with a more comprehensive analysis and consideration of alternatives, at a future Commission meeting.

We anticipate the Commission's formal findings in support of its action to be adopted at the April 10-12, 2013, Commission meeting in Santa Barbara.

The federal consistency regulations provide:

§ 930.43 State agency objection.

(b) If the State agency's objection is based upon a finding that the Federal agency has failed to supply sufficient information, the State agency's response must describe the nature of the information requested and the necessity of having such information to determine the consistency of the Federal agency activity with the enforceable policies of the management program.

(c) State agencies shall send to the Director a copy of objections to Federal agency consistency determinations.

(d) In the event of an objection, Federal and State agencies should use the remaining portion of the 90-day notice period (see § 930.36(b)) to attempt to resolve their differences. If resolution has not been reached at the end of the 90-day period, Federal agencies should consider using the dispute resolution mechanisms of this part and postponing final federal action until the problems have been resolved. At the end of the 90-day period the Federal agency shall not proceed with the activity over a State agency's objection unless:

(1) the Federal agency has concluded that under the "consistent to the maximum extent practicable" standard described in section 930.32 consistency with the enforceable policies of the management program is prohibited by existing law applicable to the Federal agency and the Federal agency has clearly described, in writing, to the State agency the legal impediments to full consistency (See §§ 930.32(a) and 930.39(a)), or

(2) the Federal agency has concluded that its proposed action is fully consistent with the enforceable policies of the management program, though the State agency objects.

(e) If a Federal agency decides to proceed with a Federal agency activity that is objected to by a State agency, or to follow an alternative suggested by the State agency, the Federal agency shall notify the State agency of its decision to proceed before the project commences.

-4-

If you have any questions, please feel free to call me at (415) 904-5289.

Sincerely,

MARK DELAPLAINE
Manager, Energy, Ocean Resources,
and Federal Consistency Division

Attachment - NOAA Administrator Letter

cc: Office of Ocean and Coastal Resource Management
(Margaret Davidson, Acting Director, David Kaiser, Kerry Kehoe)
NOAA Fisheries (Michelle Magliocca)
Hawaii Coastal Management Program (John Nakagawa)
Acting Under Secretary of Commerce for Oceans and Atmosphere and Acting NOAA Administrator (Dr. Kathryn Sullivan)

UNITED STATES DEPARTMENT OF COMMERCE
The Under Secretary of Commerce
for Oceans and Atmosphere
Washington, D.C. 20230

JAN 19 2010

Ms. Nancy Sutley
Chair, Council on Environmental Quality
730 Jackson Place, NW
Washington, DC 20503

Dear Nancy,

I write to report to you on the National Oceanic and Atmospheric Administration's (NOAA) review of mitigation measures in rules authorizing take of marine mammals incidental to Navy training exercises, and to inform you of the plan with respect to future work with the Navy on possible additional mitigation measures.

As you recall, on January 20, 2009, as the Obama Administration was taking office, NOAA's National Marine Fisheries Service (NMFS) was in the process of publishing a regulation that would establish a framework to authorize the take of marine mammals incidental to the Navy training exercises involving use of mid-frequency active sonar on its ranges along the Atlantic Coast and in the Gulf of Mexico. Earlier in January, NMFS had published similar rules related to the take of marine mammals incidental to Navy training on Navy training ranges in Hawaii and Southern California. This issue has a history of being controversial, and you requested that NOAA conduct a comprehensive review of all mitigation measures applicable to the use of sonar.

NMFS intended the comprehensive review to give the new Administration an opportunity to understand the process used to develop the rules, and also to evaluate the adequacy of the mitigation measures required by the rule. Each rule took months to develop jointly by the Navy and NOAA scientists, with input from the public during a comment process on the proposed rules. For each rule, an Environmental Impact Statement (EIS) was prepared by the Navy and adopted by NOAA regarding Navy training exercises. In addition to the EISs, for each rule, NMFS prepared an Environmental Assessment in which it specifically considered a suite of mitigation measures, many of which had been recommended by members of the public during the public comment process. In those assessments, NMFS evaluated the potential effectiveness and benefit of each possible mitigation measure. Also, as required by the Marine Mammal Protection Act, NMFS reviewed the practicability of each of the mitigation measures in light of the impact on personnel safety, the practicality of implementation, and the impacts on the Navy's ability to achieve its training goals.

In the Environmental Assessments, NMFS also identified the relevant uncertainties regarding the impacts of the proposed training on marine mammals. Two are worth highlighting. One involves lack of knowledge about the mechanisms whereby some species of marine mammals, particularly beaked whales, are adversely affected by mid-frequency active sonar. The other concerns the difficulties of limiting the impact of active sonar where the mitigation efforts depend on visual sighting of whales. The ongoing mitigation efforts, in our view, must do more

THE ADMINISTRATOR

Printed on Recycled Paper

to address both of these uncertainties. NMFS included adaptive management provisions in the rules as a mechanism for improving the effectiveness of mitigation, as appropriate. NMFS also required the Navy to provide after-action reports following each exercise, which NMFS will monitor and use to modify mitigation measures, as appropriate. Thus, there are some mechanisms already in place to improve mitigation measures in the long run as new information becomes available.

In the short run, as a result of our findings in this review, NOAA will undertake three specific activities to address the issue of whether there are areas of biological significance impacted by these permitted activities and others undertaken under permits from NMFS (such as oil and gas exploration). First, NMFS, in concert with other civilian agencies (e.g., Minerals Management Service), would like to reinitiate comprehensive aerial cetacean and sea turtle surveys (i.e., multipurpose surveys). I will encourage the Navy to be part of the planning process for these new surveys, and to support their implementation. These surveys will provide not only fine-scale density estimates of whales in particularly sensitive or otherwise important areas (e.g., the ranges), but also provide improved population estimates supporting listing decisions and activities of take reduction teams.

Second, NMFS will conduct a workshop to develop a plan for estimating a comprehensive sound budget for the oceans. We will invite the Navy and other agencies to take part. There is currently a great deal of concern that a variety of human sources of marine sound (e.g., vessel traffic, seismic activity, sonar, and construction activities) are acting in a cumulative way to degrade the environment in which sound-sensitive animals communicate. There are no comprehensive baselines with which to measure the cumulative sound impacts such as increased military vessel traffic and emitted sound, e.g., in the ranges.

Third, NMFS will organize another workshop this year to learn more about marine mammal "hot spots." The Navy and NMFS have made substantial investments in models of existing whale distribution and environmental data to predict abundance and distribution of whales and other mammals in specific locations. As part of this focus, the workshop will evaluate these models, developed primarily for the Northwest Atlantic and the California Current and eastern tropical Pacific, and assess their general applicability. Such models, if verified, have great potential to assist in the design of appropriate mitigation measures that are effective and efficient. Protecting important marine mammal habitat is generally recognized to be the most effective mitigation measure currently available.

In addition, there are ongoing activities that NMFS will be conducting with the Navy because they are required by the permits that have been issued. For example, NMFS has required that the Navy convene a workshop to review and modify, as appropriate, the monitoring measures included in the regulations. This workshop is scheduled for 2011 to give agencies time to gain experience with the rules, to collect information for analysis at the workshop, and to identify any needed changes to improve the monitoring program. NMFS and the Navy have agreed to conduct a pre-workshop in 2010 to allow the public an opportunity to provide input and prepare for the 2011 workshop.

All of the planned workshops should lead to substantial new information related to improved mitigation strategies for military activities that would be implemented through the adaptive management provisions of the permits. Based on the information developed in these workshops, I will encourage NMFS and the Navy and other permittees to address the uncertainties identified above and to evaluate additional methods to reduce further any adverse effects on marine mammals resulting from the Navy's training exercises or other activities that may impact marine mammals or other protected resources.

In addition, NMFS included in various final rules, a requirement that the Navy develop an integrated comprehensive monitoring program, which it recently completed and will go into effect immediately. Any changes to the monitoring program will be made during workshops with NMFS and Navy. NMFS will also continue to work with the Navy to develop and implement new tools to characterize and predict areas that are important to marine mammals in the context of developing associated measures, as appropriate, to reduce impacts to marine mammals in these important areas while allowing the Navy to meet its training goals. In several rules, NMFS required the Navy to enter into a Memorandum of Agreement requiring the Navy to assist NMFS with investigations of strandings of marine mammals. NMFS is working with the Navy to complete this Agreement as soon as possible. NMFS will recommend that the Navy further focus on, develop, and implement technologies that enhance marine mammal detection capabilities (such as passive acoustic detection on instrumented ranges) to allow for both a better understanding of marine mammal activities in the presence of military training as well as, potentially, more effective implementation of mitigation measures.

Moreover, consistent with our legal and scientific mandates, I have directed NMFS to ensure thorough reviews of the Navy's after-action reports are conducted to identify opportunities for strengthening mitigation measures; to process and integrate new information from population assessments, interagency biological response studies, and other sources into its decision making framework; and to take advantage of the adaptive mechanisms in the regulations and annual authorizations to optimize the mitigation measures that are in place for protection of marine mammal species or stocks.

Finally, as part of a settlement agreement in litigation regarding the effects of sonar training on marine mammals, the Navy and the Natural Resources Defense Council (NRDC) have begun to meet and confer to resolve outstanding differences concerning marine mammal mitigation measures. NOAA participated in the first discussion, and is committed to playing an active role in future meetings. I have met with both the Navy and NRDC over the past several months, and I have developed an understanding of the issues and of their respective positions. I believe NOAA's participation will enhance these discussions, and can help to resolve the differing views among the parties. My expectation is that the parties will identify areas of scientific disagreement and uncertainty, and will engage in a healthy debate concerning how to ensure the Navy's training activities minimize, to the least practicable impact, adverse effects on marine mammal species or stocks. I also expect the Navy to be open to new ideas and approaches to mitigation that are supported by the best available science.

At this point, NOAA's review has concluded, but our work on these issues will continue. In addition to the actions outlined above, NMFS will continue to work with the Navy, and in the event specific problems are identified, NMFS will aggressively seek appropriate solutions.

Sincerely,

Jane Lubchenco, Ph.D.
Under Secretary of Commerce
for Oceans and Atmosphere

DEPARTMENT OF THE NAVY
COMMANDER
UNITED STATES PACIFIC FLEET
250 MAKALAPA DRIVE
PEARL HARBOR, HAWAII 96860-3131

IN REPLY REFER TO:
5090
Ser N01CE1/0390
March 26, 2013

Mr. Mark Delaplaine
Manager, Energy, Ocean Resources, and Federal Consistency Division
California Coastal Commission
45 Fremont Street, Suite 2000
San Francisco, California 94105-2219

Dear Mr. Delaplaine:

SUBJECT: HAWAII-SOCAL TESTING AND TRAINING (HSTT) CONSISTENCY DETERMINATION

This letter provides the Navy's response to your letter of March 14, 2013, notifying the Navy of the decision by the California Coastal Commission on March 8, 2013 regarding the Navy's HSTT activities Consistency Determination (CD), CD-008-13.

The decision made by the Commission was to object to the Navy's CD based on a lack of sufficient information. The letter contains five areas where the Commission believes that the CD is lacking in sufficient information. It also addresses other issues noted by the Commission and requests the Navy to return with an updated CD.

The Navy believes that CD-008-13 provides sufficient information to support the Commission's determination as detailed below. The Navy's CD was prepared in accordance with, and meets all the requirements of 15 C.F.R. §930.39. In addition, throughout the HSTT project, the Navy has coordinated with the Commission staff extensively and has provided, or made available, various associated HSTT environmental analysis documents such as: the Draft Environmental Impact Statement (DEIS), Marine Mammal Protection Act (MMPA) Letter of Authorization (LOA) application, and National Marine Fisheries Service (NMFS) proposed rule.

All of these documents, consistent with the analysis in the CD, provide detailed analysis and information regarding the Navy activities. Furthermore, during the time between the submission of the Navy's CD in January 2013 and the hearing, our staff worked closely with the Commission staff by answering questions and providing requested supplemental information.

SUBJECT: CONSISTENCY DETERMINATION (CD-008-13) ADDITIONAL INFORMATION

While the Navy disagrees with the Commission's decision that the CD lacks in sufficient information, we value our relationship with the Commission and fully support using the remainder of the 90-day notice period to attempt to resolve our differences.

To facilitate this process we provide additional information in enclosure (1) that addresses the issues raised by the Commission in your letter. We believe this information will foster further discussions which we are hopeful can lead to resolving our differences. The Navy views its relationship with the State of California as essential to meeting its national security mandate and looks forward to continuing our professional relationship with the Commission and your Staff.

S. A. WEIKERT
Fleet Civil Engineer

Enclosure: Consistency Determination (CD-008-13) Additional Information

Copy to:
Chief of Naval Operations (N45)
Commander, Navy Region Southwest (N00, N40)
Commander, Third Fleet (N7)

2

SUBJECT: CONSISTENCY DETERMINATION (CD-008-13) ADDITIONAL INFORMATION

1) The Navy's analysis relied on an incomplete analysis of the requirements of Section 30230, in that it only looked at one of the three tests (population-level effects), ignoring requirements of Section 30230 for the maintenance, enhancement, and, where feasible, restoration, of the overall marine environment, as well as for providing special protection for areas and species of special biological or economic significance.

NAVY RESPONSE: The Navy's analysis properly accounts for all aspects of the California Coastal Act's marine resource policy found in Section 30230. Section 30230 provides:

> Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.

The Navy does not interpret this policy as containing three separate tests with which a federal entity must comply. The Navy interprets the first sentence of Section 30230 as providing the general purpose driving the marine resource policy. While the Navy's section 30230 analysis focuses on population-level effects and sustaining biological productivity, the analysis also addresses special protection for areas and species of special biological or economic significance. Specifically, the Navy has an extensive suite of event-specific mitigation measures described in detail in the CD that provide protection for all areas and all marine mammals. In addition, the CD analysis contains a detailed description of the Navy's process for considering geographic mitigation measures and the rationale that those measures were not carried forward. Because the Navy's action sustains biological productivity and healthy populations of all species of marine organisms and provides necessary special protections, the general policy of maintaining, enhancing and where feasible, restoring, is also met.

Enclosure (1)

SUBJECT: CONSISTENCY DETERMINATION (CD-008-13) ADDITIONAL INFORMATION

2) The Navy arbitrarily limited its analysis to only 10 of the 34 marine mammals present in the southern California study area, when the preponderance of the evidence is that 32 of the 34 species are present in the coastal zone.

NAVY RESPONSE: The analysis in the CD addresses those species the Navy considers coastal resources subject to federal consistency review. Coastal resources are those found in a state's coastal zone on a regular or cyclical basis. The species not addressed in the CD are either not regularly or cyclically found in the coastal zone or do not rely on coastal zone habitat. However, the Navy's associated EIS and the NMFS proposed rule fully address all marine mammals.

The determination on which species were included in the CD was based on a review of NMFS stock assessment reports, scientific literature, results from five years of Navy funded research and compliance monitoring within the SOCAL Range Complex (over $6M and 75,000 miles surveyed), and personal communication with NMFS Southwest Fisheries scientists as well as other non-government marine experts.

While acknowledging there can be scientific uncertainty and even differences in opinion as to movement patterns for some marine mammal species, the Navy's assessment factored in that degree of uncertainty in specifying the list of coastal zone species for inclusion in the CD. The Navy considered and included those species with a known, documented potential for coastal occurrence in terms of foraging and long-term occupancy. Conversely, the CD did not include species having a scientifically documented habitat beyond any reasonable coastal zone consideration (e.g., beaked whales), or infrequent occurrence mostly offshore within the SOCAL Range Complex portion of California (e.g., killer whales). The HSTT DEIS, LOA application, and NMFS proposed rule contain life history information and a full impact analysis and assessment for all marine mammal species thought to occur within the study area.

3) Even the Navy's population level effects analysis was questionable, as it was not supported by substantial evidence. Moreover, it did not include the type of analysis typically supplied in current-day marine mammal population analyses to estimate whether a proposed activity could result in marine mammal stocks falling below their optimal sustainable population levels, which was included in the analysis the Commission relied

2

SUBJECT: CONSISTENCY DETERMINATION (CD-008-13) ADDITIONAL INFORMATION

on in its recent review of the Pacific Gas and Electric Company's high energy seismic survey, and which compared "Level A takes" (under the Marine Mammal Protection Act) against residual "Potential Biological Removal" rates, and "Level B takes" for listed species against minimum population estimates.

NAVY RESPONSE: The analysis in the CD and associated DEIS use the best available analysis methodology for assessing impacts on marine mammals developed in cooperation with NMFS, the federal agency with expertise and jurisdiction for marine mammals. In the proposed rule, NMFS found, regarding the analysis in the Navy's HSTT documents, that: "Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat and dependent upon the implementation of the mitigation and monitoring measures, NMFS preliminarily finds that the total taking from Navy training and testing exercises in the HSTT Study Area will have a negligible impact on the affected species or stocks. NMFS has proposed regulations for these exercises that prescribe the means of effecting the least practicable adverse impact on marine mammals and their habitat and set forth requirements pertaining to the monitoring and reporting of that taking."

4) The Navy provided no explanation as to why significant intensification of use of mid-frequency sonar was needed for military training and testing (e.g., an increase in "MF-1" sonar use (the loudest of the sonars) from 4,454 to 11,534 hours per year).

NAVY RESPONSE: Section 2.2 of the CD as well as Chapters 1 and 2 of the Navy's DEIS fully document the purpose and need for the proposed activities. The Navy also spoke about the additional requirements at the Commission hearing, explaining that the HSTT document addresses the 2014-2019 Navy requirements, which include flexibility for years during which there may be a significant surge in training based on real-world Navy deployment requirements.

Also, HSTT covers significantly more sources than prior documents, includes more areas, and adds research, development and testing activities. Previous documents only focused on training activities.

3

SUBJECT: CONSISTENCY DETERMINATION (CD-008-13) ADDITIONAL INFORMATION

Finally, anti-submarine warfare continues to be a training priority for the Navy, and with the Navy and U.S. military's increasing focus on the Asia-Pacific region, the waters off Southern California will remain the focus of such training and testing.

5) The Navy failed to analyze and consider alternatives such as implementing "timearea" closures, as well as other mitigation measures previously adopted by the Commission in reviewing past Navy consistency determinations for Southern California Training and Testing (CD-086-06 and CD-049-08), measures which the Commission staff requested the Navy to analyze in its July 10, 2012, comments on the HSTT DEIS.

NAVY RESPONSE: The Navy fully considered spatial and temporal based mitigation measures, as well as all the Commission's previously adopted mitigation measures. Please see the Appendix C of CD 008-13 for further discussion where the Navy details the process used in developing and considering mitigation measures as well as the rationale for why candidate measures, after careful consideration, were eliminated.

The analysis within Navy's CD 008-13 addresses all mitigation measures identified as conditions by the Commission in prior CDs (CD-86-06 and CD049-08). As demonstrated by that analysis, the Navy's decision to eliminate measures is based on a finding that the measures either lacked a scientific basis for reducing impacts or had too great an impact on Navy training and testing. The analysis is particularly relevant to the Commission's proposed geographic restrictions. In addition, as the Navy described at the Commission hearing, the geographic areas addressed within the CD are the same areas the Navy has conducted sonar and explosive testing and training for decades without any significant impacts to the marine environment.

Finally, as stated at the hearing, the Navy's proposed mitigation measures are effective and appropriate for avoiding and minimizing impacts for all areas in the HSTT study area.

OTHER ITEMS NOTED BY THE COMMISSION

The Commission noted the Navy's refusal to avoid state and Federal MPAs. The establishment of all of the MPAs in the study area

4

SUBJECT: CONSISTENCY DETERMINATION (CD-008-13) ADDITIONAL INFORMATION

included recognition of the Navy ongoing activities within those MPAs, and a finding that those activities are compatible with the MPAs. For the State MPAs, from California Title 14, Section 632 states: "Nothing in this section expressly or implicitly precludes, restricts or requires modification of current or future uses of the waters identified as marine protected areas, special closures, or the lands or waters adjacent to these designated areas by the Department of Defense, its allies or agents." For the Channel Islands National Marine Sanctuary, the sanctuary's regulation, EIS, and Management Plan, all include and recognize the need for Navy to conduct its continuing training and testing activities in sanctuary waters.

The Commission noted a lack of sufficient information on fishing because the Navy has not implemented all the recommendations from a study conducted by the Navy in 2009. In that study, the Navy conducted interviews with members of the fishing community who made a number of recommendations. Since that time the Navy has addressed most all the recommendations and overall has significantly improved communication with the fishing community mostly through a significantly improved real-time website. Also, the Navy has established new safety zones around San Clemente Island that further reduce impacts on fishing access. The remaining recommendations, such as new cell towers, have largely been overcome by the improved website and communications, but are still being considered as part of the Navy's long-standing relationship with the fishing community. The Navy does not agree that this constitutes a lack of sufficient information.

5

DEPARTMENT OF THE NAVY
COMMANDER
UNITED STATES PACIFIC FLEET
250 MAKALAPA DRIVE
PEARL HARBOR, HAWAII 96860-3131

IN REPLY REFER TO:
5090
Ser N01CE1/0198
February 12, 2013

Mr. Gerry Davis
Habitat Conservation Division
National Marine Fisheries Service, Pacific Islands Regional Office
1601 Kapiolani Boulevard, Suite 1110
Honolulu, Hawaii 96814-4700

Subj: ESSENTIAL FISH HABITAT (EFH) ASSESSMENT FOR THE HAWAII-SOUTHERN CALIFORNIA TRAIING AND TESTING (HSTT)

Dear Mr. Davis:

In accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the U.S. Navy has prepared the EFH Assessment for the HSTT activities conducted in the Pacific Ocean within the Southern California Range Complex, Silver Strand Training Complex, Hawaii Range Complex and a transit corridor on the high seas. The U.S. Navy's assessment concludes that EFH within the HSTT Study Area may be adversely affected by training and testing activities and requests initiation of the MSA's EFH consultation process.

Additional information on HSTT may be found at the project website, including the EFH Assessment and the Draft Environmental Impact Statement /Overseas Environmental Impact Statement prepared by the U.S. Navy to analyze potential environmental impacts that could result from activities under the Proposed Action. The website is located at: http://hstteis.com. The U.S. Navy's preferred alternative in the Draft EIS and analyzed in the EFH Assessment is Alternative 2.

We appreciate your continued support in helping the U.S. Navy to meet its environmental responsibilities. Please note that due to the large HSTT Study Area, a similar letter is concurrently being sent to the National Marine Fisheries Service's Southwest Regional Office, Habitat Conservation Division.

Our point of contact for the HSTT EFH Assessment is Ms. Julie Rivers, at 808-474-6391 or julie.rivers@navy.mil.

Sincerely,

L. M. FOSTER
By direction

Enclosures: 1. EFH Assessment for HSTT (CD-ROM)

Copy to: (w/o encl)
Dr. Kelly Ebert, Chief of Naval Operations (N454)
Ms. Michelle Magliocca, NMFS Office of Protected Resources
NMFS Southwest Regional Office

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Pacific Islands Regional Office
1601 Kapiolani Blvd., Suite 1110
Honolulu, Hawaii 96814-4700
(808) 944-2200 • Fax: (808) 973-2941

L.M. Foster
U.S. Pacific Fleet
250 Makalapa Drive
Pearl Harbor, Hawaii 96860-3131

April 8, 2013

Dear Mr. Foster:

The Habitat Conservation Division of the NOAA Fisheries Service Pacific Islands Regional Office (NMFS PIRO) has reviewed the February 12, 2013 U.S. Department of the Navy's (Navy) Hawaii-Southern California Training and Testing (HSTT) Essential Fish Habitat (EFH) Assessment (5090 Ser N01CE1/0198). We appreciate the opportunity to offer the following comments pursuant to the EFH provision (§305(b)) of the Magnuson Stevens Fishery Conservation and Management Act (MSA;16 U.S.C. 1855(b)).

The proposed action is to conduct a variety of military training activities throughout the HSST study area, which includes the existing Navy Hawaii Range Complex (HRC), Southern California (SOCAL) Range Complex, Silver Strand Training Complex (SSTC), also Navy pierside locations outside of the range complexes, and transit corridors between Hawaii and California on the high seas. The proposed activities for these in-water areas include the detonation of underwater explosives, weapons firing, the use of active sonar, acoustics and electromagnetic devices, pile driving, deployment of seafloor devices and other in-water devices (e.g., remotely operated vehicles), vessel movement, and ship to shore transport of personnel, equipment and supplies. Sonar maintenance and gunnery exercises may also be conducted concurrently with ship transits that may occur outside the geographic boundaries of Navy range complexes.

NMFS PIRO has focused on evaluating the proposed activities as relevant to the HRC as the NMFS South West Regional Office has reviewed and commented on the activities occurring within the SOCAL Range Complex and SSTC. The HRC geographically encompasses an approximately 1200 nautical miles (nm) by 1600 nm ocean area bounded by 16 degrees (°) North to 43° North latitude and from 150° West longitude to the International Date Line. A subset of the water column (surface down to 1000 m depth from shore out to the outer Exclusive Economic Zone 200 mile boundary) and seafloor (shoreline down to 400m depth) within the HRC around the Hawaiians Islands chain has been designated as Essential Fish Habitat (EFH) and may support various life stages for the management unit species (MUS) identified under the Western Pacific Regional Fishery Management Council's Pelagic and Hawaii Archipelago Fishery Ecosystem Plans (FEPs). The MUS and life stages found within the area include: eggs, larvae, juveniles and adults of Coral Reef Ecosystem MUS (CRE-MUS); eggs, larvae, juveniles and adults of Bottomfish MUS (BMUS); eggs, larvae, juveniles and adults of Crustacean MUS

(CMUS); eggs, larvae, juveniles and adults of Precious Coral MUS (PCMUS); and juveniles and adults of Pelagic MUS (PMUS).

The proposed action would adversely affect EFH as a result of acoustic stressors (e.g., sonar, explosives, pile driving), electromagnetic devices, direct physical disturbance (e.g., vessels, seafloor devices, expended materials, pile driving), and contaminants (explosives and byproducts, metals, other chemicals and materials). Impacts associated with these activities would range in intensity and extent and would include increased turbidity, potential habitat loss or conversion, modifications in fish behavior, and physical injury or mortality. The duration of these impacts would be expected to range over spatial scales from temporary to permanent.

NMFS PIRO is concerned about the land-based portions of the HRC having been excluded from analysis within the EFH Assessment. Without an understanding of these connected land based activities, we are unable to evaluate the effect of these activities on EFH, and hence unable to provide conservation recommendations for these activities as required. We are also concerned that Navy's definition of impact as presented on page 4-2 of the EFH assessment may not appropriately capture what we consider to be adverse effects to EFH. For example, a "stressor" duration of a few hours, days or weeks can result in adverse effect to EFH that is more than temporary or minimal in nature. Navy has also determined throughout the document that adverse effect to EFH will be minimal due to calculation that the impact area from an individual stressor only represents a small proportion of the entire range complex/es. For example on p. 4-21 the Navy's calculated impact area from bottom detonations in HRC is 23,2388 square meters. This area may represent a small proportion of the entire HSST, but may on a local scale be considered a substantial adverse effect to EFH if it involves impact to coral reef or CREMUS EFH. We are also concerned that there will be unavoidable impacts from all the activities over time, which the EFH assessment does not address.

In taking into consideration the range of activities in HRC, the large local spatial scale of the project, and the potential for cumulative impacts, NMFS considers that the proposed activities in HRC may have more than minimal adverse effect to EFH. We recommend that the Navy avoid, minimize and offset adverse effect to EFH as per following:

1) Evaluate the impacts to EFH from the land-based portions of the HRC such as any activities occurring on the Pacific Missile Range Facility (PMRF), Naval Station Pearl Harbor, Marine Corp Base Hawaii (MCBH), and Marine Corps Training Area- Bellows, and work together with NMFS to implement measures to mitigate any identified adverse effects to EFH.

2) Avoid, to the greatest extent practicable, conducting all training and testing activities in HRC for EFH that has been designated as a Habitat Area of Concern (HAPC) for CREMUS (e.g. Kaneohe Bay). Also avoid conducting activities that have impact to seafloor in areas designated as bottom EFH for PCMUS, and in HAPC for BMUS. Avoidance of these areas will eliminate risk of impact to these important habitats. (Please refer to the Western Pacific Regional Fishery Management Council's Hawaii Archipelago FEP for these EFH designations).

2

3) Increase the distance between activities resulting in acoustic non-impulsive stressors and importantly explosive impulsive stressors and coral reefs to greater than the currently proposed 0-320 yards (0-293 m). This will provide a greater protection/buffer zone around coral reefs hence minimize impact to these sensitive systems. Navy may wish to consider mirroring the distances proposed for the floating vegetation and kelp paddies in southern California for each of the stressors as listed on page 5-2.

4) Develop and implement a protocol for immediate clean-up of unexploded ordinance also for floating debris such as parachutes in areas designated as EFH for juvenile and adult life stages for CREMUS (all bottom around the Hawaiian Islands shallower than 100 m depth). Unexploded ordinance may cause direct impacts to EFH if triggered after use, and parachutes become marine debris that may move with currents, tides and waves and trap fish and abrade corals in their path.

5) Operate amphibious vessels such that they, in transitioning between land and sea, minimize turbidity and sedimentation and avoid abrasion impact to corals and dense seagrass beds present in and near operational paths at all locations including at the MCBH, Marine Corps Training Area- Bellows, and the Kawaihae Pier.

6) Ensure that any expected also unexpected unavoidable adverse effects to EFH be identified, and fully offset. For example, if damage to coral reef resources occurs from unexploded ordinance being blown in place during removal, or from a vessel grounding on top of a reef, the lost coral reef resources should be replaced. NMFS PIRO can offer guidance and technical assistance where needed and wherever possible to help Navy during this process.

We appreciate the opportunity to comment on this HSTT project and wish to continue engaging and working with the Navy where needed to support this important mission, while ensuring the appropriate level of protection of NOAA trust resources. If you have any questions regarding this determination, contact Danielle Jayewardene at 808 944-2162 (danielle.jayewardene@noaa.gov).

Sincerely,

Gerry Davis
Assistant Regional Administrator
Habitat Conservation Division

3

DEPARTMENT OF THE NAVY
COMMANDER
UNITED STATES PACIFIC FLEET
250 MAKALAPA DRIVE
PEARL HARBOR, HAWAII 96860-3131

IN REPLY REFER TO:
5090
Ser N01CE1/0481
17 Apr 2013

Mr. Gerry Davis
Habitat Conservation Division
National Marine Fisheries Service,
Pacific Islands Regional Office
1601 Kapiolani Boulevard, Suite 1110
Honolulu, HI 96814-4700

Dear Mr. Davis:

SUBJECT: ESSENTIAL FISH HABITAT (EFH) ASSESSMENT FOR THE HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT) STUDY AREA

Thank you for the comments you provided in your letter dated April, 8 2013. Your letter correctly acknowledges that the scope of the HSTT Proposed Action is limited to the Navy's various in-water training and testing activities throughout the HSTT Study Area. You also indicated that because land-based activities are not included in the analysis in the EFH assessment, that you are unable to provide conservation recommendations pursuant to Section 305(b).

Although HSTT analysis is limited to in-water activities, land-based activities and associated mitigation measures have been previously analyzed and evaluated by the Navy and NMFS PIRO as part of the Hawaii Range Complex (HRC) EIS. The Navy did not re-analyze the land portions of the HRC because land-based activities will not be altered by the HSTT Proposed Action. Likewise, ballistic missile defense activities at the Pacific Missile Range Facility (PMRF) were not re-analyzed.

For reference, please see NMFS PIRO letter dated April 7, 2008, in which NMFS concluded that if the proposed mitigation measures are implemented, "[n]o further conservation recommendations are necessary at this time."

Notwithstanding the conclusion that you cannot offer conservation recommendations, I would like to address the enumerated comments/recommendations provided in your letter.

Recommendations 1 and 5 relate to evaluation of land-based activities at various locations in Hawaii and the development of mitigation measures for certain activities that transition from sea to land, such as amphibious landings. As noted above, these activities have been thoroughly analyzed and evaluated by the Navy and NMFS and

SUBJECT: ESSENTIAL FISH HABITAT (EFH) ASSESSMENT FOR THE HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT) STUDY AREA

mitigation measures have been put in place to minimize or avoid any adverse impacts to EFH. For example, amphibious landings are restricted to specific areas of designated beaches through mapped sandy beaches at PMRF, Marine Corp Base Hawaii and Marine Corp Training Area Bellows, therefore avoiding areas of Habitat Area of Particular Concern (HAPC) and other EFH.

Recommendation 2 requests avoiding, to the greatest extent practicable, all training and testing activities in EFH that has been designated HAPC for Coral Reef Ecosystem Management Unit Species (MUS), as well as to avoid conducting activities that have impact to the seafloor in EFH for Precious Coral MUS and HAPC for Bottom Fish MUS. Although it is impracticable to avoid all designated areas for all activities, the Navy is in fact proposing to implement the following measures to avoid adverse impacts to EFH:

- The Navy avoids and minimizes impacts to coral by conducting underwater detonations primarily in locations where these activities have historically occurred, for example, Puuloa Underwater Range, Barbers Point Underwater Range, Lima Landing and Ewa Training Minefield;
- Most training and testing activities are conducted in open ocean areas away from sensitive EFH, HAPC, or special aquatic sites;
- The Navy will not conduct precision anchoring or explosive mine countermeasure and neutralization activities within 350 yd.(320 m)of surveyed shallow coral reefs, live hardbottom, artificial reefs, or shipwrecks (EFHA at Section 5.2; EIS at Chapter 5)

Recommendation 3 appears to request a greater activity buffer around coral reefs; however, a specific range is not specified. The recommendation does state that the current proposed buffer extends to 320 yds, which is incorrect. The current proposal includes a mitigation zone up to 350 yds (320 m), which the Navy believes is adequate to minimize any adverse impacts to coral reefs. The mitigation zone of 350 yd. (320 m) is based on the estimated maximum seafloor impact zone for explosives (EIS at Section 5.3.3.2.1.1, Shallow Coral Reefs, Hardbottom Habitat, Artificial Reefs, and Shipwrecks; Section 3.3, Marine Habitats). The mitigation zones for floating vegetation are specifically for marine mammal and turtle mitigations as indicators of the potential presence of marine mammals or sea turtles and do not have a scientific relevance to coral.

Finally, recommendations 4 and 6 appear to be related to emergency actions and accidents associated with unexploded ordnance which are outside the scope of this Proposed Action. An emergency real world

2

SUBJECT: ESSENTIAL FISH HABITAT (EFH) ASSESSMENT FOR THE HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT) STUDY AREA

operation is not considered a training or testing activity, and operating procedures are in place depending on the type of emergency. In developing an appropriate response for these types of incidents, the Navy considers numerous factors including safety of personnel and equipment, as well as, minimizing impacts to the environment.

To the extent that recommendation 4 refers to debris as a result of a training activity, the Navy will remove associated debris to the extent practicable. For example, wherever blanks/pyrotechnics or plastics for wrapping C4 charges are used, they are collected at the conclusion of the exercise when practicable. Some targets, torpedoes and other non-expendable materials are recovered to the extent practicable.

Furthermore, the majority of military training items would be expended in the open ocean, where substrates would primarily be clays and silts with few benthic invertebrates. Military expended material in the coastal portions of the Study Area would be limited to small-caliber projectiles, flares, and target fragments (EIS at Section 3.3, Marine Habitats; EFH at Section 4.1.3.4, Military Expended Materials).

We again thank you for your support of this critical project and appreciate your timely response. We also would like to reaffirm the Navy's commitment to working with your agency in support of our mutual goals. My point of contact for this matter is Ms. Julie Rivers (808) 474-6391, or e-mail: julie.rivers@navy.mil.

Sincerely,

L. M. FOSTER
Director, Environmental Readiness
By direction

Copy to:
Chief of Naval Operations (N454)

3

DEPARTMENT OF THE NAVY
COMMANDER
UNITED STATES PACIFIC FLEET
250 MAKALAPA DRIVE
PEARL HARBOR, HAWAII 96860-3131

IN REPLY REFER TO:
5090
Ser N01CE1/0199
February 12, 2013

Mr. Eric Chavez
Habitat Conservation Division
National Marine Fisheries Service, Southwest Regional Office
501 West Ocean Boulevard
Long Beach, California 90802-4213

Subj: ESSENTIAL FISH HABITAT (EFH) ASSESSMENT FOR THE HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT)

Dear Mr. Chavez:

In accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the U.S. Navy has prepared the EFH Assessment for the HSTT activities conducted in the Pacific Ocean within the Southern California Range Complex, Silver Strand Training Complex, Hawaii Range Complex and a transit corridor on the high seas. The U.S. Navy's assessment concludes that EFH within the HSTT Study Area may be adversely affected by training and testing activities and requests initiation of the MSA's EFH consultation process.

Additional information on HSTT may be found at the project website, including the EFH Assessment and the Draft Environmental Impact Statement/Overseas Environmental Impact Statement prepared by the U.S. Navy to analyze potential environmental impacts that could result from activities under the Proposed Action. The website is located at: http://hstteis.com. The U.S. Navy's preferred alternative in the Draft EIS and analyzed in the EFH Assessment is Alternative 2.

We appreciate your continued support in helping the U.S. Navy to meet its environmental responsibilities. Please note that due to the large HSTT Study Area, a similar letter is concurrently being sent to the National Marine Fisheries Service's Pacific Islands Regional Office, Habitat Conservation Division.

Our point of contact for the HSTT EFH Assessment is Mr. Alex Stone, at 619-545-8128 or alexander.stone@navy.mil.

Sincerely,

L. M. FOSTER
By direction

Enclosures: 1. EFH Assessment for HSTT (CD-ROM)

Copy to: (w/o encl)
Dr. Kelly Ebert, Chief of Naval Operations (N454)
Ms. Michelle Magliocca, NMFS Office of Protected Resources, NMFS Pacific Islands Regional Office

From: Eric Chavez - NOAA Federal
To: Stone, Alexander CIV COMPACFLT N01CE1AS
Cc: Johnson, Chip CIV COMPACFLT N01CE1CJ; Scott, Cory L CIV NAVFAC PAC, EV; Boerger, Christiana M CIV NAVFAC SW; Rivers, Julie A CIV COMPACFLT, N01CE1JR; Steve Edmondson - NOAA Federal; Christina Fahy - NOAA Federal; Monica DeAngelis - NOAA Federal; Michelle Magliocca - NOAA Federal; Danielle Jayewardene - NOAA Affiliate
Subject: Re: EFH Assessment for HSTT
Date: Wednesday, April 03, 2013 6:21:45

Alex,

NOAA's National Marine Fisheries Service (NMFS) has reviewed the U.S. Department of the Navy's (Navy) Hawaii-Southern California Training and Testing (HSTT) Essential Fish Habitat (EFH) Assessment and offers the following comments pursuant to section 305(b)(4)(A) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA).

The proposed project is to conduct a variety of military training activities throughout the in-water areas off the coast of Southern California, at Navy pierside locations, in the transit corridor between Hawaii and Southern California, and around the Hawaiian Islands. As agreed to previously with the Navy, NMFS Southwest Regional Office will focus this consultation primarily on those activities occurring within the Southern California region, including the Southern California (SOCAL) Range Complex Study Area and Silver Strand Training Complex (SSTC), and to some extent, the transit corridor. Situated between Dana Point and San Diego, the SOCAL Range Complex Study Area extends more than 600 nautical miles (nm) southwest into the Pacific Ocean and covers approximately 120,000 nm2 of sea space. The SSTC is an integrated set of training areas located on and adjacent to the Silver Strand, a narrow isthmus separating San Diego Bay from the Pacific Ocean. Although not part of any defined range complex, the transit corridor provides adequate air, sea, and undersea space to conduct training and some sonar maintenance and testing while en route between Southern California and Hawaii. Those activities that occur within the Hawaii Range Complex Study Area will be addressed in a separate EFH consultation between the Navy and NMFS Pacific Islands Regional Office. The proposed project includes the detonation of underwater explosives, weapons firing, the use of active sonar, acoustics and electromagnetic devices, pile driving, deployment of seafloor devices and other in-water devices (e.g., remotely operated vehicles), vessel movement, and ship to shore transport of personnel, equipment and supplies. Sonar maintenance and gunnery exercises may also be conducted concurrently with ship transits that may occur outside the geographic boundaries of Navy range complexes.

The proposed project occurs within EFH for various federally managed fish species within the Coastal Pelagic Species, Pacific Coast Groundfish, and Highly Migratory Species Fishery Management Plans (FMPs). In addition, the proposed project occurs within estuarine habitat and in the vicinity of seagrass (e.g., eelgrass, surfgrass), rocky reef, and kelp habitat, which have been identified as habitat areas of particular concern (HAPC) under the Pacific Coast Groundfish FMP. Designated HAPC are not afforded any additional regulatory protection under MSA; however, Federal projects with potential adverse impacts to HAPC will be more carefully scrutinized during the consultation process.

The proposed project would adversely affect EFH as a result of acoustic stressors (e.g., sonar, explosives, pile driving), electromagnetic devices, direct physical disturbance (e.g., vessels, seafloor devices, expended materials, pile driving), and contaminants (explosives and byproducts, metals, other chemicals and materials). Impacts associated with these activities would range substantially and would include increased turbidity, potential habitat loss or conversion, modifications in fish behavior, and physical injury or mortality. The duration of these impacts would also be expected to range from temporary to permanent. However, many of the activities associated with the HSTT project have been addressed through extensive coordination between NMFS and the Navy during previous EFH consultations for the SOCAL Range Complex and SSTC, and the assessment of impacts to EFH from those consultations is consolidated into this EFH Assessment. Based on information within the HSTT EFH Assessment and recent communications with Navy staff members, Alexander Stone and Chip Johnson, the Navy will implement conservation measures developed during those previous EFH consultations to avoid or minimize impacts to EFH from this project. For instance, the Navy performed benthic habitat mapping surveys throughout much of the SSTC as a result of that EFH consultation, and is also in the process of collecting similar benthic habitat data for the San Clemente Island region. Data collected from these surveys will be used by the Navy to avoid impacts to sensitive habitats (e.g., seagrass, understory algal communities, kelp, rocky reefs, sea fans or sea palms, etc.) to the greatest extent practicable when conducting underwater demolition exercises or other activities that may impact bottom habitat. The Navy has also agreed to use benthic habitat information collected during the EFH five-year review for Pacific Coast Groundfish, once it is provided by NMFS, to assist their efforts to avoid impacts to sensitive habitats. In addition, the detonation of any explosives larger than 0.033 pounds net explosive weight will occur outside of San Diego Bay in the nearshore environment over sandy bottom. During the SSTC EFH consultation, the Navy also agreed to provide general location data for underwater explosives, mitigate for 1.13 acres of eelgrass impacts using credits from their San Diego Bay mitigation bank, and implement protective measures to minimize impacts to California grunion (Leuresthes tenuis). Therefore, NMFS believes the proposed conservation measures are sufficient to avoid, minimize or offset impacts to EFH and has no additional EFH Conservation Recommendations to provide at this time. Thank you for consulting with NMFS.

Regards,
Eric

On Wed, Feb 13, 2013 at 4:07 PM, Stone, Alexander CIV COMPACFLT N01CE1AS <alexander.stone@navy.mil> wrote:
> Eric,
>
> Hi - hope all is well. We have completed the EFH Assessment associated with the Hawaii-SOCAL Testing and Training (HSTT) EIS. Attached is the transmittal letter submitting to NMFS. The hard copy of the letter and EFHA (with a CD-ROM) are coming to you in the mail. I'd email it, but it's too large of a file.
>
> As I think you know the EIS (and EFHA) address the in-water only testing and training we do in SOCAL and Hawaii. It consolidates the in-water activities from the SSTC and SOCAL EISs. It also adds some new area (transit lanes between SOCAL and Hawaii) and is more comprehensive in terms of acoustic and explosive sources. That said, in general the activities are the same as SSTC and SOCAL. The real driver behind the EIS is the need for new MMPA authorization as the five-year permits we have will be expiring.
>
> We look forward to working with you on this consultation. Chip Johnson and I are the primary pocs but we will also involve other Navy SMEs. Also, we are submitting this EFHA also to the Hawaii NMFS office for EFH under their jurisdiction.
>
> V/r,
> Alex Stone
> PACFLT Environmental Readiness

--
Eric Chavez
Habitat Conservation Division
NOAA's National Marine Fisheries Service

DEPARTMENT OF THE NAVY
COMMANDER
UNITED STATES PACIFIC FLEET
250 MAKALAPA DRIVE
PEARL HARBOR, HAWAII 96860-3131

IN REPLY REFER TO:
5090
Ser N01CE1/0621
3 May 12

Mr. William Aila Jr.
Hawaii State Historic Preservation Officer
Department of Land and Natural Resources
State Historic Preservation Division
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, HI 96707

Dear Mr. Aila Jr.:

In accordance with implementation of regulations for Section 106 of the National Historic Preservation Act, the subject project has been evaluated and determined to be an undertaking as defined in 36 CFR 800.16(y).

Project Description

The Hawaii-Southern California Training and Testing (HSTT) Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) Proposed Action encompasses the ocean areas located around the Hawaiian Islands; however, activities would be mainly restricted to the Hawaii Operating Area (OPAREA), see enclosures (1 and 2). Activities specific to the Proposed Action include gunnery and explosive exercises as well as the use and maintenance of sonar equipment. The Study Area also includes select pierside locations within Pearl Harbor where Navy surface ship and submarine sonar maintenance testing occur.

National Environmental Policy Act

In addition to requesting your Section 106 review, the Navy is also providing the HSTT Draft EIS/OEIS (Enclosure 3) for your review and comment. In compliance with the National Environmental Policy Act (NEPA) of 1969, the Navy will be holding five open house meetings to inform the public and allow those concerned an opportunity to comment on the Proposed Action, alternatives under consideration, and the adequacy and accuracy of the analysis in the Draft EIS/OEIS. All comments

5090
Ser N01CE1/0621
3 May 12

(oral or written) submitted during the 60-day public review period (May 11, 2012, to July 10, 2012) will become part of the public record on the Draft EIS/OEIS and will be responded to in the Final EIS/OEIS.

There will be no formal presentation; however, Navy representatives will be available to provide information and answer questions about the proposed action and Draft EIS/OEIS. The open house public meetings will be held from **5 to 8 p.m.** at the following locations:

In Hawaii

Tuesday, June 12, 2012
Wilcox Elementary School Cafeteria
4319 Hardy St., Lihue

Wednesday, June 13, 2012
Maui Waena Intermediate School Cafeteria
795 Onehee Ave., Kahului

Thursday, June 14, 2012
East Hawaii Cultural Center
141 Kalakaua St., Hilo

Friday, June 15, 2012
McKinley High School Cafeteria
1039 S. King St., Honolulu

In California

Wednesday, June 20, 2012
Marina Village Conference Center Starboard Room
1936 Quivira Way, San Diego

The Draft EIS/OEIS is also available in electronic form on the project website at www.HSTTEIS.com.

Area of Potential Effect

The Area of Potential Effect (APE) would encompass areas in the open ocean area within the Hawaii OPAREA, as detailed on the enclosures (1 and 2).

5090
Ser N01CE1/0621
3 May 12

Identification of Historic Properties

A majority of the training activities for the HSTT are to take place within open ocean portions of the Hawaii OPAREA. The Papahānaumokuākea Marine National Monument, an area having both cultural and ecological significance, is located just northwest of the Hawaii OPAREA but within the Hawaii portion of the HSTT Study Area. It was placed on the United Nations Educational, Scientific, and Cultural Organization (UNESCO) World Heritage List in 2010.

Near-shore activities would take place within Pearl Harbor, which in itself is a National Historic Landmark listed on both the National Register of Historic Places (NRHP) and the Hawaiʻi State Register of Historic Places (Site 50-80-13-9992). There are also several known culturally significant and historic sites located within the Pearl Harbor area.

Determination of Effect

Training and testing activities would continue in existing localities, as specified in the Hawaii Range Complex (HRC) EIS. These activities have been historically conducted or are similar to those historically conducted for some time with no cultural resources being affected throughout the years. For example, all artillery and explosive exercises are to take place within the open ocean, away from where there are any known cultural or historical resources, and the only pierside activities would be those associated with Navy surface ship and submarine sonar maintenance testing. While sonar maintenance testing would take place within the Pearl Harbor National Historic Landmark, the proposed activities would not impact any of the cultural and historic sites in the vicinity. The Navy is not proposing any new activities in the Papahanaumokuakea Marine National Monument or activities that are different from those currently conducted in this area. Therefore, proposed activities are consistent with those activities currently conducted in this area, are consistent with those described in the sanctuary's designation document, and are not being changed or modified in a way that would require consultation with the National Marine Fisheries Service.

5090
Ser N01CE1/0621
3 May 12

Based on the above, the proposed activities within the HSTT EIS/OEIS would result in a "no historic properties affected" determination in accordance with Section 106 implementing regulations under 36 CFR 800.4(d)(1). Additionally, the Navy surface ship and submarine sonar maintenance testing would not affect the significant historic qualities of the Pearl Harbor National Historic Landmark. The Navy requests your concurrence with our determination of effect. As defined in 36 CFR 800.5(c), we will assume your concurrence if no objection is received from your office within 30 days of receipt of this letter.

Should you have any questions regarding the undertaking, please contact Jeffrey Fong at 808-472-1383 or at Jeffrey.fong@navy.mil. You may send written comments to:
Naval Facilities Engineering Command, Southwest
Attention: HSTT EIS/OEIS Project Manager - EV21.CS
1220 Pacific Highway, Building 1, Floor 3
San Diego, CA 92132-5190.

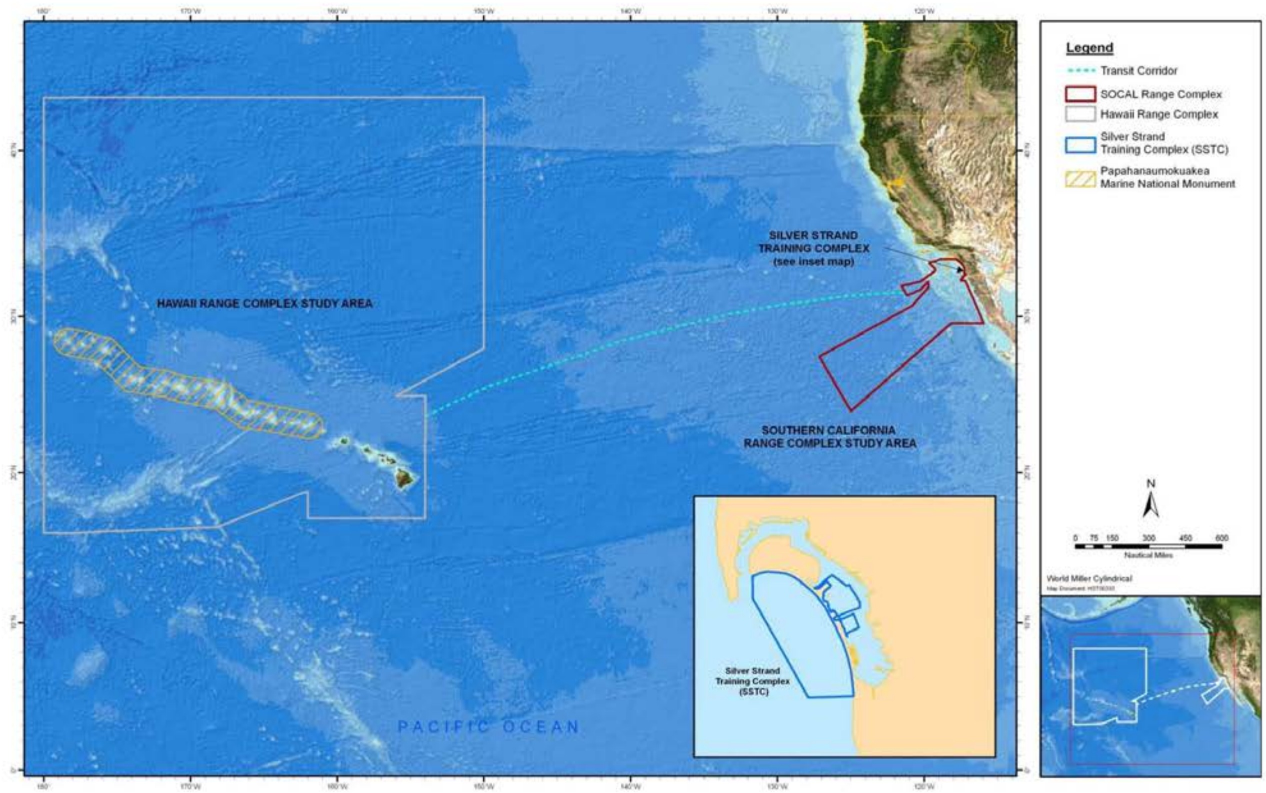
Comments may also be submitted on-line at the website (www.HSTTEIS.com). All comments must be postmarked or received online by **July 10, 2012**, to be considered in the Final EIS/OEIS.

Sincerely,

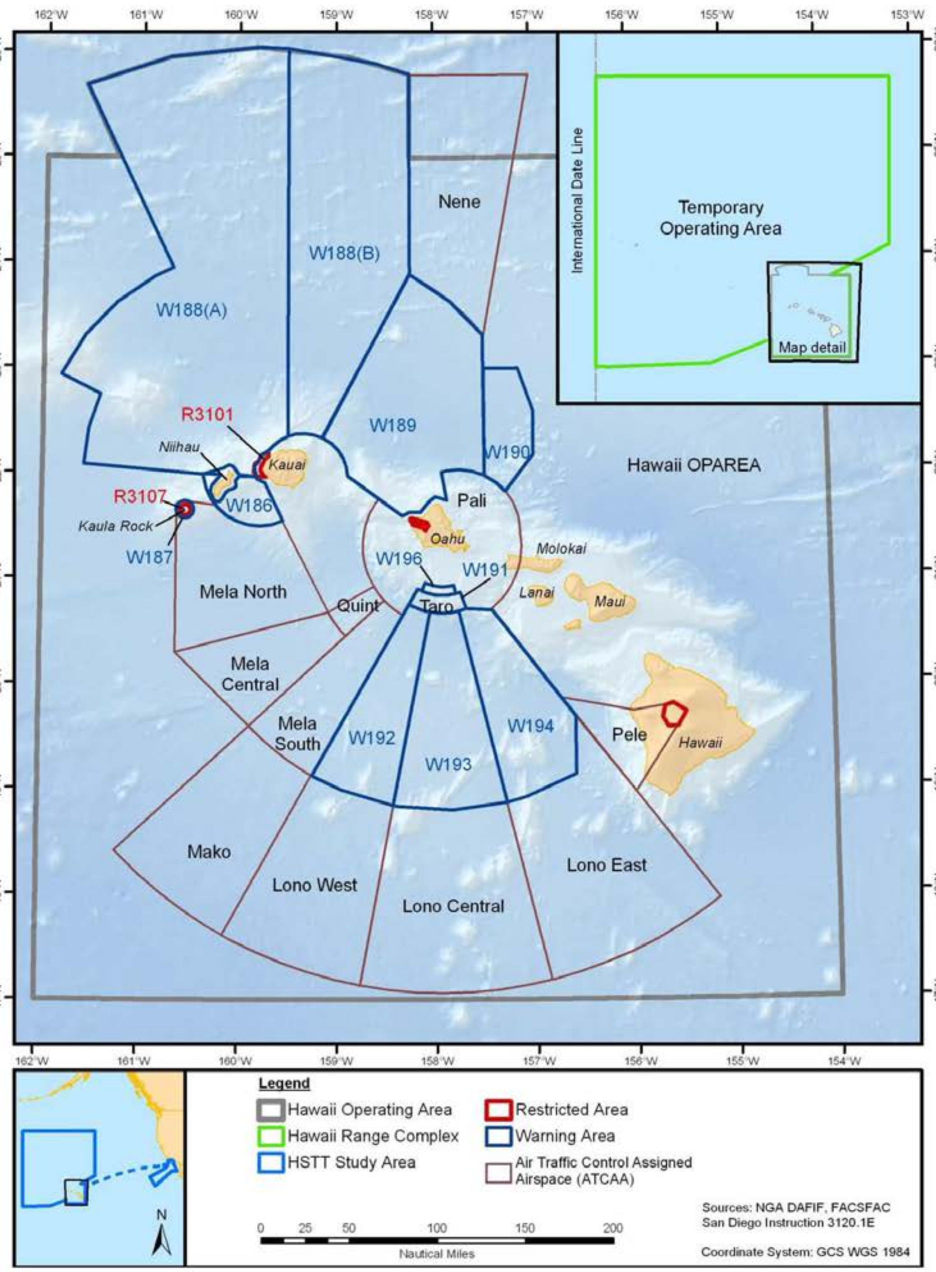
Larry M. Foster

L. M. FOSTER
Director, Environmental Readiness
By direction

Enclosures: 1. Figure of the HSTT Area
2. Figure of the HRC
3. CD-ROM of the Draft EIS/OEIS for the Navy's HSTT Activities



Enclosure (1) HSTT Study Area



Enclosure (2) Hawaii Range Complex

DEPARTMENT OF THE NAVY
COMMANDER
UNITED STATES PACIFIC FLEET
250 MAKALAPA DRIVE
PEARL HARBOR, HAWAII 96860-3131

IN REPLY REFER TO:
5090
Ser N01CE1/0622
3 May 12

Mr. Wayne Donaldson, F.A.I.A
State Historic Preservation Officer
Department of Parks and Recreation
1416 9th Street, Rm. 1442
Sacramento, CA 94296-0001

Dear Sir:

In accordance with implementation of regulations for Section 106 of the National Historic Preservation Act, the subject project has been evaluated and determined to be an undertaking as defined in 36 CFR 800.16(y).

Project Description

The Hawaii-Southern California Training and Testing (HSTT) Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) Proposed Action includes training and testing activities within Southern California (SOCAL), Hawaii, and the open ocean Transit Corridor between them however, activities would be mainly restricted to the open ocean portions of the SOCAL Range Complex within the SOCAL Operating Area (OPAREA) including the waters surrounding San Clemente Island, boat lanes and anchorages offshore of the Silver Strand Training Complex (SSTC), and the bayside training areas within San Diego Bay, see enclosures (1 through 5). Activities specific to the Proposed Action include gunnery and explosive exercises as well as the use and maintenance of sonar equipment. The Study Area also includes select pierside locations within San Diego Bay where Navy surface ship and submarine sonar maintenance testing occur.

5090
Ser N01CE1/0622
3 May 12

National Environmental Policy Act

In addition to requesting your Section 106 review, the Navy is also providing the HSTT Draft EIS/OEIS (Enclosure 6) for your review and comment. In compliance with the National Environmental Policy Act (NEPA) of 1969, the Navy will be holding open house meetings to inform the public and allow those concerned an opportunity to comment on the Proposed Action, alternatives under consideration, and the adequacy and accuracy of the analysis in the Draft EIS/OEIS. All comments (oral or written) submitted during the 60-day public review period (May 11, 2012, to July 10, 2012) will become part of the public record on the Draft EIS/OEIS and will be responded to in the Final EIS/OEIS.

There will be no formal presentation; however, Navy representatives will be available to provide information and answer questions about the proposed action and Draft EIS/OEIS. The open house public meetings will be held from **5 to 8 p.m.** at the following locations:

In California
Wednesday, June 20, 2012
Marina Village Conference Center Starboard Room
1936 Quivira Way, San Diego

In Hawaii
Tuesday, June 12, 2012
Wilcox Elementary School Cafeteria
4319 Hardy St., Lihue

Wednesday, June 13, 2012
Maui Waena Intermediate School Cafeteria
795 Onehee Ave., Kahului

Thursday, June 14, 2012
East Hawaii Cultural Center
141 Kalakaua St., Hilo

Friday, June 15, 2012
McKinley High School Cafeteria
1039 S. King St., Honolulu

5090
Ser N01CE1/0622
3 May 12

The Draft EIS/OEIS is also available in electronic form on the project website at www.HSTTEIS.com.

Area of Potential Effect

The Area of Potential Effect (APE) would encompass open ocean areas in the SOCAL Range Complex within the OPAREA, and boat lanes and anchorages offshore of the SSTC including the bayside training areas within San Diego Bay, as detailed on the enclosures (1 through 5).

Identification of Historic Properties

A majority of the training activities for the HSTT are to take place within the open ocean areas within the SOCAL Range Complex and OPAREA, and boat lanes and anchorages offshore of the SSTC including the bayside training areas within San Diego Bay. The Study Area contains no identified National Register-listed or eligible sites.

Submerged cultural resources in the waters around San Clemente Island include pleasure craft, sport and commercial fishers, and cargo and military vessels. Of these 68 submerged cultural resources, 22 are within 12 nm of San Clemente Island and seven are beyond the territorial limit. Submerged aircraft are also reported off San Clemente Island. Submerged cultural resources identified include 35 shipwrecks, 14 unknown or unidentified vessels, 17 aircraft, an anchor, and the abandoned Sea Lab.

On the bay side of Silver Strand peninsula, three shipwrecks are in or near the training beaches. Unnamed wrecks are recorded in shallow water at the northern end of Delta South beach, in the middle of San Diego Bay, and at the mouth of Fiddler's Cove. The ages and cultural value of these wrecks are not known.

On the ocean side of the peninsula, three shipwrecks are located near SSTC training areas: the bark Narwhale (sank in 1934); the submarine S-142: and the Subchaser YC689(sank in

5090
Ser N01CE1/0622
3 May 12

1943). The destroyer *USS Hogan* (DD178), a military aircraft (S2F Tracker), and a sunken sailboat are located offshore, south of SSTC and west of the City of Imperial Beach.

Known cultural resources in San Diego Bay have not been inventoried. However, cultural resources were reviewed for the San Diego Deepening at Tenth Avenue Marine Terminal project (EDAW 2005). This review identified three known submerged cultural features: a shipwreck (the *Della*), an 1887 marine utility cable, and a sunken Ford Model T. The EDAW study identified 24 cultural resources with unknown location, but known to be lost in the San Diego area, including schooners, barges, a submarine, clippers, gas and oil screws, a yacht, a bark, a ferry, a ship, and a steamer

Determination of Effect

Training and testing activities would continue in existing localities, as specified in the SOCAL EIS/OEIS and the SSTC EIS. These activities have been historically conducted or are similar to those historically conducted for some time with no cultural resources being affected throughout the years. For example, artillery and explosive exercises are to take place within the open ocean or near-shore areas, away from where there are any known cultural or historical resources, and the only pierside activities would be those associated with Navy surface ship and submarine sonar maintenance testing within San Diego Bay. Pile-driving for Elevated Causeway training at SSTC would subject nearshore sediments to vibration, disruption, and compaction at SSTC and would occur only in the Oceanside Boat Lanes 1-10 and in the bayside Bravo training area. Proposed activities are consistent with those activities currently conducted in these areas.

Based on the above, the proposed activities within the HSTT EIS/OEIS would result in a "no historic properties affected" determination in accordance with Section 106 implementing regulations under 36 CFR 800.4(d)(1). The Navy requests your concurrence with our determination of effect. As defined in 36 CFR 800.5(c), we will assume your concurrence if no objection is received from your office within 30 days of receipt of this letter.

5090
Ser N01CE1/0622
3 May 12

Should you have any questions regarding the undertaking, please contact Dr. Andy Yatsko at 619-532-2800 or at andy.yatsko@navy.mil. You may send written comments to:

Naval Facilities Engineering Command, Southwest
Attention: HSTT EIS/OEIS Project Manager - EV21.CS
1220 Pacific Highway, Building 1, Floor 3
San Diego, CA 92132-5190

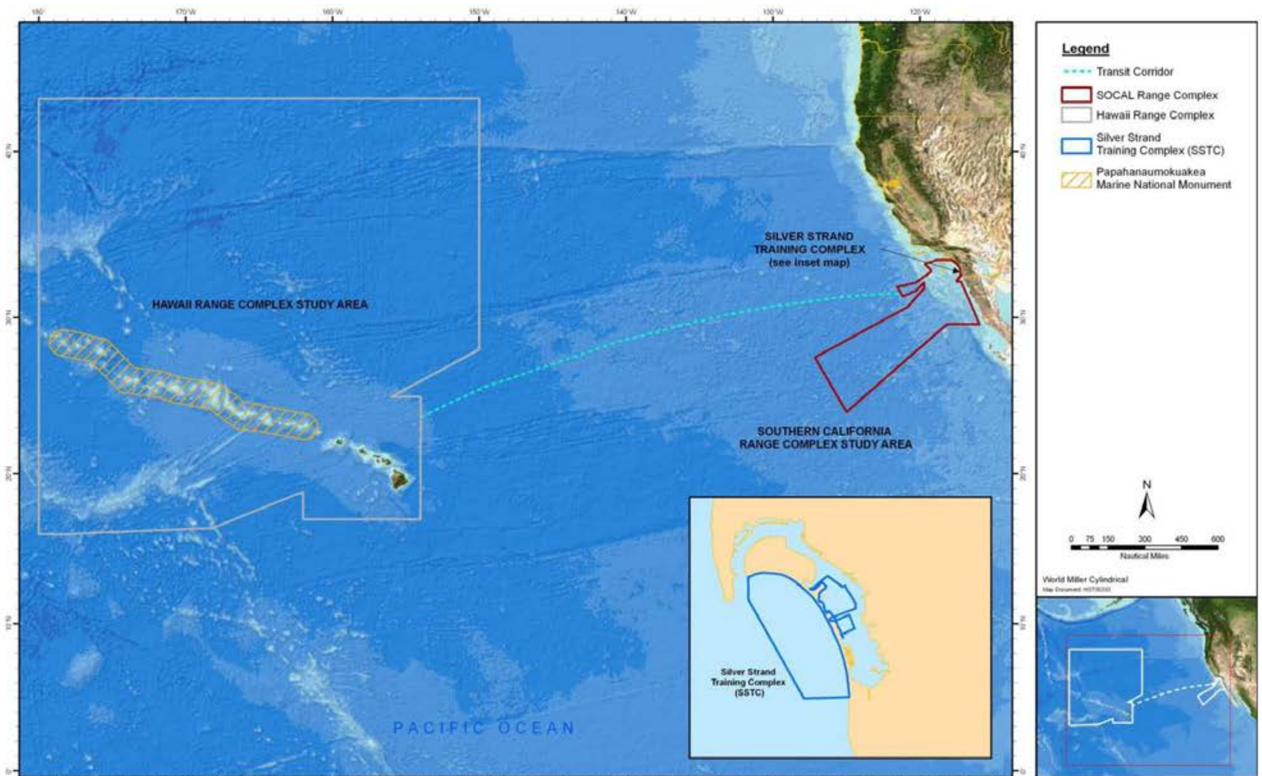
Comments may also be submitted on-line at the website (www.HSTTEIS.com). All comments must be postmarked or received online by **July 10, 2012,** to be considered in the Final EIS/OEIS.

Sincerely,

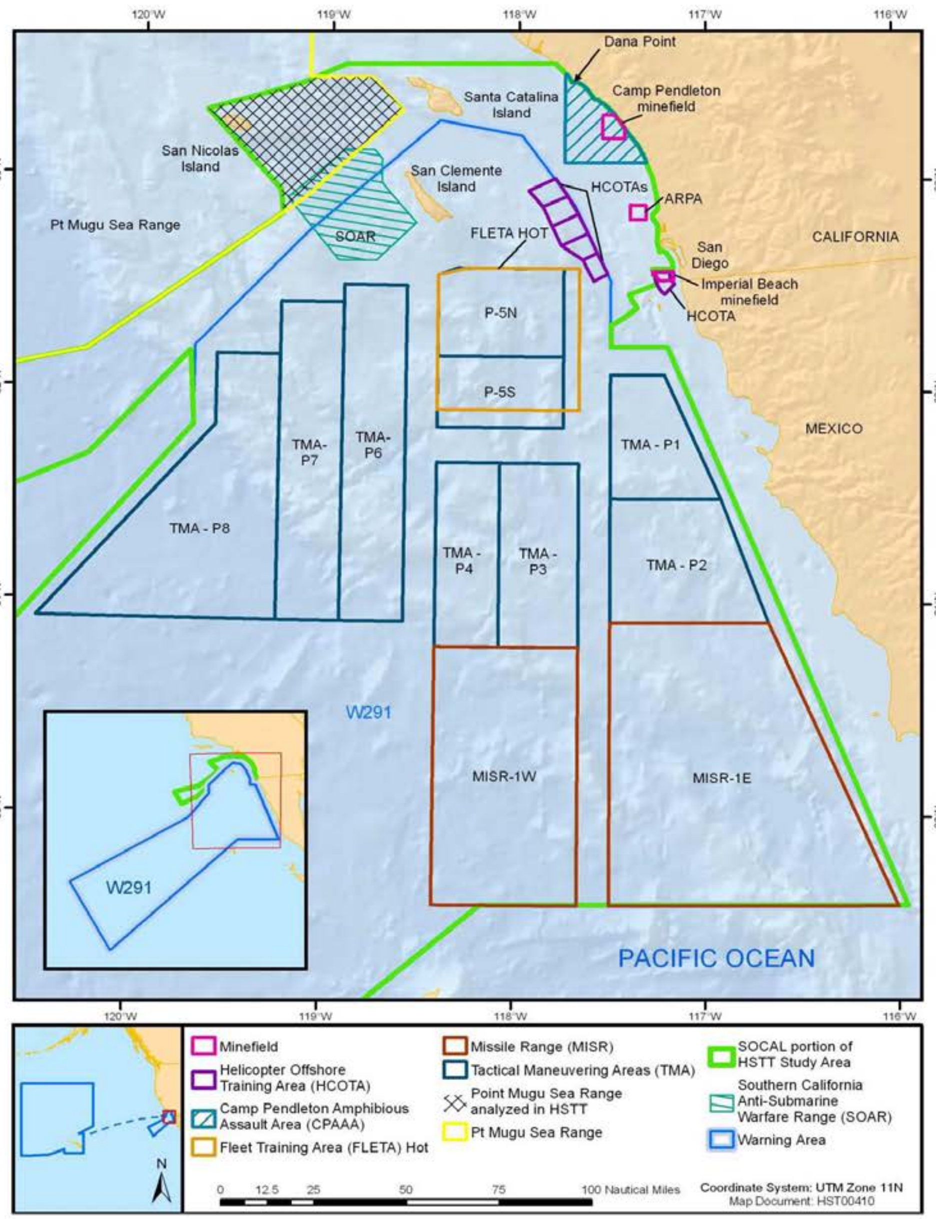
Larry M. Foster

L. M. FOSTER
Director, Environmental Readiness
By direction

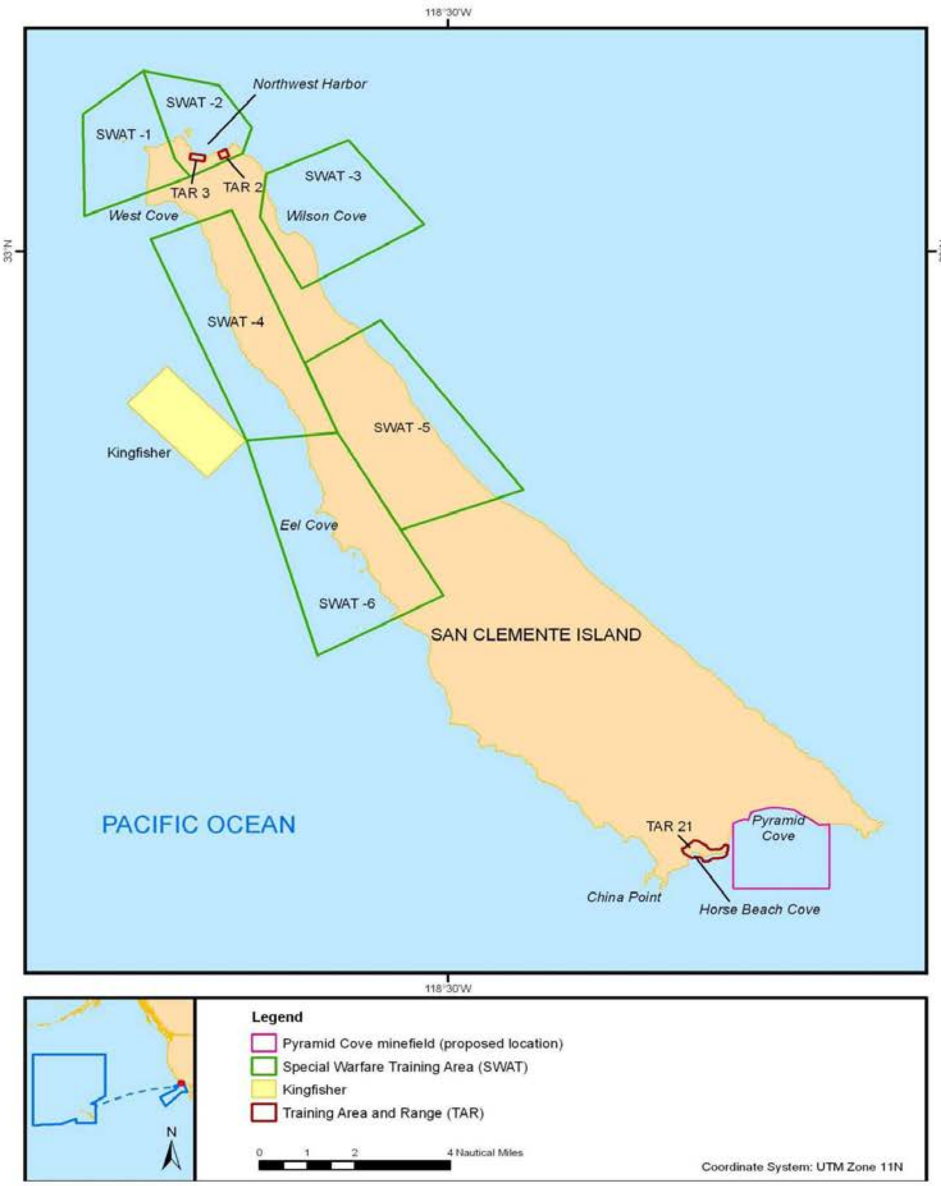
Enclosures:
1. Figure of the HSTT Area
2. Figure of the SOCAL Range Complex and OPAREA
3. Figure of San Clemente Island Nearshore Training Areas
4. Figure of San Clemente Island Offshore Training Areas
5. Figure of SSTC
6. CD-ROM of the Draft EIS/OEIS for the Navy's HSTT Activities



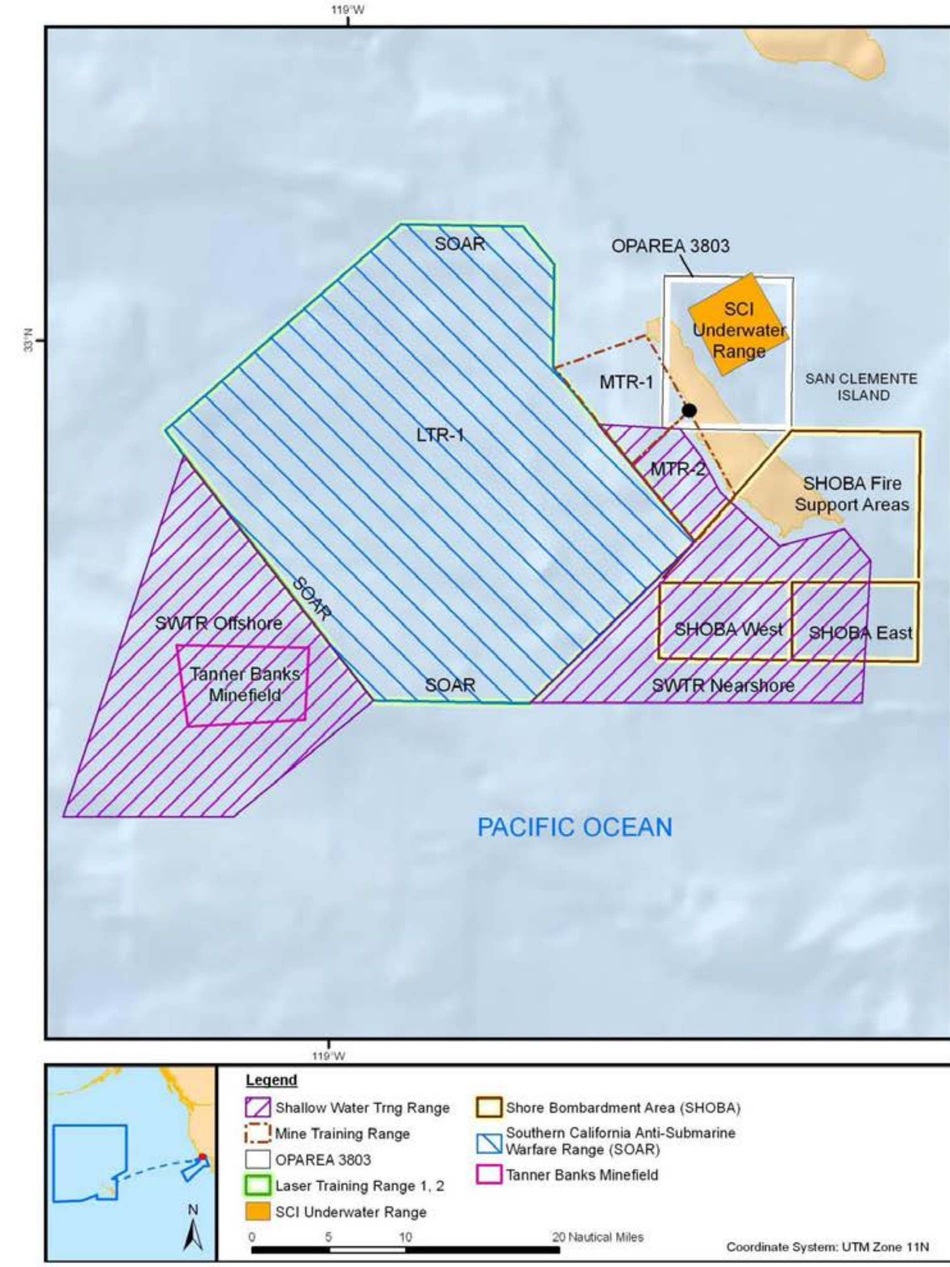
Enclosure (1) HSTT Study Area



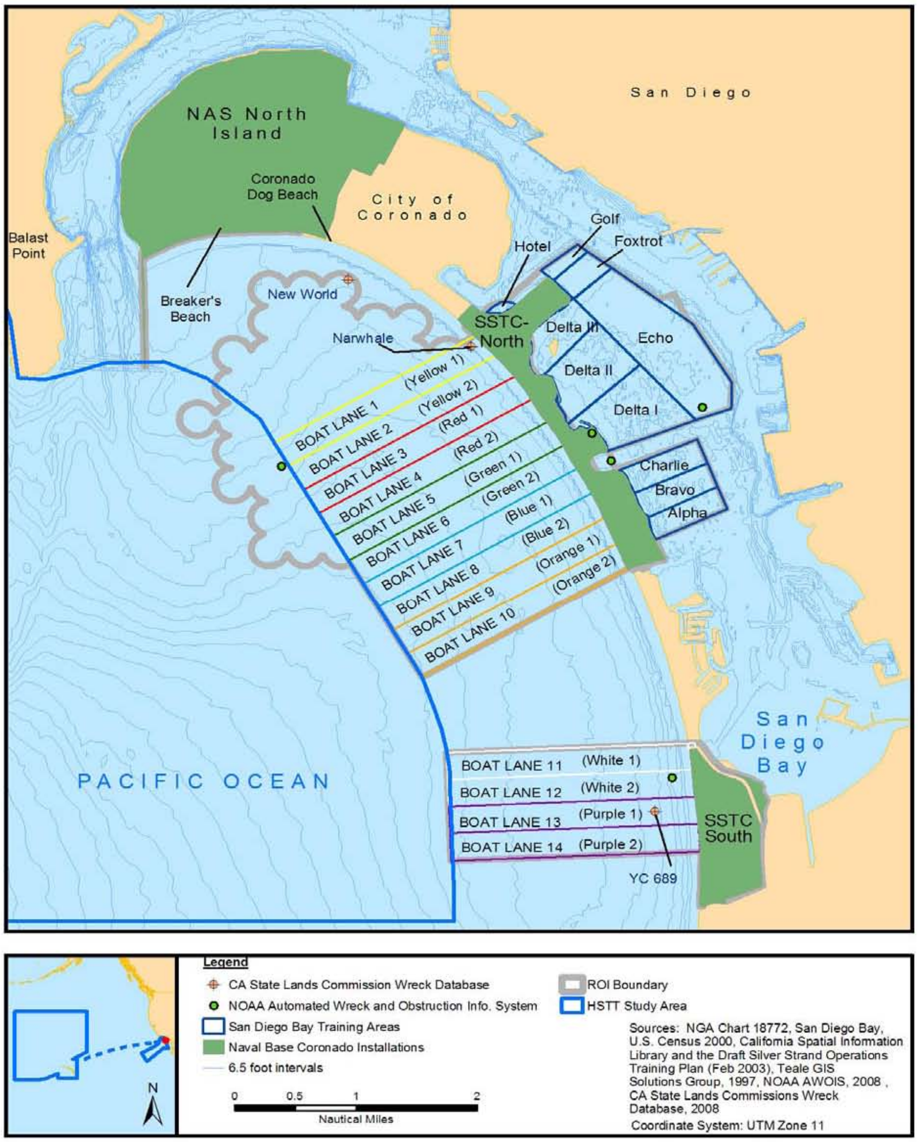
Enclosure (2) Southern California Range Complex and OPAREA



Enclosure (3) San Clemente Island Nearshore Training Areas



Enclosure (4) San Clemente Island Offshore Training Areas



Enclosure (5) Silver Strand Training Complex

STATE OF CALIFORNIA – THE NATURAL RESOURCES AGENCY
EDMUND G. BROWN, JR., *Governor*

OFFICE OF HISTORIC PRESERVATION
DEPARTMENT OF PARKS AND RECREATION
1725 23rd Street, Suite 100
SACRAMENTO, CA 95816-7100
(916) 445-7000 Fax: (916) 445-7053
calshpo@parks.ca.gov
www.ohp.parks.ca.gov

June 5, 2012

Reply in Reference To: USN120509B

Andy Yatsko
Naval Facilities Engineering Command, SW
1220 Pacific Highway, Building 1, Floor 3
San Diego, CA 92132-5190

RE: Hawaii-Southern California Training and Testing Activities, Various Ocean Areas, Southern California

Dear Mr. Yatsko:

Thank you for requesting my comments on the above-referenced undertaking. Pursuant to 36 CFR Part 800, the regulations implementing Section 106 of the National Historic Preservation Act, the United States Navy (Navy) is requesting my concurrence with a finding of No Historic Properties Affected.

The Navy plans to renew training and testing activities in the waters off of Southern California, Hawaii, and the Open Ocean Transit corridor between these two regions. The majority of activities off of California will occur within the Southern California Operating Area (OPAREA), including the waters surrounding San Clemente Island, boat lanes and anchorages offshore of the Silver Strand Training Complex (SSTC), and the bayside training areas within San Diego Bay. Activities specific to this undertaking include gunnery and explosive exercises as well as the use and maintenance of sonar equipment. The project area also includes select pier side locations within San Diego Bay where Navy surface ship and sonar maintenance testing occurs.

The Navy defines the Area of Potential Effects (APE) for this activity as the open ocean areas in the Southern California Range Complex with the OPAREA, and boat lanes and anchorages offshore of the SSTC, including the bayside training areas within San Diego Bay. In addition to your letter, you have provided maps and a CDR containing environmental studies undertaken in the project area.

Submerged cultural resources in the waters around San Clemente Island include pleasure craft, sport and commercial fishers, cargo ships, and military vessels. Of these resources, twenty-two are sited within twelve nautical miles of San Clemente Island and seven are beyond the territorial limit.

On the bay side of Silver Strand peninsula, three shipwrecks are in or near the training beaches. Unnamed wrecks are sited in shallow water at the northern end of Delta

Mr. Andy Yatsko USN120509B
June 5, 2012
Page 2 of 2

South Beach, in the middle of San Diego Bay, and at the mouth of Fiddler's Cove. The ages and cultural value of these wrecks are unknown.

On the ocean side of the peninsula, three shipwrecks are located near SSTC training areas: the bark Narwhale (sank in 1934); the submarine S-142; and the Subchaser YC689 (sank in 1943). The destroyer USS Hogan, a military aircraft, and a sunken sailboat are located offshore, south of SSTC and west of the City of Imperial Beach.

Known cultural resources in San Diego Bay have not been comprehensively inventoried. However, cultural resources were reviewed for the San Diego Deepening at Tenth Avenue Marine Terminal Project (EDAW 2005). This review identified three known submerged cultural features: a shipwreck (identified as the *Della*), an 1887 marine utility cable, and a sunken Ford Model T. The EDAW study identified an additional twenty-four resources known to have been lost in the San Diego area, including schooners, barges, a submarine, clippers, gas and oil screws, a yacht, a bark, a ferry, a ship, and a steamer.

Training and testing activities are consistent with actions currently conducted in the above-referenced areas. For example, artillery and explosive exercises will take place within the Open Ocean or near-shore areas, away from where there are any known cultural or historical resources. Pile driving for elevated causeway training at STC will subject near shore sediments to vibration, disruption, and compaction at SSTC and will occur only in the Oceanside Boat Lanes 1-10 and in the Bayside Bravo Training Area. Proposed activities area consistent with activities currently conducted in these areas.

Having reviewed your submittal, I concur with your Finding of Effect. I also agree that you have adequately determined the undertaking's APE. Please be advised that in the event of a change in project description or an inadvertent discovery, you may have additional responsibilities under 36 CFR Part 800.

Thank you for considering historic properties during project planning. If you have any questions or comments, please contact Tristan Tozer of my staff at (916) 445-7027 or by email at ttozer@parks.ca.gov.

Sincerely,

Jenan Saunders
(for) Milford Wayne Donaldson, FAIA
State Historic Preservation Officer

This Page Intentionally Left Blank

Appendix D: Air Quality Example Emissions Calculations and Example Record of Non-Applicability

APPENDIX D

AIR QUALITY EXAMPLE EMISSIONS CALCULATIONS
AND
EXAMPLE RECORD OF NON-APPLICABILITY

This Page Intentionally Left Blank

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

This Page Intentionally Left Blank

APPENDIX D AIR QUALITY EXAMPLE EMISSIONS CALCULATIONS AND EXAMPLE RONA

This appendix discusses emission factor development, calculations, and assumptions used in the air quality analyses presented in the Air Quality section of Chapter 3 (see Section 3.2).

D.1 SURFACE OPERATIONS EMISSIONS

Surface operations are activities associated with vessel movements. Fleet training activities use a variety of marine vessels, including cruisers, destroyers, frigates, carriers, submarines, amphibious vessels, and small boats. Testing activities use a variety of marine vessels, including various testing support vessels, work boats, torpedo recovery vessels, unmanned surface vehicles, and small boats. These vessels use a variety of propulsion methods, including marine outboard engines, diesel engines, and gas turbines.

Marine Outboard Engines:

The United States (U.S.) Environmental Protection Agency (USEPA) has published emissions factors for air pollutants produced by several types of two-stroke and four-stroke outboard engines. The most conservative emission factors for two-stroke engines of various horsepower are presented in Table D.1-1.

Table D.1-1: Emission Factors for Two Stroke Engines

USEPA Outboard Engine Emissions Factors (grams/hp-hr.)			
NO_x	CO	VOC	SO_x
0.018	0.63	0.25	0.00108

Notes: USEPA = United States Environmental Protection Agency, hp = horsepower, hr. = hour; NO_x = nitrogen oxides, CO = carbon monoxide, VOC = volatile organic compounds, SO_x = sulfur oxides

Source: USEPA, 1999, Exhaust Emissions Factors for Non-Road Engine Modeling-Spark Ignition. Report No. NR-010b; Office of Mobile Sources, Assessment and Modeling Division, EPA-R-99-009

Emissions for surface craft using outboard engines were calculated using USEPA AP-42 factors, and multiplied by the engine horsepower and hours of operation.

$$Emissions = HP \times HR/YR \times EF \times ENG$$

Where:

Emissions = surface craft emissions
HP = horsepower (reflective of a particular load factor/engine power setting)
HR/YR = hours per year
EF = emission factor for specific engine type
ENG = number of engines

To obtain the total criteria pollutant emissions for the Proposed Action, emissions were calculated for each training or testing activity, type of surface vessel, and criteria pollutant. These individual estimates of emissions, in units of tons per year, were then summed by criteria pollutant to obtain the aggregate emissions for surface vessel emissions activities.

Diesel Engines:

Limited data were available for large marine diesel engines. Therefore, USEPA AP-42 emissions factors for industrial reciprocating engines were used to calculate diesel engine emissions. Other sources of vessel emissions factors were previous U.S. Department of the Navy (Navy) Environmental Impact Statement (EIS)/Overseas EIS (OEIS) documents (citing JJMA 2001). Diesel was assumed to be the primary fuel to ensure a conservative estimate. Calculation methods similar to those described for Marine Outboard Engines were used to obtain emissions estimates for diesel engines.

$$Emissions = HP \times HR/YR \times EF \times ENG$$

Where:

Emissions = surface craft emissions
HP = horsepower (reflective of a particular load factor/engine power setting)
HR/YR = hours per year
EF = emission factor for specific engine type
ENG = number of engines

Diesel engine emission factors were multiplied by the engine horsepower and annual hours of operation to calculate the pollutant emissions per year.

D.2 AIR OPERATIONS EMISSIONS

Fleet training and Naval Air Systems Command testing consists of the activities of various aircraft, including the F/A-18, P-3, SH-60B, MH-53, MH-60S, and Lear jet. RDT&E air operations consist of the activities of various aircraft, including the 1UH-1N, SH-60B, MH-53, MH-60S, and Cessna-172. Aircraft operations of concern are those that occur from ground level up to 3,000 feet (ft.) (914 meters [m]) above ground level (AGL). The 3,000 ft. (914 m) AGL ceiling was assumed to be the atmospheric mixing height above which any pollutant generated would not contribute to increased pollutant concentrations at ground level (known as the mixing zone). All criteria pollutant emissions from aircraft generated above 3,000 ft. (914 m) AGL are excluded from analysis of compliance with National Ambient Air Quality Standards. The pollutant emission rate is a function of the aircraft engine's fuel flow rate and efficiency. Emissions for one complete training activity for a particular aircraft are calculated by knowing the specific engine pollutant emission factors for each mode of operation.

For this EIS/OEIS, emission factors for most military engines were obtained from Navy's Aircraft Environmental Support Office (AESO) memoranda and previous Navy EIS/OEIS documentation (primarily citing the Federal Aviation Administration's EDMS model). For those aircraft for which engine data were unavailable, an applicable surrogate was used. Table D-2 is an example of emission factors for the aircraft engines. The table lists the various engine power modes, time in each mode, fuel flow, and corresponding pollutant emission factors. Using these data, as well as information on activity levels (i.e., number of sorties), pollutant emissions for each aircraft/organization were calculated by applying the equation below.

$$Emissions = TIM \times FF \times EF \times ENG \times CF$$

Where:

Emissions = aircraft emissions (pounds [lb.]) (for EF in lb./1,000 gallons [gal.] fuel)
TIM = time-in-mode at a specified power setting (hours [hr.]/operation).

FF = fuel flow at a specified power setting (gal./hr./engine)
EF = emission factor for specific engine type and power setting (lb./1,000 gal. of fuel used)
ENG = number of engines on aircraft
CF = conversion factor (0.001)

D.3 ORDNANCE AND MUNITIONS EMISSIONS

Available emissions factors (AP-42, *Compilation of Air Pollutant Emission Factors*) were used. These factors were then multiplied by the net weight of the explosive and the number of items that were used per year. This calculation provides estimates of annual emissions.

$$Emissions = EXP/YR \times EF \times Net\ Wt$$

Where:

Emissions = ordnance emissions
EXP/YR = explosives, propellants, and pyrotechnics used per year
EF = emissions factor
Net Wt = net weight of explosive

D.4 EMISSIONS ESTIMATES SPREADSHEETS

The following spreadsheets are examples of the emissions calculations for aircraft, vessels, and munitions. The examples provided for aircraft are for baseline training within the Southern California Range Complex. These examples are representative of calculation spreadsheets developed for each range complex or testing area. They are also representative of calculation spreadsheets developed for testing events. Moreover, they are representative of the calculations developed for each alternative analyzed in this EIS/OEIS. The example ordnance emissions calculation is for baseline ordnance emissions. The full set of calculation spreadsheets is available on the Hawaii-Southern California Training and Testing (HSTT) EIS project website.

This Page Intentionally Left Blank

Table D.4-1: Sample Air Emissions Calculations Table (Training Ops Information – Sample only)

Training - Aircraft Air Emissions—No-Action Alternative																		
			TRAINING OPS INFORMATION - AIRCRAFT													Training Platform Information		
				Aircraft		Time		Altitude		Distribution (%)			Distribution (hr)					
Training or Testing Event	Location	Annual Operations (#)	Distribution	A/C Sorties (#)	Type	Ave Time on Range (hr)	Total Time on Range (hr)	Time < 3,000 ft (%)	Time < 3,000 ft (hr)	0-3 nm from shore	3-12 nm from Shore	>12 nm from Shore	Total Time 0-3 nm from shore	Total Time 3-12 nm from shore	Total Time >12 nm from shore	Engine Model	Engines (#)	Fuel Flow (lb/hr)
Anti-Air Warfare																		
Air Combat Maneuver	SOCAL	0	1.75	4060	FA-18E/F	1.0	4060.0	0%	0.0	4%	11%	85%	0.00	0.00	0.00	F414-GE-40	2	4049
	Hawaii	2320	0.25	580	AV-8B	1.0	580.0	0%	0.0	4%	11%	85%	0.00	0.00	0.00	F402-RR-40	1	5785
	Transit	385																
	Total	2705																
Air Defense Exercise	SOCAL	0	0.14	83	E-2	1.0	83.3	50%	41.7	0%	0%	100%	0.00	0.00	41.65	T56-A-425 (	2	1100
	Hawaii	595	0.86	512	FA-18E/F	1.0	511.7	50%	255.9	0%	0%	100%	0.00	0.00	255.85	F414-GE-40	2	4049
	Transit	21																
	Total	616																
Gunnery Exercise, Air-to-Air (Medium Caliber)	SOCAL	0	1.75	53	FA-18E/F	1.0	52.5	0%	0.0	4%	11%	85%	0.00	0.00	0.00	F414-GE-40	2	4049
	Hawaii	30	0.25	8	AV-8B	1.0	7.5	0%	0.0	4%	11%	85%	0.00	0.00	0.00	F402-RR-40	1	5785
	Transit	10																
	Total	40																
Missile Exercise, Air-to-Air	SOCAL	0	0.33	53	FA-18A/C	2.0	105.6	0%	0.0	0%	0%	100%	0.00	0.00	0.00	F404-GE-40	2	3318
	Hawaii	160	0.5	80	FA-18E/F	2.0	160.0	0%	0.0	0%	0%	100%	0.00	0.00	0.00	F414-GE-40	2	4049
	Transit	20	0.09	14	E-2C	4.0	57.6	0%	0.0	0%	0%	100%	0.00	0.00	0.00	T56-A-425 (	2	1100
	Total	180																
Gunnery Exercise, Surface-to-Air (Large	SOCAL	0	0.58	10	Learjet	3.0	31.3	50%	15.7	0%	0%	100%	0.00	0.00	15.66	TFE 731-2-2	2	532
	Hawaii	18																
	Transit	0																
	Total	18																
Missile Exercise, Surface-to-Air	SOCAL	0	0.33	8	SH-60B	3.0	23.8	100%	23.8	0%	0%	100%	0.00	0.00	23.76	T700-GE-40	2	600
	Hawaii	24	0.33	8	P-3	3.0	23.8	67%	15.8	0%	0%	100%	0.00	0.00	15.85	T56-A-14 (a	4	1500
	Transit	8	0.33	8	Learjet	3.0	23.8	67%	15.8	0%	0%	100%	0.00	0.00	15.85	TFE 731-2-2	2	531.76
	Total	32																

Table D.4-2: Sample Air Emissions Calculations Table (Emissions Factors – Sample only)

Training - Aircraft Air Emissions—No-Action Alternative												
			EMISSIONS FACTORS									
Training or Testing	Location	Annual Operations	Emission Indices, lb/1,000 lb fuel					Emissions Factors (lb/hr)				
			CO	NOx	VOC	SOx	PM	CO	NOx	VOC	SOx	PM
Anti-Air Warfare												
Air Combat Maneuver	SOCAL	0	0.89	11.58	0.12	0.40	6.31	7.21	93.77	0.97	3.24	51.10
	Hawaii	2320	7.70	8.60	0.54	0.40	3.80	44.54	49.75	3.12	2.31	21.98
	Transit	385										
	Total	2705										
Air Defense Exercise	SOCAL	0	2.16	8.06	0.49	0.40	3.97	4.75	17.73	1.08	0.88	8.73
	Hawaii	595	0.89	11.58	0.12	0.40	6.31	7.21	93.77	0.97	3.24	51.10
	Transit	21										
	Total	616										
Gunnery Exercise, Air-to-Air (Medium Caliber)	SOCAL	0	0.89	11.58	0.12	0.40	6.31	7.21	93.77	0.97	3.24	51.10
	Hawaii	30	7.70	8.60	0.54	0.40	3.80	44.54	49.75	3.12	2.31	21.98
	Transit	10										
	Total	40										
Missile Exercise, Air-to-Air	SOCAL	0	2.44	6.74	0.44	0.40	6.36	16.19	44.73	2.92	2.65	42.20
	Hawaii	160	0.89	11.58	0.12	0.40	6.31	7.21	93.77	0.97	3.24	51.10
	Transit	20	2.16	8.06	0.49	0.40	3.97	4.75	17.73	1.08	0.88	8.73
	Total	180										
Gunnery Exercise, Surface-to-Air (Large	SOCAL	0	22.38	5.90	4.28	0.54	4.20	23.80	6.27	4.55	0.57	4.47
	Hawaii	18										
	Transit	0										
	Total	18										
Missile Exercise, Surface-to-Air	SOCAL	0	6.25	6.40	0.55	0.40	4.20	7.50	7.68	0.66	0.48	5.04
	Hawaii	24	1.82	8.43	0.41	0.40	3.97	10.92	50.58	2.46	2.40	23.82
	Transit	8	22.38	5.90	4.28	0.54	4.20	23.80	6.27	4.55	0.57	4.47
	Total	32										

Table D.4-3: Sample Air Emissions Calculations Table (Emissions – Sample only)

Training - Aircraft Air Emissions—No-Action Alternative

EMISSIONS (lb/yr)

Training or Testing	Location	Annual Operations	State (0-3 nm)					U.S. (3-12 nm)					International (>12 nm)					Annual Fuel Use		GHG Emissions (lb)			
			CO	NOx	VOC	SOx	PM	CO	NOx	VOC	SOx	PM	CO	NOx	VOC	SOx	PM	Pounds	Gallons	CO_2	N_2O	CH_4	CO_{2-e}
Anti-Air Warfare																							
Air Combat Maneuver	SOCAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16,438,940	2,417,491	50,897,859	1,651	1,438	51,439,921
	Hawaii	2320	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,355,300	493,426	10,388,601	337	294	10,499,239
	Transit	385																					
	Total	2705	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19,794,240	2,910,918	61,286,460	1,988	1,732	61,939,161
Air Defense Exercise	SOCAL	0	0	0	0	0	0	0	0	0	0	0	198	739	45	37	364	91,630	13,475	283,703	9	8	286,724
	Hawaii	595	0	0	0	0	0	0	0	0	0	0	1844	23992	249	829	13074	2,071,873	304,687	6,414,885	208	181	6,483,204
	Transit	21																					
	Total	616	0	0	0	0	0	0	0	0	0	0	2,042	24,731	294	865	13,437	2,163,503	318,162	6,698,588	217	189	6,769,928
Gunnery Exercise, Air-to-Air (Medium Caliber)	SOCAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	212,573	31,261	658,162	21	19	665,171
	Hawaii	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43,388	6,381	134,335	4	4	135,766
	Transit	10																					
	Total	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	255,960	37,641	792,497	26	22	800,937
Missile Exercise, Air-to-Air	SOCAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	350,381	51,527	1,084,841	35	31	1,096,394
	Hawaii	160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	647,840	95,271	2,005,827	65	57	2,027,189
	Transit	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	63,360	9,318	196,174	6	6	198,263
	Total	180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,061,581	156,115	3,286,841	107	93	3,321,846
Gunnery Exercise, Surface-to-Air (Large	SOCAL	0	0	0	0	0	0	0	0	0	0	0	373	98	71	9	70	16,655	2,449	51,566	2	1	52,115
	Hawaii	18																					
	Transit	0																					
	Total	18	0	0	0	0	0	0	0	0	0	0	373	98	71	9	70	16,655	2,449	51,566	2	1	52,115
Missile Exercise, Surface-to-Air	SOCAL	0	0	0	0	0	0	0	0	0	0	0	178	182	16	11	120	14256	2096	44139	1	1	44,609
	Hawaii	24	0	0	0	0	0	0	0	0	0	0	173	802	39	38	377	35640	5241	110348	4	3	111,523
	Transit	8	0	0	0	0	0	0	0	0	0	0	377	99	72	9	71	12635	1858	39119	1	1	39,536
	Total	32	0	0	0	0	0	0	0	0	0	0	728	1,084	127	59	568	62,531	9,196	193,606	6	5	195,668

This Page Intentionally Left Blank

D.5 DRAFT RECORD OF NON-APPLICABILITY

This appendix provides a Record of Non-Applicability (RONA) Memorandum (Figure D.5-1) and draft Records of Non-Applicability and Conformity Analyses (Figures D.5-2 through D.5-5) for each California Air Basin potentially impacted by the Proposed Action (South Coast Air Basin and San Diego Air Basin).

MEMORANDUM FOR THE RECORD

From: __________

Subj: Applicability Analyses for Hawaii-Southern California Training and Testing (HSTT) Environmental Impact Statement/Overseas Environmental Impact Statement – Operations in State of California Waters

Ref: (a) 40 C.F.R., 51.853(b)

Encl: (1) Record of Non-Applicability (RONA) for Hawaii-Southern Training and Testing in State of California Waters, South Coast Air Basin; and

(2) Record of Non-Applicability (RONA) for Hawaii-Southern Training and Testing in State of California Waters, San Diego Air Basin.

1. Enclosure (1) is a RONA for those Pacific Fleet training and testing activities that are expected to occur annually in State of California waters in South Coast Air Basin (SCAB). The Preferred Alternative (Alternative 2) emissions of carbon monoxide (CO), nitrogen oxides (NO_x), volatile organic compounds (VOC), and particulates under 10 microns (PM_{10}) and under 2.5 microns ($PM_{2.5}$), in SCAB are provided in Enclosure 1. A comparison of the relevant criteria air pollutant emissions of the Proposed Action with Reference (a) shows that the anticipated emissions are *de minimis*.

2. Enclosure (2) is a RONA for those Pacific Fleet training and testing activities that are expected to occur annually in State of California waters in San Diego Air Basin (SDAB). The Preferred Alternative (Alternative 2) emissions of CO, NO_x, and VOC in SDAB are provided in Enclosure 2. A comparison of the relevant criteria air pollutant emissions of the Proposed Action with Reference (a) shows that the anticipated emissions are *de minimis*.

2. If there are any questions or if additional information is needed, please call ________ at ______.

____

Name

Title

Figure D.5-1: Record of Non-Applicability Memorandum

NAVY RECORD OF NON-APPLICABILITY FOR CLEAN AIR ACT CONFORMITY

The Proposed Action falls under the Record of Non-Applicability (RONA) category, and is documented with this RONA.

Action Proponents: United States Pacific Fleet

Naval Sea Systems Command

Naval Air Systems Command

Proposed Action: Hawaii-Southern California Training and Testing (HSTT)

Proposed Action Location: Southern California Range Complex, CA

Proposed Action and Emissions Summary:

See attached Conformity Analysis

Affected Air Basin: South Coast Air Basin

Date RONA prepared: ____

RONA prepared by: Naval Facilities Engineering Command, Southwest

Attainment Area Status and Emissions Evaluation Conclusion:

To the best of my knowledge and belief, the information contained within this General Conformity Applicability Analysis is correct and accurate. By signing this statement, I am in agreement with the finding that the total of all reasonably foreseeable direct and indirect emissions that will result from this action is below the *de minimis* threshold set forth in 40 C.F.R. 51.853(b). Accordingly, it is my determination that this action conforms to the applicable State Implementation Plan (SIP).

RONA Approval:

Signature: ______________________________________

Name/Rank: ____________________________ Date: __________________

Position: _____________Commanding Officer: ___________________ Activity: ___________________

Enclosure 1

Figure D.5-2: Record of Non-Applicability Form, South Coast Air Basin

Subject: Conformity Analysis for Navy Training and Testing, South Coast Air Basin

INTRODUCTION

The Proposed Action falls under the Record of Non-Applicability (RONA) category pursuant to 40 Code of Federal Regulations (CFR) Parts 52 and 93, and the basis for exemption from conformity requirements is documented with this RONA.

The United States (U.S.) Environmental Protection Agency (USEPA) published *Determining Conformity of General Federal Actions to State or Federal Implementation Plans; Final Rule*, in the Federal Register (40 CFR Parts 6, 51, and 93) on November 30, 1993. The U.S. Navy published *Clean Air Act General Conformity Guidance* in Chief of Naval Operations Instruction (OPNAVINST) 5090.1C CH-1 (18 July 2011). These publications provide guidance to document Clean Air Act Conformity requirements. Federal regulations state that no department, agency, or instrumentality of the federal government shall engage in, support in any way, or provide financial assistance for, license or permit, or approve any activity that does not conform to an applicable implementation plan. The federal agency that is the action proponent is responsible for determining whether a federal action conforms to the applicable implementation plan before the Proposed Action is taken (40 CFR Part 1, Section 51.850[a]).

Federal actions may be exempt from conformity determinations if they do not exceed designated *de minimis* levels for criteria pollutants as set forth in 40 CFR § 93.153(c) (Table 1). These standards are reflected in Appendix F of OPNAVINST 5090.1C CH-1.

Table 1: *De Minimis* Thresholds for Conformity Determinations

Pollutant	Nonattainment or Maintenance Area Type	*De Minimis* Threshold (TPY)
Ozone (VOC or NO_x)	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other areas outside an ozone transport region	100
Ozone (NO_x)	Marginal and moderate nonattainment inside an ozone transport region	100
	Maintenance	100
Ozone (VOC)	Marginal and moderate nonattainment inside an ozone transport region	50
	Maintenance within an ozone transport region	50
	Maintenance outside an ozone transport region	100
CO, SO_2 and NO_2	All nonattainment & maintenance	100
PM_{10}	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
$PM_{2.5}$	All nonattainment & maintenance	100
Lead (Pb)	All nonattainment & maintenance	25

Notes: NO_X = nitrogen oxides; Pb = lead; PM_{10} = particulate matter under 10 microns; SO_x = sulfur oxides; TPY = tons per year; VOC = volatile organic compounds

Figure D.5-3: Conformity Analysis, South Coast Air Basin

PROPOSED ACTION

Proposed Action Summary

The Proposed Action consists of increases in training and testing activities on the at-sea portions of the Southern California (SOCAL) Range Complex required to address a training shortfall, and to accommodate expected force-structure changes and range enhancements. The assessment of air quality impacts includes all military training activities in the SOCAL Range Complex involving vessels, aircraft, and weapons systems in State of California waters.

Proposed Action Emissions

Aircraft

To estimate aircraft emissions, the operating modes (e.g., “cruise” mode), number of hours of operation, and types of engine for each type of aircraft were evaluated. All aircraft are assumed to travel to and from training ranges at or above 3,000 ft. (914 m) above ground level and, therefore, their transits to and from the ranges do not affect surface air quality. Air combat maneuvers and air-to-air missile exercises are primarily conducted at altitudes well in excess of 3,000 ft. (914 m) above ground level and, therefore, are not included in the estimated emissions of criteria air pollutants. Activities or portions of those training or testing activities occurring below 3,000 ft. (914 m) are included in emissions estimates. Examples of activities typically occurring below 3,000 ft. (914 m) include those involving helicopter platforms such as mine warfare, anti-surface warfare, and anti-submarine warfare training and testing activities.

The types of aircraft used and the numbers of flights flown under the No Action Alternative are derived from historical data. The types of aircraft identified include the typical aircraft platforms that conduct a particular training or testing exercise (or the closest surrogate when information is not available), including range support aircraft (e.g., non-Navy commercial air services). For the Preferred Alternative, estimates of future aircraft sorties are based on evolutionary changes in the Navy’s force structure and mission assignments. Where there are no major changes in types of aircraft, future activity levels are estimated from the distribution of baseline activities.

Time on range (activity duration) under the No Action Alternative was calculated from average times derived from range records and Navy subject matter experts. To estimate time on range for each aircraft activity under the Preferred Alternative, the average flight duration approximated in the baseline data was used in the calculations. Estimated altitudes of activities for all aircraft were obtained from aircrew members in operational squadrons. Several testing activities are similar to training activities, and therefore similar assumptions were made for such activities in terms of aircraft type, altitude, and flight duration. Where aircraft testing activities were dissimilar to training activities, assumptions for time on range were derived from Navy subject matter experts.

Air pollutant emissions were estimated based on the Navy’s Aircraft Environmental Support Office Memorandum Reports for individual aircraft categories (Aircraft Emission Estimates: Mission Operations). For aircraft for which Aircraft Environmental Support Office emission factors were not available, emission factors were obtained from other published sources.

Figure D.5-3: Conformity Analysis, South Coast Air Basin (continued)

The emissions calculations for each alternative conservatively assume that each aircraft activity is separately conducted. In practice, a testing activity may be conducted during a training flight. Two or more training activities also may be conducted during one flight (e.g., chaff or flare exercises may occur during electronic warfare operations; or air-to-surface gunnery and air-to-surface bombing activities may occur during a single flight operation). Using conservative assumptions may produce elevated aircraft emissions estimates, but accounts for the possibility (however remote) that each aircraft training and testing activity is separately conducted.

Vessels

The methods of estimating marine vessel emissions involve evaluating the type of activity, the number of hours of operation, the type of propulsion, and the type of onboard generator for each vessel type. The types of surface ships and numbers of activities for the No Action Alternative are derived from range records and Navy subject matter experts regarding vessel participant data. For the Preferred Alternative, estimates of future ship activities are based on anticipated evolutionary changes in the Navy's force structure and mission assignments. Where there are no major changes in types of ships, estimates of future activities are based on the historical distribution of ship use. Navy aircraft carriers and submarines are nuclear-powered, and have no air pollutant emissions associated with propulsion.

For surface ships, the durations of activities were estimated by taking an average over the total number of activities for each type of training and testing. Emissions for baseline activities and for future activities were estimated based on discussions with exercise participants. In addition, information provided by subject-matter experts was used to develop a breakdown of time spent at each operational mode (i.e., power level) used during activities in which marine vessels participated. Several testing activities are similar to training activities, and therefore similar assumptions were made for such activities in terms of vessel type, power level, and activity duration.

Emission factors for marine vessels were obtained from the database developed for Naval Sea Systems Command by John J. McMullen Associates, Inc. (John J. McMullen Associates 2001). Emission factors were provided for each marine vessel type and power level. The resulting calculations provided information on the time spent at each power level in each part of the Study Area, emission factors for that power level (in pounds of pollutant per hour), and total emissions for each marine vessel for each operational type and mode.

The pollutants for which calculations are made include exhaust total hydrocarbons, CO, NO_x, PM, CO_2, and SO_2. For non-road engines, all particulate matter emissions are assumed to be smaller than PM_{10}, and 92 percent of the particulate matter from gasoline and diesel-fueled engines is assumed to be smaller than $PM_{2.5}$. For gaseous-fueled engines (liquefied petroleum gas/compressed natural gas), 100 percent of the particulate matter emissions are assumed to be smaller than $PM_{2.5}$.

The emissions calculations for each alternative conservatively assume that each vessel activity is separately conducted and separately produces vessel emissions. In practice, one or more testing activities may take advantage of an opportunity to travel at sea aboard and test from a vessel conducting a related or unrelated training activity. It is also probable that two or more training activities may be conducted during one training vessel movement (e.g., a ship may conduct large-, medium-, and small-caliber surface-to-surface gunnery exercises during one vessel movement). Furthermore, multiple unit level training activities may be conducted during a larger composite training unit exercise. Using conservative assumptions may produce elevated vessel emissions estimates, but accounts for the possibility (however remote) that each training or testing activity is separately conducted.

Figure D.5-3: Conformity Analysis, South Coast Air Basin (continued)

Naval Gunfire, Missiles, Bombs, Other Munitions and Military Expended Material

Naval gunfire, missiles, bombs, and other types of munitions used in training and testing activities emit air pollutants. To estimate the amounts of air pollutants emitted by ordnance during their use, the numbers and types of munitions used during training or testing activities are first totaled. Then generally accepted emissions factors (AP-42, Compilation of Air Pollutant Emission Factors, Chapter 15: Ordnance Detonation [USEPA 1995]) for criteria air pollutants are applied to the total amounts. Finally, the total amounts of air pollutants emitted by each munition type are summed to produce total amounts of each criteria air pollutant under each alternative.

The estimated annual operational emissions for the No Action Alternative and Preferred Alternative are presented in Table 2. Annual emissions are expected to increase from the No Action Alternative levels to the Preferred Alternative levels over several years. All annual Preferred Alternative emissions would be below General Conformity *de minimis* levels.

Table 2: Estimated Air Pollutant Emissions Under the Proposed Action

Parameter	Emissions by Air Pollutant (TPY)				
	CO	NO_X	VOC	PM_{10}	$PM_{2.5}$
No Action Alternative	229	540	285	42	39
Preferred Alternative	252	540	284	42	39
Net Change	**23**	**0**	**-1**	**0**	**0**
De Minimis Threshold	100	10	10	70	100
Exceeds Threshold?	No	No	No	No	No

Notes: Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding. CO = carbon monoxide; NO_X = nitrogen oxides; PM_{10} = particulates under 10 microns; $PM_{2.5}$ = particulates under 2.5 microns; TPY = tons per year; VOC = volatile organic compounds

EMISSIONS EVALUATION CONCLUSION

The U.S. Navy concludes that the *de minimis* thresholds for applicable criteria pollutants would not be exceeded by implementation of the Proposed Action. The emissions data supporting that conclusion are shown in Table 2, which summarizes the calculated estimates and *de minimis* limits. Therefore, the U.S. Navy concludes that further formal Conformity Determination procedures are not required, resulting in this record of Non-Applicability.

Figure D.5-3: Conformity Analysis, South Coast Air Basin (continued)

NAVY RECORD OF NON-APPLICABILITY FOR CLEAN AIR ACT CONFORMITY

The Proposed Action falls under the Record of Non-Applicability (RONA) category, and is documented with this RONA.

Action Proponents: United States Pacific Fleet

Naval Sea Systems Command

Naval Air Systems Command

Proposed Action: Hawaii-Southern California Training and Testing (HSTT)

Proposed Action Location: Southern California Range Complex, CA

Proposed Action and Emissions Summary:

See attached Conformity Analysis

Affected Air Basin: San Diego Air Basin

Date RONA prepared: ______________________________________

RONA prepared by: Naval Facilities Engineering Command, Southwest

Attainment Area Status and Emissions Evaluation Conclusion:

To the best of my knowledge and belief, the information contained within this General Conformity Applicability Analysis is correct and accurate. By signing this statement, I am in agreement with the finding that the total of all reasonably foreseeable direct and indirect emissions that will result from this action is below the *de minimis* threshold set forth in 40 C.F.R. 51.853(b). Accordingly, it is my determination that this action conforms to the applicable State Implementation Plan (SIP).

RONA Approval:

Signature: ____________________________________

Name/Rank: ___________________________ Date: _________________

Position: ____________Commanding Officer: __________________ Activity: __________________

Enclosure 2

Figure D.5-4: Record of Non-Applicability Form, San Diego Air Basin

Subject: Conformity Analysis for Navy Training and Testing, San Diego Air Basin

INTRODUCTION

The Proposed Action falls under the Record of Non-Applicability (RONA) category pursuant to 40 Code of Federal Regulations (CFR) Parts 52 and 93, and the basis for exemption from conformity requirements is documented with this RONA.

The United States (U.S.) Environmental Protection Agency (USEPA) published *Determining Conformity of General Federal Actions to State or Federal Implementation Plans; Final Rule*, in the Federal Register (40 CFR Parts 6, 51, and 93) on November 30, 1993. The U.S. Navy published *Clean Air Act General Conformity Guidance* in Chief of Naval Operations Instruction (OPNAVINST) 5090.1C CH-1 (18 July 2011). These publications provide guidance to document Clean Air Act Conformity requirements. Federal regulations state that no department, agency, or instrumentality of the federal government shall engage in, support in any way, or provide financial assistance for, license or permit, or approve any activity that does not conform to an applicable implementation plan. The federal agency that is the action proponent is responsible for determining whether a federal action conforms to the applicable implementation plan before the Proposed Action is taken (40 CFR Part 1, Section 51.850[a]).

Federal actions may be exempt from conformity determinations if they do not exceed designated *de minimis* levels for criteria pollutants as set forth in 40 CFR § 93.153(c) (Table 1). These standards are reflected in Appendix F of OPNAVINST 5090.1C CH-1.

Table 1: *De Minimis* Thresholds for Conformity Determinations

Pollutant	Nonattainment or Maintenance Area Type	*De Minimis* Threshold (TPY)
Ozone (VOC or NO_x)	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other areas outside an ozone transport region	100
Ozone (NO_x)	Marginal and moderate nonattainment inside an ozone transport region	100
	Maintenance	100
Ozone (VOC)	Marginal and moderate nonattainment inside an ozone transport region	50
	Maintenance within an ozone transport region	50
	Maintenance outside an ozone transport region	100
CO, SO_2 and NO_2	All nonattainment & maintenance	100
PM_{10}	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
$PM_{2.5}$	All nonattainment & maintenance	100
Lead (Pb)	All nonattainment & maintenance	25

Notes: NO_X = nitrogen oxides; Pb = lead; PM_{10} = particulate matter under 10 microns; SO_x = sulfur oxides; TPY = tons per year; VOC = volatile organic compounds

Figure D.5-5: Conformity Analysis, San Diego Air Basin

PROPOSED ACTION

Proposed Action Summary

The Proposed Action consists of increases in training and testing activities on the at-sea portions of the Southern California (SOCAL) Range Complex required to address a training shortfall, and to accommodate expected force-structure changes and range enhancements. The assessment of air quality impacts includes all military training activities in the SOCAL Range Complex involving vessels, aircraft, and weapons systems in State of California waters.

Proposed Action Emissions

Aircraft

To estimate aircraft emissions, the operating modes (e.g., “cruise” mode), number of hours of operation, and types of engine for each type of aircraft were evaluated. All aircraft are assumed to travel to and from training ranges at or above 3,000 ft. (914 m) above ground level and, therefore, their transits to and from the ranges do not affect surface air quality. Air combat maneuvers and air-to-air missile exercises are primarily conducted at altitudes well in excess of 3,000 ft. (914 m) above ground level and, therefore, are not included in the estimated emissions of criteria air pollutants. Activities or portions of those training or testing activities occurring below 3,000 ft. (914 m) are included in emissions estimates. Examples of activities typically occurring below 3,000 ft. (914 m) include those involving helicopter platforms such as mine warfare, anti-surface warfare, and anti-submarine warfare training and testing activities.

The types of aircraft used and the numbers of flights flown under the No Action Alternative are derived from historical data. The types of aircraft identified include the typical aircraft platforms that conduct a particular training or testing exercise (or the closest surrogate when information is not available), including range support aircraft (e.g., non-Navy commercial air services). For the Preferred Alternative, estimates of future aircraft sorties are based on evolutionary changes in the Navy’s force structure and mission assignments. Where there are no major changes in types of aircraft, future activity levels are estimated from the distribution of baseline activities.

Time on range (activity duration) under the No Action Alternative was calculated from average times derived from range records and Navy subject matter experts. To estimate time on range for each aircraft activity under the Preferred Alternative, the average flight duration approximated in the baseline data was used in the calculations. Estimated altitudes of activities for all aircraft were obtained from aircrew members in operational squadrons. Several testing activities are similar to training activities, and therefore similar assumptions were made for such activities in terms of aircraft type, altitude, and flight duration. Where aircraft testing activities were dissimilar to training activities, assumptions for time on range were derived from Navy subject matter experts.

Air pollutant emissions were estimated based on the Navy’s Aircraft Environmental Support Office Memorandum Reports for individual aircraft categories (Aircraft Emission Estimates: Mission Operations). For aircraft for which Aircraft Environmental Support Office emission factors were not available, emission factors were obtained from other published sources.

Figure D.5-5: Conformity Analysis, San Diego Air Basin (continued)

The emissions calculations for each alternative conservatively assume that each aircraft activity is separately conducted. In practice, a testing activity may be conducted during a training flight. Two or more training activities also may be conducted during one flight (e.g., chaff or flare exercises may occur during electronic warfare operations; or air-to-surface gunnery and air-to-surface bombing activities may occur during a single flight operation). Using conservative assumptions may produce elevated aircraft emissions estimates, but accounts for the possibility (however remote) that each aircraft training and testing activity is separately conducted.

Vessels

The methods of estimating marine vessel emissions involve evaluating the type of activity, the number of hours of operation, the type of propulsion, and the type of onboard generator for each vessel type. The types of surface ships and numbers of activities for the No Action Alternative are derived from range records and Navy subject matter experts regarding vessel participant data. For the Preferred Alternative, estimates of future ship activities are based on anticipated evolutionary changes in the Navy's force structure and mission assignments. Where there are no major changes in types of ships, estimates of future activities are based on the historical distribution of ship use. Navy aircraft carriers and submarines are nuclear-powered, and have no air pollutant emissions associated with propulsion.

For surface ships, the durations of activities were estimated by taking an average over the total number of activities for each type of training and testing. Emissions for baseline activities and for future activities were estimated based on discussions with exercise participants. In addition, information provided by subject-matter experts was used to develop a breakdown of time spent at each operational mode (i.e., power level) used during activities in which marine vessels participated. Several testing activities are similar to training activities, and therefore similar assumptions were made for such activities in terms of vessel type, power level, and activity duration.

Emission factors for marine vessels were obtained from the database developed for Naval Sea Systems Command by John J. McMullen Associates, Inc. (John J. McMullen Associates 2001). Emission factors were provided for each marine vessel type and power level. The resulting calculations provided information on the time spent at each power level in each part of the Study Area, emission factors for that power level (in pounds of pollutant per hour), and total emissions for each marine vessel for each operational type and mode.

The pollutants for which calculations are made include exhaust total hydrocarbons, CO, NO_x, PM, CO_2, and SO_2. For non-road engines, all particulate matter emissions are assumed to be smaller than PM_{10}, and 92 percent of the particulate matter from gasoline and diesel-fueled engines is assumed to be smaller than $PM_{2.5}$. For gaseous-fueled engines (liquefied petroleum gas/compressed natural gas), 100 percent of the particulate matter emissions are assumed to be smaller than $PM_{2.5}$.

The emissions calculations for each alternative conservatively assume that each vessel activity is separately conducted and separately produces vessel emissions. In practice, one or more testing activities may take advantage of an opportunity to travel at sea aboard and test from a vessel conducting a related or unrelated training activity. It is also probable that two or more training activities may be conducted during one training vessel movement (e.g., a ship may conduct large-, medium-, and small-caliber surface-to-surface gunnery exercises during one vessel movement). Furthermore, multiple unit level training activities may be conducted during a larger composite training unit exercise. Using conservative assumptions may produce elevated vessel emissions estimates, but accounts for the possibility (however remote) that each training or testing activity is separately conducted.

Figure D.5-5: Conformity Analysis, San Diego Air Basin (continued)

Naval Gunfire, Missiles, Bombs, Other Munitions and Military Expended Material

Naval gunfire, missiles, bombs, and other types of munitions used in training and testing activities emit air pollutants. To estimate the amounts of air pollutants emitted by ordnance during their use, the numbers and types of munitions used during training or testing activities are first totaled. Then generally accepted emissions factors (AP-42, Compilation of Air Pollutant Emission Factors, Chapter 15: Ordnance Detonation [USEPA 1995]) for criteria air pollutants are applied to the total amounts. Finally, the total amounts of air pollutants emitted by each munition type are summed to produce total amounts of each criteria air pollutant under each alternative.

The estimated annual operational emissions for the No Action Alternative and Preferred Alternative are presented in Table 2. Annual emissions are expected to increase from the No Action Alternative levels to the Preferred Alternative levels over several years. All annual Preferred Alternative emissions would be below General Conformity *de minimis* levels.

Table 2: Estimated Air Pollutant Emissions Under the Proposed Action

Parameter	Emissions by Air Pollutant (TPY)		
	CO	NO_X	VOC
No Action Alternative	176	546	175
Preferred Alternative	243	592	184
Net Change	**67**	**46**	**9**
De Minimis Threshold	100	100	100
Exceeds Threshold?	No	No	No

Notes: Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding. CO = carbon monoxide; NO_X = nitrogen oxides; TPY = tons per year; VOC = volatile organic compounds

EMISSIONS EVALUATION CONCLUSION

The U.S. Navy concludes that the *de minimis* thresholds for applicable criteria pollutants would not be exceeded by implementation of the Proposed Action. The emissions data supporting that conclusion are shown in Table 2, which summarizes the calculated estimates and *de minimis* limits. Therefore, the U.S. Navy concludes that further formal Conformity Determination procedures are not required, resulting in this record of Non-Applicability.

Figure D.5-5: Conformity Analysis, San Diego Air Basin (continued)

This Page Intentionally Left Blank

Appendix E: Public Participation

APPENDIX E

PUBLIC PARTICIPATION

This Page Intentionally Left Blank

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

There are no figures in this section.

APPENDIX E PUBLIC PARTICIPATION

This appendix includes information about the public's participation in the development of the Hawaii-Southern California Training and Testing Activities (HSTT) Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS).

E.1 PROJECT WEB SITE

A public web site was established specifically for this project, http://www.HSTTEIS.com/. The web site address (originally http://www.HawaiiSOCALEIS.com) was published in the *Notice of Intent to Prepare an Environmental Impact Statement and Overseas Impact Statement* (Appendix B; Federal Register Notices). It was subsequently re-printed in newspaper advertisements, agency letters, and postcards for the Notice of Intent, Notices of Availability, and Notice of Public Meetings. The scoping meeting fact sheets, public meeting fact sheets, technical reports, and various other materials are available on the project web site and will be made available throughout the course of the project.

E.2 SCOPING PERIOD

The public scoping period began with the issuance of the Notice of Intent in the *Federal Register* on 15 July 2010 (Appendix B; Federal Register Notices). This notice included a project description and scoping meeting dates and locations. The scoping period lasted 60 days, concluding on 14 September 2010. The scoping period allowed a variety of opportunities for the public to comment on the scope of the EIS/OEIS. The Navy made significant efforts to notify the public to ensure maximum public participation during the scoping process, including using stakeholder notification letters, postcard mailers, press releases, and newspaper display advertisements. The meetings were structured in an open house format, presenting informational posters and written information, with Navy staff and project experts available to answer participants' questions. Section E.2.1 describes the United States (U.S.) Department of the Navy's (Navy's) notification efforts during scoping. The scoping period allowed a variety of opportunities for the public to comment on the scope of the EIS/OEIS.

E.2.1 PUBLIC SCOPING NOTIFICATION

The Navy made significant efforts at notifying the public to ensure maximum public participation during the scoping process. A summary of these efforts follows.

E.2.1.1 Scoping Notification Letters

Notice of Intent/Notice of Scoping Meeting Letters were distributed on 14 July 2010, to 230 federal, state, and local elected officials and government agencies. Recipients included:

<u>Federal</u>
U.S. Senators (Hawaii, California)
U.S. Representatives (California Districts 35, 36, 37, 44, 46, 48, 49, 50, 52, and Hawaii Districts 1 and 2)
Federal Aviation Administration
    Washington, D.C., Headquarters
    Western Pacific Region
U.S. Army Corps of Engineers
    Pacific Ocean Division
        Honolulu District
    South Pacific Division
        Los Angeles District

- U.S. Department of Commerce
    - National Oceanic and Atmospheric Administration
        - National Marine Fisheries Service
            - Washington, D.C., Headquarters
            - Southwest Regional Offices
            - Southwest Fisheries Science Center
            - Pacific Islands Regional Office
            - Pacific Islands Fisheries Science Center
            - Office of Habitat Conservation
                - Southwest Regional Office
                - Pacific Islands Regional Habitat Conservation Division
            - Office of Protected Resources
                - Headquarters and Pacific Islands Region
    - Channel Islands National Marine Sanctuary
    - Hawaiian Islands Humpback Whale National Marine Sanctuary
    - Papahanaumokuakea Marine National Monument
- U.S. Department of Homeland Security
    - U.S. Coast Guard
        - District 11
        - District 14
        - Office of Operating and Environmental Standards
- U.S. Department of the Interior
    - Bureau of Indian Affairs
        - Pacific Regional Office
        - Southern California Agency
    - Bureau of Land Management
        - California Coastal National Monument
    - Bureau of Ocean Energy Management, Regulation, and Enforcement
        - National Offshore Office
        - Pacific Outer Continental Shelf Region
    - Channel Islands National Park
    - National Park Service
        - Pacific West Region
    - Office of Environmental Policy and Compliance
        - Oakland Region
- U.S. Environmental Protection Agency
    - National Environmental Policy Act Compliance Division
    - Region IX (San Francisco)
    - Washington, D.C., Headquarters
- U.S. Fish and Wildlife Service
    - Carlsbad Office
    - Pacific Regional Office
    - Pacific Southwest Regional Office
    - Ventura Office
    - San Diego Bay National Wildlife Refuge
    - San Diego National Wildlife Refuge
    - Hanalei National Wildlife Refuge
    - Huleia National Wildlife Refuge

James Campbell National Wildlife Refuge
Kealia Pond National Wildlife Refuge
Kilauea Point National Wildlife Refuge
Pearl Harbor National Wildlife Refuge
Marine Mammal Commission
U.S. Geological Survey
Western Region Offices
California Water Science Center
Pacific Islands Water Science Center
Western Fisheries Research Center

State of California
Office of the Governor
Office of Planning and Research, Military Affairs
State Senators (Districts 27, 33, 35, 38, and 39)
State Assembly members (Districts 54, 55, 74, 75, 76, 77, 78, and 79)
California Coastal Commission
Department of Conservation
Division of Land Resource Protection
Department of Fish and Game
Marine Life Protection Act Blue Ribbon Task Force
Marine Region 7
South Coast Region 5
Wildlife Branch
Department of Parks and Recreation
Department of Public Health
Department of Transportation
Division of Aeronautics, Office of Airports
Department of Toxic Substance Control
Region 4
Department of Veterans Affairs
Environmental Protection Agency
Air Resources Board
Office of Environmental Health Hazard Assessment
Office of the Secretary
Natural Resources Agency
Office of Historic Preservation
State Lands Commission
State Water Resources Control Board
Los Angeles Regional Water Quality Control Board
San Diego Regional Water Quality Control Board
Santa Ana Regional Water Quality Control Board
Wildlife Conservation Board

State of Hawaii
Office of the Governor
State Senators (all)
State Representatives (all)
Department of Business, Economic Development, and Tourism

Hawaii Coastal Zone Management Program
State Land Use Commission
Department of Hawaiian Home Lands, Office of the Chairman
Department of Health
Department of Land and Natural Resources
Division of Aquatic Resources
Division of Conservation and Resources Enforcement
Division of Forestry and Wildlife
Division of State Parks
Historic Preservation Division
Island Burial Councils (Hawaii, Kauai/Niihau, Maui/Lanai, Molokai, and Oahu)
Office of Conservation and Coastal Lands
Department of Transportation
Airports Division
Harbors Division
Office of Hawaiian Affairs

<u>Local - California</u>

City of Avalon
City of Coronado
City of Dana Point
City of Huntington Beach
City of Imperial Beach
City of Laguna Beach
City of Long Beach
City of Los Angeles
City of Malibu
City of Newport Beach
City of Oceanside
City of San Diego
County of Los Angeles
County of Orange
County of San Diego
Port of Long Beach
Port of Los Angeles
San Diego Unified Port District

<u>Local - Hawaii</u>
City and County of Honolulu
County of Hawaii
County of Kauai
County of Maui

E.2.1.2 Postcard Mailers

On 21 July 2010 postcards were mailed to 1,288 organizations and individuals on the HSTT project mailing list, which was compiled from previous Hawaii and Southern California Navy NEPA project mailing lists, with the scoping meeting dates, locations, and times.

E.2.1.3 Press Releases

Press releases to announce the Notice of Intent were distributed on 15 July 2010.

E.2.1.4 Newspaper Display Advertisements

Advertisements were made to announce the scoping meetings in the following cities and newspapers on the dates indicated below:

San Diego	Long Beach	Maui
Union Tribune	*Long Beach Press-Telegram*	*Maui News*
Saturday, July 17, 2010	Saturday, July 17, 2010	Saturday, July 17, 2010
Sunday, July 18, 2010	Tuesday, July 20, 2010	Sunday, July 18, 2010
Monday, July 19, 2010	Wednesday, July 21, 2010	Monday, July 19, 2010
Wednesday, July 21, 2010	Thursday, July 22, 2010	Thursday, August 12, 2010
Wednesday, July 28, 2010	Friday, July 30, 2010	Sunday, August 22, 2010
Monday, August 2, 2010	Tuesday, August 3, 2010	Wednesday, August 25, 2010
Tuesday, August 3, 2010	Wednesday, August 4, 2010	Thursday, August 26, 2010
Wednesday, August 4, 2010	Thursday, August 5, 2010	Friday, August 27, 2010

Honolulu/Oahu	Lihue/Kauai	Hilo/Big Island
Honolulu Star-Advertiser	*The Garden Island*	*Hawaii Tribune-Herald*
Saturday, July 17, 2010	Saturday, July 17, 2010	Saturday, July 17, 2010
Sunday, July 18, 2010	Sunday, July 18, 2010	Sunday, July 18, 2010
Monday, July 19, 2010	Monday, July 19, 2010	Monday, July 19, 2010
Tuesday, August 10, 2010	Monday, August 9, 2010	Wednesday, August 11, 2010
Wednesday, August 18, 2010	Thursday, August 19, 2010	Thursday, August 19, 2010
Monday, August 23, 2010	Sunday, August 22, 2010	Tuesday, August 24, 2010
Tuesday, August 24, 2010	Monday, August 23, 2010	Wednesday, August 25, 2010
Wednesday, August 25, 2010	Tuesday, August 24, 2010	Thursday, August 26, 2010

E.2.2 Scoping Meetings

Six scoping meetings were held on August 4, 5, 24, 25, 26, and 27 in the cities of San Diego, CA; Lakewood, CA; Lihue, HI; Honolulu, HI; Hilo, HI; and Kahului, HI, respectively. At each scoping meeting, staffers at the welcome station greeted guests and encouraged them to sign in to be added to the project mailing list to receive future notifications. In total, 131 people signed in at the welcome table. The meetings were held in an open house format, presenting informational posters and written information, with Navy staff and project experts available to answer participants' questions. Additionally, a digital voice recorder was available to record participants' oral comments. The interaction during the information sessions was productive and helpful to the Navy.

What is a scoping meeting?

The scoping period determines the extent of the EIS in terms of significant issues. Scoping meetings allow the face-to-face exchange of information and ideas to ensure relevant topics are identified and properly studied and that the Draft EIS is thorough and balanced.

E.2.3 PUBLIC SCOPING COMMENTS

Scoping participants submitted comments in five ways:

- Oral statements at the public meetings (as recorded by the tape recorder)
- Written comments at the public meetings
- Written letters (received any time during the public comment period)
- Electronic mail (received any time during the public comment period)
- Comments submitted directly on the project web site (received any time during the public comment period)

In total, the Navy received comments from 72 individuals and groups during the scoping comment period. Because many of the comments addressed more than one issue, 228 total comments resulted. Table E-1 provides a breakdown of areas of concern based on comments received during scoping. The summary following Table E-1 provides an overview of comments and is organized by area of concern.

Table E.2-1: Public Scoping Comment Summary

Area of Concern	Count	Percent of Total
Sonar/Underwater Detonations	44	19.3%
Marine Mammals	43	18.9%
Other	30	13.2%
Fish/Marine Habitat	29	12.7%
Meeting/NEPA Process	11	4.8%
Alternatives	10	4.4%
Regional Economy	9	3.9%
Noise	9	3.9%
Threatened and Endangered Species	8	3.5%
Proposed Action	7	3.1%
Water Quality	6	2.6%
Air Quality	5	2.2%
Depleted Uranium	5	2.2%
Public Health and Safety	4	1.8%
Cumulative Impacts	4	1.8%
Terrestrial/Birds	3	1.3%
Recreation	1	0.4%
TOTAL	**228**	

E.2.3.1 Sonar and Underwater Detonations

Many comments mentioned concerns about the effect of Navy sonar on marine life, such as marine mammals, fish, sea turtles, and sea invertebrates. Participants frequently requested that the EIS/OEIS consider alternative technologies to mid-frequency active sonar.

E.2.3.2 Biological Resources-Marine Mammals

A significant number of participants expressed concerns about impacts to marine mammals, primarily from the use of Navy sonar. It was frequently requested that the EIS/OEIS consider alternative technologies to mid-frequency active sonar.

E.2.3.3 Other

This category of comments expressed the desire to close all military bases, that all military activities should cease, and the land be returned to the native Hawaiian people. There were several comments expressing that activities be performed elsewhere.

E.2.3.4 Biological Resources-Fish and Marine Habitat

A significant number of participants expressed concerns about impacts to fish and marine habitat.

E.2.3.5 Meetings/National Environmental Policy Act Process

Comments on the National Environmental Policy Act (NEPA) process included several that felt the information available during the scoping process was inadequate to provide informed comments. There was one comment stating that the Navy HSTT informational video was too basic. There were also comments received indicating a desire for more active public participation at scoping meetings via public speaking at the scoping meetings.

E.2.3.6 Alternatives

Most comments regarding alternatives were in opposition to the current training and testing activities of the Navy in general. Many expressed concerns about the perceived expansion of the training and testing activities area that now includes an adjusted Study Area and a transit corridor between Hawaii and California.

E.2.3.7 Regional Economy

There were several comments regarding regional economic concerns, including questions about the effects on commercial shipping and commercial fishing.

E.2.3.8 Noise

Many participants in the commenting process wanted to know what the noise impacts would be to marine mammals and how they would be protected from acoustic trauma.

E.2.3.9 Threatened and Endangered Species

Concerns in this area were about ensuring that endangered marine mammals and other species would not be harmed during Navy activities.

E.2.3.10 Proposed Action

The comments pertaining to the Proposed Action requested more details on the web site regarding the planned activities and request for a timeline to be presented for the use of the HSTT area.

E.2.3.11 Biological Resources-Onshore

Terrestrial issues mentioned were concerns about habitat fragmentation and potential damage to intertidal, inland, or upland resources.

E.2.3.12 Water Quality

Water quality comments included general concerns about the potential contaminants in the water.

E.2.3.13 Air Quality

Comments in this category expressed concern about the effects of military activities on air quality, including off-shore emissions.

E.2.3.14 Depleted Uranium

The concern with depleted uranium was the effect of its use on the environment in general.

E.2.3.15 Public Health and Safety

One comment was made regarding the safety challenge of military ship transits through San Diego Bay. Another participant expressed concern over the effect on people of sonar testing.

E.2.3.16 Cumulative Impacts

Comments in this category expressed concern about the overall impact of military activity in the HSTT Study Area.

E.2.3.17 Terrestrial/Birds

Comments in this area addressed the impact of training activities on birds and the land.

E.2.3.18 Recreation

One comment regarding recreation was concerned about how all levels of Navy sonar use would impact recreational activities.

E.3 PUBLIC COMMENT PERIOD FOR THE DRAFT ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT

The 60-day public comment period on the Draft EIS/OEIS began with the issuance of the Notice of Availability and a Notice of Public Meetings in the Federal Register on 11 May 2012 (Appendix B; Federal Register Notices). The public comment period began on 11 May 2012 and concluded on 10 July 2012. The Navy made significant efforts to notify the public to ensure maximum public participation during the public comment period, including using postcards, press releases, and newspaper display advertisements.

The Notice of Public Meetings included a project description and dates and locations of the five public meetings. The public comment period allowed a variety of opportunities for the public to comment on the Draft EIS/OEIS (Appendix B; Federal Register Notices). Copies of the Draft EIS/OEIS were provided to seven libraries in California and Hawaii, and the document was available on the project web site for review. Navy representatives were available during the open house public meetings to provide information and answer questions one-on-one. Comment sheets were made available to attendees.

Commenters provided their input on the Draft EIS/OEIS in letters submitted through mail, written or oral comments received at the public meetings, and via the project web site. The Navy also received form letters from one non-governmental organization and a petition from another non-governmental organization. Approximately 76,000 copies of one form letter were received, and there was an online petition that generated approximately 477,000 signatures (See Sections E.3.2.1 and E.3.2.2, respectively).

Additionally, during the 60-day public comment period, comments were received from 5 federal agencies, 10 state/local/regional agencies, 2 Native-American Tribes, 18 non-governmental organizations, and approximately 850 private individuals (approximation due to duplicate comments received).

Tables E.3-1, E.3-2, E.3-3, and E.3-4 provide a listing of all comments received on the Draft EIS/OEIS and the Navy's response. Each row in these tables presents the identification of the commenter, the comment, and the Navy's response to the comment. Because many commenters touched on more than one topic, the commenter's topics were separated into individual comments, assigned a number, and responded to separately. The commenter's name is abbreviated when the comment is broken into more than one topic. The comment numbering system also captures whether the comment was received electronically via HSTTEIS.com or a computer at one of the public meetings, in written form by mail or during a public meeting, or orally during public testimony at a public meeting. For example, the first of the agency comments is by the U.S. Environmental Protection Agency, Region IX. Since their comments cover several topics, these are separated into subsequent comments named USEPA-02, USEPA-03, etc.

Responses to all comments were prepared and reviewed for scientific and technical accuracy and completeness. Comments appear as they were submitted and have not been altered with the exception that expletives and personal information were removed, as necessary.

Table E.3.2-1 contains comments from federal, state, and local agencies received during the public comment period and the Navy's response.

This Page Intentionally Left Blank

Table E.3-1: Responses to Comments from Agencies

Commenter	Comment	Navy Response
U.S. Environmental Protection Agency – Region IX-01 (Written)	We have rated the DEIS as Environmental Concerns- Insufficient Information (EC-2) (see enclosed "Summary of Rating Definitions"), based on the adverse impacts to marine resources described in the DEIS, and our concern that the information provided in the document does not sufficiently assess such impacts. While we defer to the National Marine Fisheries Service's expertise regarding the likely adverse affect of proposed project on marine mammals and sea turtles, we believe that the FEIS would benefit from improved and corrected disclosure of impacts. Please see the enclosed detailed comments for more information regarding our concerns. EPA appreciates the opportunity to review this DEIS. When the Final EIS is released for public review, please send one copy to the address above (mail code: CED-2). If you have any questions, please contact me at (415) 972-3521 or Tom Kelly, the lead reviewer for this project, at 415-972-3856 or kelly.thomasp@epa.gov.	Navy responses are provided to the specific comments below. A copy of the Final EIS/OEIS will be delivered to U.S. EPA Region IX per the request.
USEPA-02	Acoustic Impacts The DEIS frequently mentions the Navy Acoustic Effects Model as the source of the estimates of impacts on marine mammals and sea turtles. The Navy's website contains a supporting technical document that discusses the model and its results. While the supporting technical document appears consistent in many respects with the DEIS, the hours of sonar operation modeled in the technical report (Table 14) differ from the hours of sonar use in the DEIS (Table 3.0-8) for some source classes. For example, the technical report indicates the hours of operation for Sonar Source Class LF-4 (Low-frequency sources equal to 180 dB and up to 200 dB) for the preferred alternative is 87 hours, while the DEIS indicates that number is 2,157. Similarly, the number of mammal species experiencing permanent threshold shift (i.e., permanent noise-induced hearing damage) differs between the reports. For example, the technical report indicates that annual testing events would result in permanent threshold shift for nearly 5,850 Short-Beaked Common Dolphins (Table 19), while the DEIS indicates that number would be 309 (Table 3.4-14). Recommendation: The FEIS should correct any discrepancies between the technical report and the FEIS.	Late changes to the technical document were not included in the Draft EIS/OEIS, but have been corrected in the Final EIS/OEIS. The Technical Report itself has been revised also, and can be found on the HSTTEIS.com website.

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
USEPA-03	Mitigation Measures Ramp-Up The DEIS clarifies the distinction between training and testing in Section 1.4, emphasizing the need for training to "be as realistic as possible to provide the experiences so important to success and survival" (p. 1-5). It separates testing into several categories: scientific research and testing, private contractor testing, developmental testing, operational testing, fleet training support, follow-on test evaluation and maintenance and repair testing (1-7). We note that, under the preferred alternative, sonar testing results in more level A harassment to marine mammals than does sonar training. Mitigation considered but rejected from the DEIS discusses the concept of sonar "[r]ampup procedures, (slowly increasing the sound in the water to necessary levels)" (p. 5-55), which appears to be a process that greatly reduces the effects of sonar for many testing processes. Ramp up procedures are dismissed for training because they would not allow the Navy to "train as they fight," but the DEIS also states, "ramp-up procedures have been used in testing." Recommendation: The FEIS should include a more thorough discussion of ramp-up, either as a mitigation measure or an operational procedure, for testing (not training) activities listed in Chapter 2. We recognize that ramp-up would not be appropriate in many sonar testing procedures (e.g. where testing is concurrent with training), but the FEIS should disclose the circumstances under which it would be compatible with testing.	The Navy has considered ramp-up of sound sources during testing, and very rarely practices this procedure (only as needed). For a description of those rare circumstances when a ramp-up is necessary, see Section 5.3.4.2.1 (Implementing Active Sonar Ramp-Up Procedures During Testing) of Chapter 5 in the Draft EIS/OEIS. However, in most cases a ramp-up is either ineffective or would impact the purpose of the test event. Regarding the effectiveness and practicality of ramp-up for testing, the following points are provided for explanation: 1. Most testing must be performed "realistically" as in training, either as the stated goal of the particular test, or because the test is "piggy-backing" on a training event, where ramp-up would be counter to the training objectives. 2. Some tested systems are either "on" or "off" and can't be ramped up. 3. Nearly all of the potential effects to marine mammals result from sound sources that have significant intervals between "pings," and are on moving platforms, typically ships. Because the ship is moving, the ramp up of a signal would begin in one location, but the increased, or "ramped up" signal would be generated in a different location, nullifying the effect of the lower energy ramp-up signal. For example, the ASW sonar used on a DDG will nominally transmit at 50 second intervals. A ship traveling at 15 nautical miles per hour (a typical speed) would move approximately 400 yards in the time between pings. 4. Finally, the summation of energy is what contributes to most effects, and a ramp up before actual training or testing could begin would require putting more total sound energy into the water and result in more exposure to marine species.
USEPA-04	Identification of Cautionary Areas and Coral Reef Resources The DEIS discusses the designation of a humpback whale cautionary area, "which consists of a 5 km (3 .1 miles) buffer zone that has been identified as having one of the highest concentrations of humpback whales during the critical winter months" (p. 5-45). From December 15 to April 15, the cautionary area will only be used for training if approval is granted by the commander of the U.S. Pacific Fleet, taking into account "the Navy's commitment to fully consider and balance mission requirements with environmental stewardship" (p. 5.45-46). It is not clear whether the area identified in the DEIS as a cautionary area is within or consistent with the boundaries of the Hawaiian	A figure depicting the Navy Humpback Whale Cautionary Area (Figure 5.3-1) has been added to Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS. Maps showing coral locations are located in the Marine Habitats section, Figures 3.3-3 through 3.3-6. The Navy Humpback Whale Cautionary Area is not intended to prevent Navy activities from taking place in the Cautionary Area, nor is it intended to provide protection for coral. The Protective Measures Assessment Protocol is not merely a

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	Islands Humpback Whale National Sanctuary managed by NMFS. The DEIS also includes a mitigation measure to limit training and testing within 350 yards of coral reefs (p. 5-46). While it discusses the inclusion of coral reefs and other protected areas in the Navy's mapping program, known as the Protective Measures Protocol Assessment, the DEIS does not include a map of these areas. Recommendation: The FEIS should clarify the relationship, if any, of the Humpback Whale Cautionary Area to the Hawaiian Islands Humpback Whale National Sanctuary, and include a map of the Area, as well as a map of coral reefs that will be avoided. By including these maps in the FEIS, or making them available through a link similar to DEIS technical reports, the Navy and NMFS could invite comments on the accuracy or thoroughness of the maps from researchers and ocean protection groups.	"mapping program." As described in Section 5.2.2.2 (Protective Measures Assessment Protocol), the protocol is a decision support and situational awareness tool that provides information about required mitigation, a visual display of the exercise area, the unit's position relative to the target area, and any relevant environmental data.
International Boundary and Water Commission (Written)	During our review of the EIS it appears that the operations conducted under this EIS do not impact any of the property or interests of the USIBWC, however, the USIBWC would like to note the location of the South Bay Ocean Outfall located off shore of Imperial Beach. The South Bay Ocean Outfall extends 23,600 feet in a westerly direction from near the mouth of the Tijuana River. The South Bay Ocean Outfall is a treated wastewater effluent pipe containing a vertical drop shaft located on the land that descends 190 feet to a horizontal tunnel that extends 18,970 feet under the ocean floor to a riser assembly that ascends 160 feet to the seafloor. At the seafloor the outfall extends 4,670 feet west along the seafloor to a wye diffuser. From this wye diffuser, two diffuser legs extend 1,974 feet north and south and terminate at a depth of approximately 93 feet below sea level. The terminus of the diffuser is located at Latitude 32° 32' 15" North and Longitude 117° 11' 00" West. The outfall, based on the maps provided in the EIS, lies slightly to the east of the HSTT in this area, however, any operations in the area of the outfall should use caution as any unmanned and manned vehicles, munitions, and divers could present a hazard to the outfall. Thank you again for the opportunity to review and comment on the subject document for the proposed project. Should you or your staff have questions, please contact me at (915) 832-4749 or Mr. Wayne Belzer at (915) 832-4703.	The Navy appreciates this information.
Marine Mammal Commission-01 (Written)	The Marine Mammal Commission recommends that the Navy- • revise the DEIS by expanding the range of alternatives under consideration to include at least one with lower levels of training and testing activities. Doing so is particularly important at this time when decision-makers may be faced with the choice of reducing the Navy's budget and, if they do so, they should be well informed about the environmental consequences of the various decisions that they might make;	The Navy developed the alternatives considered in this EIS/OEIS after careful assessment of the Navy's training and testing requirements by subject matter experts, including military units and commands that utilize the ranges, military range management professionals, and Navy environmental managers and scientists. The environmental consequences of individual activities (e.g., torpedo exercises, mine countermeasures exercises, tracking exercises, etc.) have been analyzed in the EIS/OEIS with sufficient detail to inform the decision maker of the environmental consequences of making a budget-related

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
		reduction in training or testing activity if needed.
MMC-02	• revise the discussion of North Pacific right whales by (1) moving it from the section on species unlikely to be found in the study area (i.e., 3.4.1.1) to the section discussing other marine mammals in the study area (i.e. section 3.4.2) and (2) expanding it to provide a more complete review of their status and threats; • undertake research to determine if North Pacific right whales use or regularly migrate through Navy training and testing areas in the Pacific during fall and winter months-that research should include satellite telemetry studies to identify the migratory routes and overwintering areas of whales using summer feeding grounds in the Southeast Bering Sea and passive acoustic monitoring to detect right whale vocalizations in the Hawaii and southern California training and testing areas;	Applying the best scientific information available, and as described in the Draft EIS/OEIS, there is ample evidence to support the Navy's conclusion that North Pacific right whales are unlikely to be present in the Study Area. Further, with no density information on this species for the Study Area, no quantitative impact analysis could be conducted. While new research that goes beyond existing studies are not required for an EIS, the Navy will continue to work with its Scientific Advisory Group to determine new opportunities for coherent and synergistic research.
MMC-03	• adjust all acoustic and explosive thresholds for low-, mid-, and high-frequency cetaceans by the appropriate amplitude factor (e.g., 16.5 or 19.4 dB), if it intends to use the type II weighting functions as depicted in Figure 6 of Finneran arid Jenkins (2012);	The thresholds were adjusted based on weighting the exposures from the original research from which the thresholds were derived with the Type II weighing functions. The weighted threshold is not derived by a simple amplitude shift.
MMC-04	• explain why Kastak et al. (2005) data were used as the basis for explosive thresholds in pinnipeds and specify the extrapolation process and factors used as the basis for associated TTS thresholds;	The same offset between impulsive and non-impulsive temporary threshold shift found for the only species where both types of sound were tested (beluga) was used to convert the Kastak data (which used non-impulsive tones) to an impulsive threshold. This method is explained in Finneran and Jenkins (2012) and Southall et al. (2007).
MMC-05	• provide detailed information regarding how it determined marine mammal takes that occur when multiple types (i.e., acoustic, explosive, and non-explosive impulsive) of sound producing sources of varying frequencies (i.e., low, mid, and high) are used simultaneously;	Events involving multiple source types (e.g., acoustic vs. explosive) are treated as separate events, and the sound exposure levels are not summed. Furthermore, in most cases, explosives and sonar are not used within the same activities and therefore are unlikely to affect the same animals over the same time period. Energy is summed for multiple exposures of similar source types. For sonars, including use of multiple systems within any scenario, energy is accumulated within the following four frequency bands: low-frequency, mid-frequency, high-frequency, and very-high-frequency. After the energy has been summed within each frequency band, the band with the greatest amount of energy is used to evaluate the onset of PTS or TTS. For explosives, including use of multiple explosives in a single scenario, energy is summed across the entire frequency band. Please see *Determination of Acoustic Effects on Marine Mammals and Sea Turtles for the Phase II Hawaii-Southern California Fleet Training and Testing EIS/OEIS* (Naval Undersea Warfare Center 2012) on the HSTTEIS.com website for additional explanation.

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
MMC-06	• use its spatially and temporally dynamic simulation models to estimate strike probabilities for specific activities (i.e., movements of vessels, torpedoes, unmanned underwater vehicles and expended munitions, ordnance, and other devices) rather than using simple probability calculations;	The recommendation of the Marine Mammal Commission to use a dynamic simulation model to estimate strike probability was considered, but the Navy found that use of historical data was more appropriate for the analysis. The strike probability analysis completed in this EIS/OEIS is based upon actual data collected from historical use of vessels, in-water devices, and military expended materials and the likelihood that these items may even have the potential to strike an animal. These data account for real world variables over the course of many years, and any model would be expected to be less accurate than the use of actual data.
MMC-07	• provide the predicted average and maximum ranges for all criteria (i.e., behavioral response, ITS, PTS, onset slight lung injury, onset slight gastrointestinal injury, and onset mortality), for all activities (i.e., based on the activity category and representative source bins), and all functional hearing groups of marine mammals;	Ranges to effects for all criteria and functional hearing groups are provided for representative active sonars (Section 3.4.3.2.1.1, Range to Effects) and explosives (Section 3.4.3.2.2.1, Range to Effects). The representative sources include the most powerful active sonar source and the largest proposed charge weight analyzed. The Navy needs to conduct testing and training in a variety of environments having variable acoustic propagation conditions. These variations in acoustic propagation conditions are considered in the Navy's acoustic modeling and the quantitative analysis of acoustic impacts; average ranges to effect are provided in the EIS to show the reader typical zones of impact around representative sources.
MMC-08	• use passive and active acoustics, whenever practicable, to supplement visual monitoring during the implementation of its mitigation measures for all activities that generate sound;	Passive acoustic monitoring is already and will continue to be implemented with several activities (e.g., Improved Extended Echo Ranging sonobuoys and torpedo [explosive] testing). I As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
		ship and aircraft and then provide “a crude estimate” of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, “(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching.” When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60’. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in “calm sea conditions” is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier’s and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the “one or two personnel” described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy’s reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
MMC-09	• cease the use of its sound sources (including explosive activities that do not use time-delay firing devices) and not reinitiate them for periods at least as long as the maximum dive times of the species observed (if identified to species) or likely to be encountered (if species identification is uncertain), after the sighting of one or more marine mammals within or about to enter a mitigation zone;	As described in the Final EIS/OEIS in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring), a 30 min. wait period more than covers the average dive times of most marine mammal species but may not be sufficient for some deep-diving marine mammal species or for sea turtles. However, the analysis in Section 3.4.3.1.1 (Non-Impulsive and Impulsive Sound Sources) shows that injury to deep-diving marine mammals (e.g., sperm whales and beaked whales) is not expected to occur. Furthermore, any wait period greater than 30 min. would result in an unacceptable operational impact on readiness.
MMC-10	• adjust the size of the mitigation zone for mine neutralization events using the average swim speed of the fastest swimming marine mammal occurring in the area where time-delay firing devices would be used to detonate explosives;	The principles of HSTT time-delay firing device mitigation are similar to those contained within the 2011 VACAPES Letter of Authorization. For time delay activities, the mitigation zone is 1,000 yd. for all charge sizes (5, 10, and 20 lb. charges) and for a maximum time-delay of 10 min. The mitigation zone takes into account a portion of the distance that a marine mammal could potentially travel during the time delay. However, the mitigation zone was set at 1,000 yd. because that is the maximum distance that Lookouts in two small boats can realistically observe. The use of more than two boats for observation during this activity presents an unacceptable impact to readiness due to limited personnel resources. If a swim speed of 3 knots (101 yd./min.) (A nominal average for a delphinid in this area) is considered, the 1,000-yd. mitigation zone results in coverage of the potential range to mortality for all charges, including up to a 9 min. time delay. Furthermore, the mitigation zone covers the potential range to injury for 5 lb. charges, including up to a 6 min. time delay, and for 10 lb. and 20 lb. charges, including up to a 5 min. time delay. The 3 knot swim speed, therefore, was a consideration, but not the only determining factor in development of the time delay mitigation zones; therefore, considering different swim speeds would not result in a change to or expansion of the mitigation zone size for time delay activities. The Navy asserts that the 1,000 yd. time delay zone is both practical and protective. The proposed AFTT mitigation zone covers the entire predicted maximum range to PTS as well as a portion of the estimated swim speed distance. Due to practicality of implementation and impact on the effectiveness of the military readiness activity, the proposed mitigation zone represents the maximum distance that Lookouts on small boats can adequately observe given the number of personnel who will be involved. The use of more than two boats for observation

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
		during this activity presents an unacceptable impact on readiness due to limited personnel and equipment resources. Takes that cannot be avoided through mitigation are considered in the MMPA permitting process. Species-specific identification of marine mammals is not a Lookout requirement; therefore, a single activity-specific waiting time is needed between species.
MMC-11	• revise its DEIS by (1) including in its cumulative impacts analysis all potential risk factors, whether they are deemed individually significant or negligible and (2) describing the specific details needed for 'the reader to evaluate the utility of the Navy's conceptual framework for its cumulative impacts analysis.	As stated in Section 4.4.1 (Resource Areas Dismissed from Current Impact Analysis) of the Draft EIS/OEIS, in accordance with Council on Environmental Quality guidance, the cumulative impacts analysis focused on impacts that are “truly meaningful.” This was accomplished by reviewing the direct and indirect impacts that would occur on each resource under each of the alternatives. Key factors considered were the current status and sensitivity of the resource and the intensity, duration, and spatial extent of the impacts of each potential stressor. In general, long-term rather than short-term impacts and widespread rather than localized impacts were considered more likely to contribute to cumulative impacts. Those impacts to a resource that were considered to be negligible were not considered further in the analysis. The level of analysis for each resource was commensurate with the intensity of the impacts identified in Chapter 3 (Affected Environment and Environmental Consequences).
MMC-12	The no action alternative In this and several prior environmental impact statements for various range complexes, the Navy uses the term "no action" to mean continued use at the current level. The Navy cites guidance from the Council on Environmental Quality as the basis of its selection of this baseline as the no action alternative against which other alternatives are compared. The Council on Environmental Quality has published guidance (http://ceq.hss.doe.gov/nepa/regs/40/1-10.HTM) that posits two alternative interpretations of what constitutes no action. The first is that the action would not take place at all. Under this alternative, the impacts of the other alternatives would be assessed against not conducting any training or testing activities. As characterized by the Navy (page 2-62), the second interpretation "allows the No Action Alternative to be thought of in terms of continuing with the present course of action until that action is changed." The referenced guidance states that- The first situation might involve an action such as updating a land management plan where ongoing management programs initiated under existing legislation and regulations will continue, even as new plans are developed. In these cases "no action" is "no change" from current management direction or level of management intensity. To construct an alternative that is based on no management at	The Navy developed the alternatives considered in this EIS/OEIS after careful assessment by subject matter experts, including military units and commands that utilize the ranges, military range management professionals, and Navy environmental managers and scientists. A reduction in training and testing activities would fail to meet the Purpose and Need and would not allow the Navy to meet its obligations under Title 10. Refer to Section 2.5 (Alternatives Development) of the Draft EIS/OEIS for an explanation of the alternatives development. The Navy has analyzed individual activities within the document with sufficient detail to inform a decision-maker of the environmental consequences of a making a future budget-related reduction in training or testing activities.

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	all would be a useless academic exercise. Therefore, the "no action" alternative may be thought of in terms of continuing with the present course of action until that action is changed. Consequently, projected impacts of alternative management schemes would be compared in the EIS to those impacts projected for the existing plan. In this case, alternatives would include management plans if both greater and lesser intensity, especially greater and lesser levels of resource development. (Emphasis added) The Navy has chosen to use a continuation of current activities as the no action alternative. The Commission understands that choice and considers it reasonable as long as the environmental impacts of all major current activities have been assessed appropriately. However, the Commission must question the selection of the other alternatives because, as a set, they do not satisfy the requirement under the applicable guidance that the DEIS consider management of both greater and lesser intensity. Therefore, the Marine Mammal Commission recommends that the Navy revise the DEIS by expanding the range of alternatives under consideration to include at least one with lower levels of training and testing activities. Doing so is particularly important at this time when decision makers may be faced with the choice of reducing the Navy's budget and, if they do so, they should be well informed about the environmental consequences of the various decisions that they might make.	
MMC-13	Marine mammal occurrence Sections 3.4.1 and 3.4.2 in the DEIS are very well drafted generally. Those sections include relevant, up-to-date, and accurate information on most species of marine mammals. However, the Navy assumed that North Pacific right whales would be unlikely to occur in either the Hawaii or Southern California study areas. It stated that the presence of North Pacific right whales in the study area is extremely low, as they have been sighted only rarely in the Bering Sea and Gulf of Alaska in recent years. Although sightings of right whales in the study area are rare, this may be due to the small size the North Pacific right whale population rather than a lack of importance of the area as habitat for the species. In recent years, a few North Pacific whales have been seen in the southeast Bering Sea every summer since 1997 when regular efforts to look for them began (Wade et al. 2011). Those sightings indicate that the southeast Bering Sea is an important summer feeding area for the small number of remaining whales. The whales' winter habitat, however, remains unknown and requires further research to identify. All other right whale populations whose winter habitats are known make annual migrations between summer high-latitude feeding grounds and lower-latitude calving grounds. That being the case, right whales feeding in the summer in the southeastern Bering Sea and along the Kurile Islands are likely to migrate to lower latitudes in the winter. Rare as they may be, sightings of right whales in Hawaiian waters indicate that	Applying the best scientific information available, and as described in the Draft EIS/OEIS, there is ample evidence to support the Navy's conclusion that North Pacific right whales are unlikely to be present in the Study Area. Further, with no density information on this species for the Study Area, no quantitative impact analysis could be conducted. [Same as MMC-2. Awaiting validation from EAB.]

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	this area may be important for reproductive purposes or at least as part of a migratory corridor. Such habitat use patterns are supported by photographs matching an individual right whale in Hawaii and the southeast Bering Sea in 1996 (Kennedy et al. 2011). Therefore, the DEIS should be revised to note that although their occurrence around Hawaii is uncertain, waters off Hawaii could provide important migratory and winter habitats for North Pacific right whales. Accordingly, the Marine Mammal Commission recommends that the Navy revise the discussion of North Pacific right whales by (1) moving it from the section on species unlikely to be found in the study area (i.e., 3.4.1.1) to the section discussing other marine mammals in the study area (i.e. section 3.4.2) and (2) expanding it to provide a more complete review of their status and threats. Given the extremely endangered status of the North Pacific right whale and the possibility that the Pacific study area may include vital habitat for the species, the Marine Mammal Commission also recommends that the Navy undertake research to determine if North Pacific right whales use or regularly migrate through Navy training and testing areas in the Pacific during fall and winter months-that research should include satellite telemetry studies to identify the migratory routes and overwintering areas of whales using summer feeding grounds in the Southeast Bering Sea and passive acoustic monitoring to detect right whale vocalizations in the Hawaii and southern California training and testing areas.	
MMC-14	Criteria and thresholds The Navy proposes to estimate takes resulting from its activities by adjusting received sound levels at different frequencies based on the hearing sensitivity of various groups of marine mammals at those frequencies. The adjustments are based on "weighting" functions derived by Southall et al. (2007) and Finneran and Jenkins (2012; type I and type II weighting functions, respectively). Type I weighting functions (see Figure 1 in Southall et al. 2007) are flat over a wide range of frequencies and then decline at the extremes of the animal's hearing range. Type II weighting functions (Finneran and Jenkins 2012) are used only for cetaceans and combine the precautionary type I curves developed by Southall et al. (2007) with equal loudness weighting functions derived from empirical studies with bottlenose dolphins (Finneran and Schlundt 2011). The Commission considers the theory behind those weighting functions to be sound. However, the amplitudes of the final type II weighting functions appear to have been shifted, lowering the sensitivity at all frequencies by roughly 16-20 dB (compare Figures 2 and 6 of Finneran and Jenkins (2012)). For sonar-related activities Finneran and Jenkins (2012) reduced the acoustic thresholds for low- and mid-frequency cetaceans by 16.5 dB (presumably to account for the amplitude decrease in the type II weighting functions), but it appears that they did not apply a similar adjustment of 19.4 dB for high-frequency cetaceans. Because data are lacking for TTS thresholds for high-frequency cetaceans exposed to acoustic (i.e., tonal) signals, they appear to add a 6-dB correction factor to the TTS threshold derived from non-explosive impulsive sources (i.e., airguns)	The same offset between impulsive and non-impulsive TTS found for the only species where both types of sound were tested (beluga) was used to convert the Kastak data (which used non-impulsive tones) to an impulsive threshold. This method is explained in Finneran and Jenkins (2012) and Southall et al. (2007).

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	based on the method outlined in Southall et al. (2007). However, the Commission's understanding is that Southall et al. (2007) did not use the 6-dB factor to extrapolate between impulsive and acoustic thresholds, but rather to estimate PTS thresholds from TTS thresholds based on peak pressure levels. In addition, it is unclear how the explosive thresholds (i.e., for underwater detonations) were adjusted downward to account for the amplitude decrease in the type II weighting functions. If those thresholds were not adjusted by the appropriate amplitude factor, the Navy may have underestimated takes of marine mammals. To address these concerns, the Marine Mammal Commission recommends that the Navy adjust all acoustic and explosive thresholds for low-, mid-, and high-frequency cetaceans by the appropriate amplitude factor (e.g., 16.5 or 19.4 dB), if it intends to use the type II weighting functions as depicted in Figure 6 of Finneran and Jenkins (2012). For determining TTS thresholds for pinnipeds for underwater detonations, the Navy used data from Kastak et al. (2005) and extrapolation factors from Southall et al. (2007). Kastak et al. (2005) estimated the average sound exposure level for onset-TTS for pinnipeds exposed to octave band underwater sound centered at 2.5 kHz (i.e., mid-frequency sound). However, underwater detonations produce broadband sound in the low-frequency range. The Commission recognizes that Kastak et al. (2005) may be the only available data, but those data may not provide an appropriate basis for estimating those thresholds. Furthermore, the extrapolation factors from Southall et al. (2007) were not stated specifically in the Navy's analysis for underwater detonations, but it appears that they used 6 dB. As noted in the previous paragraph, Southall et al. (2007) seem to use 6 dB as the extrapolation factor for determining PTS thresholds from TTS thresholds based on peak sound pressure levels, not for extrapolating from acoustic to explosive thresholds. Thus, the Commission is unsure why thresholds based on octave-band mid-frequency sound were used for underwater detonations and what extrapolation factors were used and why. Therefore, the Marine Mammal Commission recommends that the Navy explain why Kastak et al. (2005) data were used as the basis for explosive thresholds in pinnipeds and specify the extrapolation process and factors used as the basis for associated TTS thresholds.	
MMC-15	Modeling methods Some of the Navy's activities involve the simultaneous use of multiple source types (i.e., acoustic, explosive, non-explosive impulsive) that generate sound within various frequency bands (i.e., low, mid, and high). To account for activities involving those sources, the Navy has proposed to sum all sound exposure levels received by an animal in each frequency band. However, the DEIS did not describe how the Navy would sum the sound exposure levels from multiple source types (e.g., acoustic vs. explosive). It also did not explain how the various thresholds for those different source types would be	Events involving multiple source types (e.g., acoustic vs. explosive) are treated as separate events and the sound exposure levels are not summed. Furthermore, in most cases, explosives and sonar are not used within the same activities and therefore are unlikely to affect the same animals over the same time period. Energy is summed for multiple exposures of similar source types. For sonars, including use of multiple systems within any scenario, energy is accumulated within the following four frequency bands: low-frequency, mid-frequency, high-frequency, and very high frequency. After the energy has been

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	prioritized and applied. In such cases with multiple source types, a simple summation of sound exposure levels may not necessarily estimate takes accurately. In addition, the Navy used three different types of propagation models: the Comprehensive Acoustic System Simulation/ Gaussian Ray Bundle model for acoustic sources, Reflection and Refraction in Multilayered Ocean/Ocean Bottoms with Shear Wave Effects model for explosive sources, and the Range-Dependent Acoustic Model for non-explosive impulsive sources. The DEIS and supporting technical documents did not provide (1) information regarding how the Navy integrated propagation of sound from those three models into its effects model and (2) details regarding how sound exposure levels would be summed. Again, it is not clear whether a basic summation of those sound exposure levels is appropriate. If the Navy used some other algorithm for this summation, it should explain that algorithm. For all of these reasons, the Marine Mammal Commission recommends that the Navy provide detailed information regarding how it determined marine mammal takes that occur when multiple types (i.e., acoustic, explosive, and non-explosive impulsive) of sound-producing sources of varying frequencies (i.e., low, mid, and high) are used simultaneously.	summed within each frequency band, the band with the greatest amount of energy is used to evaluate the onset of PTS or TTS. For explosives, including use of multiple explosives in a single scenario, energy is summed across the entire frequency band. Please see *Determination of Acoustic Effects on Marine Mammals and Sea Turtles for the Phase II Hawaii-Southern California Fleet Training and Testing EIS/OEIS* (Naval Undersea Warfare Center 2012) on the HSTTEIS.com website for additional explanation.
MMC-16	The Navy also estimated the probability of vessels, expended munitions, and non-explosive materials (e.g. sonobuoys) striking a marine mammal. The Navy's method for determining those strike probabilities was based on simple probability calculations. For example, it used a Poisson model to estimate the probability of ship strikes based on the historical rate of ship strikes. Although the use of the Poisson model is not unreasonable for modeling the occurrence of rare events, such as a ship striking a marine mammal, the assumption that the encounter rate will remain the same is questionable if the Navy increases the number of training and testing activities or if the abundance and distribution of marine mammals change. Such an approach may be appropriate for the no action alternative but is clearly deficient for assessing impacts of alternatives 1 and 2. To estimate the probability of spent munitions or non-explosive materials striking marine mammals, the Navy simply compared the aggregated footprint of some specific marine mammal species with the footprint of all objects that might strike them (DEIS Appendix G). Both of those were based only on densities of marine mammals in the action area and expected amount of materials to be expended within a year in those areas. By combining marine mammal densities and those activities over space and time into a single calculation sequence, the Navy provided only a crude estimate of strike probabilities for the "average" condition. Unfortunately, neither marine mammals nor Navy activities are distributed homogeneously in space or time. The Commission does not understand why the Navy did not incorporate spatial and temporal considerations to make its take estimation procedure more realistic biologically. The Navy's model for determining takes of marine mammals from sound-producing activities can account for moving sound sources and marine mammals. In that model, the Navy could adjust the data collected by the animat dosimeters from received sound level to a close approach	The recommendation of the Marine Mammal Commission to use a dynamic simulation model to estimate strike probability was considered, but the Navy found that use of historical data was more appropriate for the analysis. The strike probability analysis completed in this EIS/OEIS is based upon actual data collected from historical use of vessels, in-water devices, and military expended materials and the likelihood that these items may even have the potential to strike an animal. These data account for real world variables over the course of many years, and any model would be expected to be less accurate than the use of actual data.

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	distance and estimate strike probabilities more realistically. The Marine Mammal Commission recommends that the Navy use its spatially and temporally dynamic simulation models to estimate strike probabilities for specific activities (i.e., movements of vessels, torpedoes, unmanned underwater vehicles and expended munitions, ordnance, and other devices) rather than using simple probability calculations.	
MMC-17	Table 5.3-2 in the DEIS lists the Navy's predicted distances or ranges over which PTS might occur and recommended mitigation zones. The table categorizes sound sources by type (e.g., MF1:SQS-53 mid-frequency active hull-mounted sonar) and does not include all sources, but rather includes for each category (or bin) the average and maximum distances from the sound source at which PTS could be expected to occur. Chapter 3 of the DEIS also includes tables listing such ranges. However, in Chapter 3, the tables include only a subset of the proposed activities (6 of the 13 explosive activities analyzed) and the average rather than maximum ranges (see Tables 3.4-15). In addition, the DEIS does not provide the ranges to PTS for acoustic sources for more than one ping (Table 3.4-9), as it does for TTS (i.e., 1, 5, and 10 pings; Tables 3.4-10). Instead, the DEIS simply assumes that marine mammals would not maintain a nominal speed of 10 knots parallel to a ship and thereby receive sound from more than a single ping. Absent this kind of information, the DEIS process is not fully transparent and the Commission and public cannot comment on the appropriateness of the proposed mitigation zones. To address those shortcomings in the DEIS, the Marine Mammal Commission recommends that the Navy provide the predicted average and maximum ranges for all criteria (i.e., behavioral response, TTS, PTS, onset slight lung injury, onset slight gastrointestinal injury, and onset mortality), for all activities (i.e., based on the activity category and representative source bins), and all functional hearing groups of marine mammals.	Ranges to effects for all criteria and functional hearing groups are provided for representative active sonars (Section 3.4.3.2.1.1, Range to Effects) and explosives (Section 3.4.3.2.2.1, Range to Effects). The representative sources include the most powerful active sonar source and the largest proposed charge weight analyzed. The Navy needs to conduct testing and training in a variety of environments having variable acoustic propagation conditions. These variations in acoustic propagation conditions are considered in the Navy's acoustic modeling and the quantitative analysis of acoustic impacts; average ranges to effect are provided in the Environmental Impact Statement to show the reader typical zones of impact around representative sources. The range to effects from various acoustic sources are highly dependent on both operating characteristics and environmental variables. The grouping by bin takes into account operating characteristics of the sources and sources within a bin are by definition equal to or lesser in output than the source which represents the bin. It is therefore unnecessary and contrary to the binning approach to provide information for all sources individually. For explosives, it is reasonable to assume that the range for a bin not provided would fall between the next lowest and next highest bins. For these reasons, it is not necessary to provide all average and maximum ranges for all criteria and all sources or bins. With regard to ranges to PTS and as explained in Section 3.4 (Marine Mammals), because the ranges are so short for even the most powerful acoustic source of concern (hull mounted mid-frequency anti-submarine warfare sonar), the ship is moving, and the pings occur approximately every 50 seconds, there is not sufficient overlapping energy from one ping to the next to make presentation of multiple pings useful (each subsequent ping has the same approximate range to PTS from the bow of the ship as the first ping). As noted in the comment and presented in the Draft EIS/OEIS, an animal would have to be exposed to a TTS level first ping and then parallel the ship within close proximity for 50 seconds to receive a second ping potentially resulting in PTS. Given all the science detailed in the EIS/OEIS indicating that marine mammals will behaviorally avoid high levels of

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
		sound, the assumption that a marine mammal would not remain along-side a pinging vessel is a simple but reasonable assumption. As presented in the Draft EIS/OEIS, while 10 knots was the speed used in modeling the ship's speed of advance, a ship engaged in anti-submarine warfare training or testing would be moving at between 10 and 15 knots. In addition and as discussed in the Draft EIS/OEIS in Section 3.4.3.1.6.1 (Model Assumptions and Limitations), there are many other conservative inputs made with regard to the modeling that will tend to overestimate impacts such as assuming marine mammals are always facing the source and therefore hearing the maximum sound predicted for a location.
MMC-18	The DEIS notes that the use of observers (lookouts) would increase the likelihood of detecting marine mammals at the surface, but it also notes that the value of visual monitoring is limited and could not be relied on to avoid all impacts to all species. The Commission agrees and has made numerous recommendations to the Navy to characterize the effectiveness of visual observation. Importantly, the Navy is now working with collaborators at the University of St. Andrews to study observer effectiveness. The Commission believes those studies will be very useful once completed. However, until the results are available, the Commission also believes that the Navy should supplement its visual monitoring efforts with other measures rather than simply reducing the size of the zones it plans to monitor. The DEIS does propose to supplement visual monitoring using passive acoustics during activities that generate impulsive sounds (i.e., primarily for explosives), but does not propose the same during the use of (non-impulsive) low-, mid-, and high-frequency active sonar. In contrast, the Navy uses visual, passive acoustic, and active acoustic monitoring during Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) sonar activities to augment its mitigation efforts over large areas. It is not clear why the Navy is not proposing to use those same monitoring methods for the other activities described in the DEIS. To ensure effective monitoring, the Marine Mammal Commission recommends that, whenever practicable, the Navy use passive and active acoustics to supplement visual monitoring during the implementation of its mitigation measures for all activities that generate sound.	Mitigation measures were developed on a case-by-case basis based on predicted potential impacts; therefore, the use of acoustic monitoring is not always warranted, nor practicable from an operational standpoint (Section 5.3.2.1, Acoustic Stressors). Some events do use passive acoustic monitoring as part of the mitigation when practicable, including improved extended echo ranging sonobuoys, explosive sonobuoys using 0.6–2.5 pound net explosive weight, explosive torpedo testing, and sinking exercises. The active sonar system used by SURTASS LFA is built into the system's vertical array and can only be employed in this fashion from a slow-moving platform. It is not possible to employ this system on the types of platforms analyzed in the HSTT EIS/OEIS because it cannot be installed on other ship classes. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
		mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website. .

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
MMC-19	In addition, the Navy proposes that, if feasible, it will cease acoustic activities (i.e., active sonar transmissions) and explosive activities (i.e., detonations that do not use time-delay firing devices) when a marine mammal is detected within the mitigation zone. Those activities would resume when the animal is "thought to have exited" the mitigation zone. The meaning of "thought to have exited" is not clear, and a more definitive criterion is needed to clarify when activities might be resumed. The current mitigation measures allow the Navy to resume mid-frequency active sonar activities only when a sighted marine mammal has not been resighted for 30 minutes or the vessel has transited more than 2,000 yards beyond the location of the last detection. Those measures also stipulate that explosives cannot be detonated unless a sighted marine mammal has not been resighted for 30 minutes, but those measures do not stipulate a distance because those detonations occur at a fixed location. In any case, the Commission must question all of those approaches if the position of the marine mammal is unknown. That is, the key considerations driving those measures are the relative positions of the marine mammal and the sound source. Their relative positions over time are best estimated as a function of their positions when the marine mammal was first sighted, the speed and heading of the vessel, and the speed and heading of the marine mammal. If the vessel and marine mammal are moving in opposite directions, then the marine mammal may leave the mitigation zone relatively quickly. However, if they are moving in the same direction, then the marine mammal may remain in the mitigation zone for a prolonged period. Unless a sighted marine mammal is resighted leaving or outside the safety zone, the Navy should not resume its activity until it has had a reasonable chance of verifying that it can do so safely. The delay should take into account that (1) a marine mammal may remain underwater where it is not visible, (2) it may change its heading and speed in response to the vessel, and (3) using visual observation alone it is not possible to determine a marine mammal's position relative to the vessel or sound source after the initial sighting, unless the marine mammal surfaces again and is observed.	Clarification of what is meant by "thought to have exited" (based on animal course and speed) as well as additional information on additional post-sighting activity recommencement criteria has been added to Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) for each activity. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
		mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
MMC-20	The dive time of a sighted marine mammal is a central consideration whenever mitigation measures depend on visual observation. For small cetaceans, the Commission has recommended a delay of at least 15 minutes because their dive times are shorter and generally occur within that timeframe. For some mysticetes and large cetaceans, the proposed 30-minute pause may be inadequate, sometimes markedly so. Sperm whales and beaked whales, in particular, may remain submerged for periods far exceeding 30 minutes. Blainville's beaked whales dive to considerable depths (> 1,400 m) and can remain submerged for nearly an hour (Baird et al. 2006, Tyack et al. 2006). In addition, observers may not detect marine mammals each time they return to the surface. Even under ideal conditions detection can be a problem, particularly for cryptic species such as beaked whales. Barlow (1999) found that "accounting for both submerged animals and animals that are otherwise missed by the observers in excellent survey conditions, only 23 percent of Cuvier's beaked whales and 45 percent of Mesoplodon beaked whales are estimated to be seen on ship surveys if they are located directly on the survey trackline." Thus, depending on the species involved, short-term visual monitoring may not be adequate to confirm that a sighted marine mammal has left the mitigation zone. To address this problem, the Marine Mammal Commission again recommends that, after the sighting of one or more marine mammals within or about to	Dive behavior varies amongst species. As described in *the Dive Distribution and Group Size Parameters for Marine Species Occurring in Navy Training and Testing Areas in the North Atlantic and North Pacific Oceans* technical report, a 30 min. waiting period accounts for the dive capabilities typical of most species. Post-sighting activity recommencement wait periods longer than 30 min. would be impracticable to implement and would decrease realism of activities. For activities involving platforms restricted by fuel or other constraints (e.g., helicopters), the wait times have been adjusted based on operational need and practicability of implementation. A discussion of the effectiveness of each wait time is provided in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) for each activity. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	enter a mitigation zone, the Navy cease the use of its sound sources (including explosive activities that do not use time-delay fusing devices) and not reinitiate them for periods at least as long as the maximum dive times of the species observed (if identified to species) or likely to be encountered (if species identification is uncertain).	detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel"

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
		described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website. Lastly, species-specific identification of marine mammals is not a Lookout requirement. Therefore, a single activity-specific waiting time is needed between species.
MMC-21	For explosive activities that do involve time-delay fusing devices, the Navy proposes to use a 915-m mitigation zone, which is smaller than the 1,326-m zone currently used. The current zone was based on a 20-lb net explosive weight charge, a time delay to detonation of 10 minutes, an average swim speed for dolphins of 3 knots, and an added buffer to account for marine mammals that may be transiting at speeds faster than the average. The Commission has commented on this matter in numerous letters and continues to believe that the use of 3 knots as an average swim speed is inaccurate and inadequate, even with an added buffer to account for animals swimming faster than 3 knots. A simple calculation indicates that if a marine mammal swims at just 4 knots for the duration of the time-delay (10 minutes), the size of the mitigation zone would be inadequate, whether at 1,326 or 915 m. Importantly, many marine mammals are capable of swimming, and regularly do swim, much faster than 4 knots, especially for short periods. The average swim speed for bottlenose dolphins, for example, ranges from 2.6 to 8 knots (Lockyer and Morris 1987, Mate et al. 1995, Ridoux et al. 1997). In addition, pelagic dolphins swim faster than coastal species. The average swim speed for captive Pacific white-sided dolphins is 12.4 knots (Rohr and Fish 2004). Wild long-beaked common dolphins have been observed swimming at an average of 8.1 knots and captive individuals of that species have been observed swimming at an average of 13.0 knots (Rohr et al. 1998). In addition, the average swim speed for wild pantropical spotted dolphins is 6.9 knots (Au and Perryman 1982). Because many of the marine mammal species in the study area can and generally do swim faster than 3 knots, the mitigation zone proposed by the Navy is simply inadequate and poses a risk of additional injury and mortality, as was recently observed at the Silver Strand Training Complex. To address this concern, the Marine Mammal Commission recommends that the Navy adjust the size of the mitigation zone for mine neutralization events using the average swim speed of the fastest swimming marine mammal occurring in the area where time-delay firing devices would be used to detonate explosives.	The principles of HSTT time-delay firing device mitigation are similar to those contained within the 2011 VACAPES Letter of Authorization. For time delay activities, the mitigation zone is 1,000 yd. for all charge sizes (5, 10, and 20 lb. charges) and for a maximum time delay of 10 min. The mitigation zone takes into account a portion of the distance that a marine mammal could potentially travel during the time delay. However, the mitigation zone was set at 1,000 yd. because that is the maximum distance that Lookouts in two small boats can realistically observe. The use of more than two boats for observation during this activity presents an unacceptable impact to readiness due to limited personnel resources. If a swim speed of 3 knots (101 yd./min.) (a nominal average for a delphinid in this area) is considered, the 1,000 yd. mitigation zone results in coverage of the potential range to mortality for all charges, including up to a 9 min. time delay. Furthermore, the mitigation zone covers the potential range to injury for 5 lb. charges, including up to a 6 min. time delay, and for 10 lb. and 20 lb. charges, including up to a 5 min. time delay. The 3 knot swim speed, therefore, was a consideration, but not the only determining factor in development of the time delay mitigation zones; therefore, considering different swim speeds would not result in a change to or expansion of the mitigation zone size for time delay activities. The Navy asserts that the 1,000-yard time delay zone is both practical and protective. The proposed AFTT mitigation zone covers the entire predicted maximum range to PTS as well as a portion of the estimated swim speed distance. Due to practicality of implementation and impact on the effectiveness of the military readiness activity, the proposed mitigation zone represents the maximum distance that Lookouts on small boats can adequately observe given the number of personnel who will be involved. The use of more than two boats for observation during this activity presents an unacceptable impact on readiness due

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
		to limited personnel and equipment resources. Takes that cannot be avoided through mitigation are considered in the MMPA permitting process. Species-specific identification of marine mammals is not a Lookout requirement; therefore, a single activity-specific waiting time is needed between species.
U.S. Department of the Interior-01 (Written)	The EIS/OEIS should note that military operations and oil and gas operations have been conducted concurrently offshore in southern and south-central California for more than 50 years. During that period there have been no major incidents or accidents involving military and OCS oil and gas operations.	Thank you for providing this information. This information has been included in Section 4.3.2.1 (Proposed Outer Continental Shelf Oil and Gas Leasing Program 2012-2017) of the Final EIS/OEIS.
USDOI-02	Section 4.3.2 Oil and Natural Gas Exploration, Extraction, and Production The EIS/OEIS should note that BOEM and DOD have been working in a collaborative manner at both the planning and operational stages for OCS oil and gas activities to ensure that each organization can carry out its mission requirements in an effective and efficient manner. This collaboration has been ongoing for more than 30 years and is guided by the policies and procedures set forth in a 1983 Memorandum of Agreement (MOA) between DOI and DOD, and a 1987 DOD Directive (see attachment). BOEM recommends that the EIS/OEIS briefly describe the MOA and Directive, and that a copy of the MOA and Directive be included in an appendix of the document.	The Navy agrees that operations between the Bureau of Ocean Energy Management and the Navy have been conducted in a collaborative manner. The 1983 Memorandum of Agreement between DOI and DOD and the 1987 Directive outlines the policies and procedures for joint use of offshore areas for military activities and mineral exploration or other development purposes. The MOA serves to avoid potential conflicting activities and major incidents that could result in environmentally damaging incidents. Thank you for highlighting the collaborative manner in which the planning and operational stages for Off Continental Shelf oil and gas activities ensures that each organization may carry out its mission requirements in an effective and efficient manner. The Memorandum of Agreement (MOA) between DOI and DOD, and a 1987 DOD Directive are available on the HSTT EIS/OEIS public website.
USDOI-03	Section 4.3.2.1 Proposed Outer Continental Shelf Oil and Gas Leasing Program 2012-2017 The Draft EIS/OEIS states "Areas off the Pacific coast are not included in the 2012-2017 Outer Continental Shelf Oil and Gas Leasing Program proposed by the U.S. Department of the Interior Bureau of Ocean Energy Management based upon an agreement signed by the governors of California, Washington, and Oregon in 2006 (Bureau of Ocean Energy Management 2011)." The second part of that sentence -- "based upon an agreement signed by the governors of California, Washington, and Oregon in 2006" -- is inaccurate and should be deleted because the states' agreement (documenting shared opposition to oil and gas development off their coasts) had no legal bearing or influence on the leasing program or on the Secretary's decision about which areas to exclude from the program.	The text in Section 4.3.2.1 (Proposed Outer Continental Shelf Oil and Gas Leasing Program 2012-2017) of the Final EIS/OEIS has been revised in accordance with this recommendation.

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
USDOI-04	In addition, the states' opposition was only one of many factors that the Secretary considered. Table 4.3-1 indicates that the Proposed OCS Oil and Gas Leasing Program 2012-2017 is to be "retained" for further consideration in the Cumulative Impacts Analysis. However, since the leasing program does not include any Pacific Region areas and it therefore poses no potential impact to the areas addressed in the EIS/OEIS, BOEM recommends that the table be revised to indicate that the leasing program has been "dismissed" from further analysis. BOEM also advises that the Final OCS Oil and Gas Leasing Program 2012-2017 is scheduled to become effective on July 1, 2012, and that references to the "Proposed" program in the Draft EIS/OEIS should be changed to "Final".	These changes have been incorporated in the Final EIS/OEIS.
USDOI-05	Section 4.3.3 Offshore Power Generation This section of the EIS/OEIS should include a sub-section describing the OCS Renewable Energy Program, and the text in Section 4.3.3.1 (Marine Hydrokinetic Projects) should be revised to ensure consistency between the two sub-sections.	A new section describing the OCS Renewable Energy Program has been added to the Final EIS/OEIS, now Section 4.3.3.1 (Outer Continental Shelf Renewable Energy Program).
USDOI-06	The EIS/OEIS should also note that the Energy Policy Act of 2005 amended the Outer Continental Shelf Lands Act, authorizing the Secretary of the Interior to issue leases on the OCS for activities that produce or support production, transportation, or transmission of energy from sources other than oil and gas. The Secretary delegated these responsibilities to BOEM, which issued regulations for OCS renewable energy activities in April 2009. Those regulations, which were updated in 2011 to address reorganizational changes, establish a program to grant leases, easements, and rights-of-way for orderly, safe, and environmentally responsible renewable energy development activities, such as the siting and construction of offshore wind-generating facilities on the OCS, as well as other forms of renewable energy, such as wave, current, and solar. The Energy Policy Act of 2005 mandated that the Secretary of the Interior coordinate with affected State and local governments and federal agencies in developing the program and issuing leases for the development of renewable energy resources. BOEM has met this statutory requirement by establishing task forces with coastal states that have expressed interest in commercial development of OCS renewable energy resources.	This information does not contribute to the analysis of cumulative impacts and has not been added.
USDOI-07	1. The US Fish and Wildlife Service (Service) recommends that the following language be clarified or corrected in the final EIS/OEIS where it is found though-out the document: Under the ESA, [a specific activity] occurring at [location] under the No Action Alternative, Alternative 1, or Alternative 2 may affect, but are not likely to adversely affect, ESA-listed [specific species]. An assessment of effects is not made in the ESA (Endangered Species Act) per se, and while this is likely not the intent of these statements, as written they imply that the ESA is the reference document in which such determinations were made.	Changed throughout to "pursuant to the ESA…"

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
USDOI-08	2. Effects Determinations pursuant to section 7 of the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 et seq.) The document concludes that all proposed training activities under all three alternatives (No Action, Alternative 1 and Alternative 2) may affect, but are not likely to adversely affect, any federally-listed species considered in the document. We recommend that an effects determination not be made solely on the basis of the information provided in the draft EIS/OEIS. Impacts to federally-listed species from training activities considered under the No Action Alternative in this document have been the subject of previous formal consultations with the US Fish and Wildlife Service (e.g., Biological Opinion on the U.S. Navy's Silver Strand Training Complex Operations, Naval Base, Coronado, San Diego, California; issued July 10, 2010) and some of the actions proposed under Alternatives 1 and/or 2 may have been, or will be, the subject of consultation as well. Hence, the statement is incorrect in some cases. The question of whether a proposed action has been sufficiently addressed under NEPA differs from an "effects determination" pursuant to section 7 of the Act.	The Navy has concluded formal consultation with the U.S. Fish and Wildlife Service (USFWS) and NMFS, in which previous formal consultations were also considered.
USDOI-09	3. Sediment Quality - Chapter 3.1-14 We recommend that the final EIS/OEIS provide more detailed information regarding sediment quality in San Diego Bay, and if possible, more current information (e.g., the reference documents for section 3.1.2.2.2 were dated 2002 and 2003). For example, could a figure analogous to the figure provided for the Hawaiian Islands (Figure 3.1-1) and a table similar to Tables 3.1-3 and 3.1-4, which provide information on sediment quality within the Hawaiian Islands and San Clemente Island, be provided for San Diego Bay? If there is more current, site-specific information regarding sediment quality, it would be helpful to have it available in the final EIS/OEIS. We recognize the scale and scope of the activities discussed in the draft EIS/OEIS may be such that more fine-scale information about sediment quality is not relevant to the proposed actions. Although we agree with the general conclusion that sediments in San Diego Bay are substantially free of chemical contamination, the broad conclusion seems counter to recent efforts to clean sediments at specific sites; e.g., La Playa Cove, 10th Street Marine Terminal. Does this EIS cover changes to berthing or hull maintenance? If so, the number of ships berthed within the Bay, and estimated contribution of these ships to contaminant load within different areas of the Bay, needs discussion. If a separate EIS evaluates the environmental impacts of ship berthing in San Diego Bay, reference to the document should be provided.	The information presented in the Draft and Final EIS/OEIS regarding sediment quality in San Diego Bay is the most current and relevant information. The Proposed Action does not include hull maintenance.
USDOI-10	4. Inclusion of Other Species We are providing you with a link to the Listing Workplan, a multi-year listing work plan describing the process to review and address more than 250 species listed on the 2010 Candidate Notice of Review to determine if they should be added to the Federal Lists of Endangered and Threatened Wildlife and Plants. We recommend you review this	Thank you for providing this information. These species were all considered in the development of the Draft EIS/OEIS.

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	information to determine whether any candidate species within the Study Area warrant further review in the final EIS/OEIS. http://www.fws.gov/endangered/improving_ESA/listing_workplan.html	
USDOI-11	Page 3.6.63: The document addresses the issue of plastic ingestion by seabirds, and discusses the significance of plastic ingestion and seabird survival. However, the full impact of plastic ingestion on the population may be more important in the young rather than mature birds. Fry et al. (1987) showed that ingestion of plastic debris by Laysan albatrosses and wedge-tailed shearwaters chicks in the Hawaiian Islands resulted in a significant percentage of chicks with proventricular impactions or ulcerative lesions. The U.S. Geological Survey suggests that the Final EIS/OEIS include the Fry et al. (1987) description of the potential impact of plastic ingestion on chicks. The reference is: Fry, D. M.; Fefer, S. I.; Sileo, L. 1987. Ingestion of plastic debris by Laysan albatrosses and wedge-tailed shearwaters in the Hawaiian Islands. Marine Pollution Bulletin 18(6):339-343.	The information collected by Fry et al. (1987) has been included in the overall description of potential consequences of plastics ingestion. However, the overall risk to birds, and non-fledging chicks, remains low, as the distribution of plastics associated with training activities is less than 1 piece per square nautical mile. Further, the highest density of ingestible materials would be within the SOCAL Range Portion of the Study area, which does not overlap the areas utilized by foraging adults during the pre-fledging period of chicks.
U.S. Geological Survey (Written)	Thank you for forwarding the subject Draft EIS/OEIS for review and comment by the staff of the U.S. Geological Survey Pacific Islands Water Science Center. We regret however, that due to prior commitments and lack of available staff time, we are unable to review this document. We appreciate the opportunity to participate in the review process.	No response required.
Comments by State and Local Agencies and Elected Officials		
California Coastal Commission-01 (Written)	Thank you for the opportunity to comment on this DEIS/OEIS ("DEIS"). We will focus our comments on the implications for California's coastal species and populations of marine species which spend portions or all of their life cycle within the California coastal zone, impacts to either of which we believe clearly trigger the requirements of Section 307 of the federal Coastal Zone Management Act. We appreciate that the DEIS indicates the Navy's intent to comply with the Coastal Zone Management Act (CZMA), although the document could be clearer on this subject. The procedural discussion on pages 6-4 and 6-5 of the DEIS correctly spells out the applicable CZMA requirements; however the document does not clearly indicate whether the Navy intends to submit a consistency determination to the California Coastal Commission for the activities proposed in California's offshore waters. During the Commission's most recent two reviews of Navy SOCAL testing and training, Consistency Determinations CD-086-06 and CD-049-08, several differences of opinion between the Navy and the Commission arose concerning which activities were considered to involve effects on coastal zone resources, what thresholds should be relied upon in the determination of effects to marine mammals, and, most importantly, what minimization and mitigation measures should be employed to reduce such impacts. Modifications the Commission requested the Navy to consider during the most recent of these reviews (CD-049-08), are attached as Appendix A. Given	The Navy submitted a consistency determination to the California Coastal Commission for the entirety of the Southern California Training and Testing activities. Subsequent correspondence between the California Coastal Commission and the Navy is included in Appendix C (Agency Correspondence).

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	our past disagreements involving the extent to which activities affecting marine mammals in California ocean waters conducted outside the coastal zone (but affecting coastal zone resources, in our opinion), we would appreciate a clear statement that the Navy will be submitting a consistency determination for the entirety of the Southern California Training and Testing activities. We believe the DEIS only underscores the need for such a complete submittal, in that it contains far more expansive estimates (than contained in previous Navy analyses) of the potential for existing levels of training and testing activities to result in harassment of marine mammals (because the previous Navy analyses relied on higher decibel received levels for impact thresholds). Under the Navy's new analysis, harassment (as defined under the Marine Mammal Protection Act (MMPA) of marine mammals under existing, or "baseline," conditions, would be on the order of 10 times more extensive than previously acknowledged, with potentially up to 650,000 California marine mammals affected annually for baseline conditions (with the understanding that these numbers represent "pre-mitigation measure" estimates). In the DEIS the Navy further proposes significant increases to levels of training that would approximately triple the numbers of potential MMPA -defined harassments offshore California. While the harassment numbers have been based on impact definitions contained in the MMPA and Endangered Species Act, the extremely large numbers estimated provide indisputable evidence that the proposed activities can reasonably be considered to be resulting in effects on California's coastal zone resources, and, therefore, that the activities must be conducted in a manner consistent to the maximum extent practicable with the marine resource protection policy of the Coastal Act. This policy provides that: Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes. To assist us in our analysis of the Navy's consistency determination for these activities, we request that the Navy provide the following information:	
CCC-02	1) A breakdown between California and Hawaii totals for numbers of estimated behavioral and Levels A and B harassments, and mortality, that separates the totals for California from those for Hawaii for the totals presented in the "boxed" discussions such as the one on page 3.4-169, which reads: Impact of sonar and other acoustic sources during training activities under Alternative 1: • May expose marine mammals up to 2,524,784 times annually to sound levels that would be considered Level 8 harassment, as defined by the MMPA • May expose marine mammals up to 441 times annually to sound levels that would be considered Level A harassment, as defined by the MMPA • May expose up to 2 beaked whales annually to sound levels that may elicit stranding	The consistency determination submitted to the California Coastal Commission included the breakdown as requested. Within the Draft and Final EIS/OEIS, the stock of each species indicates if the harassment was predicted for activities in the Hawaii or Southern California portion of the Study Area. For example, any Hawaii stock indicates a potential harassment from activities in Hawaii. All others are attributable to Southern California.

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	and subsequent serious injury or mortality Under the ESA, the use of sonar and other acoustic sources during training activities as described in Alternative 1: • May affect, and is likely to adversely affect the humpback whale, sei whale, fin whale, blue whale, sperm whale, Hawaiian monk seal, Guadalupe fur seal, and the Hawaii insular stock of false killer whale • Would have no effect on Hawaiian monk seal critical habitat	
CCC-03	2) A summary of the conclusions the Navy has drawn from its "After-Action Reports" compiled for the past 5 years of Navy SOCAL testing and training.	"The Navy does not produce "After-Action Reports" since the beginning of NMFS' MMPA authorization in January 2009. Instead, the Navy provides NMFS Office of Protected Resources an annual summary of all SOCAL monitoring by 1 October of each year. Publically available copies of reports from 2009, 2010, 2011, and 2012 are available on NMFS's website: http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications Alternatively, the Navy has also sponsored establishment of a new public monitoring website at: http://www.navymarinespeciesmonitoring.us/ SOCAL specific reports can be downloaded at: http://www.navymarinespeciesmonitoring.us/reading-room/ (under "Southern California Range Complex") As required by the 2009 NMFS Final Rule for U.S. Navy Training in the Southern California Range Complex, the Navy submits an annual SOCAL Range Complex Monitoring Plan Report. The Navy's 2012 annual monitoring report to NMFS has just been delivered to NMFS for their internal review. Finally, a cumulative summary of annual report data acquisition and conclusions will be provided to NMFS in a pending report due at the end of November 2012. NMFS will conduct a 90-day review of that report before the Navy can make it public."
CCC-04	3) A follow-up to the discussion on page 3.4-136 which indicates that, while distress or unusual marine mammal behavior was not observed during past exercises: "Results of monitoring in HSTT are preliminary and data analysis is underway to determine if there is evidence of more subtle behavioral effects present in the data collected to date." [Emphasis added]	The latest information available on behavioral effects can be found on NMFS's website: http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications.
CCC-05	4) Any relevant data and findings from NOAA's Marine Mammal Underwater Sound Research program, in particular where this research looked into effects occurring during Navy SOCAL testing and training activities, and a discussion of the degree to which NOAA's research program intends to continue to coordinate with the Navy and monitor	The California Coastal Commission would have to ask NOAA for this information, but the Navy's monitoring information can be found at http://www.navymarinespeciesmonitoring.us/reading-room/

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	marine mammal reactions during future Navy training and testing activities.	
CCC-06	5) A clear explanation as to the reasons the Navy is proposing to increase its activities to the degree that would represent an approximately three-fold increase in California marine mammal harassment levels over current training (this increase is based on a cursory study of Tables 3.4-13 and 3.4-14, which provide individual species breakdown of effects between California and Hawaii). In looking at Tables 3.8-1 through 3.8-4, which list baseline and proposed Alternative 1 and 2 levels of activities, we are unable to discern why, or during which activities, such extensive increased levels of harassment would be expected to occur at the levels depicted in Tables 3.4-13 and 3.4-14.	The increase in harassment levels is due to several contributing factors that make it inappropriate to compare takes from the 2008 SOCAL EIS/OEIS: • An increase in training and testing activities and the inclusion of more activities and sources, such as pierside sonar testing, to meet emerging requirements • The 2008 EIS/OEIS included very little of the existing testing that is now included in this EIS/OEIS, much of which was covered under other environmental analyses. • This EIS/OEIS now includes a number of previously unanalyzed sound sources • Combined geographical areas (inclusion of both SOCAL and Silver Strand Training Complexes, and areas not previously analyzed such as San Diego Bay) • Included activities conducted along a transit corridor between SOCAL and Hawaii that account for additional potential harassments • Updated marine mammal density information that reflects current species abundance • New acoustic effects model that provides a more accurate prediction of animal movement and therefore, potential exposures • New acoustic threshold criteria based on the best available science that is more protective of marine mammals, extends the ranges to effects of sound sources, and results in higher numbers of predicted level A takes.
CCC-07	6) Information on the feasibility of debris removal. Tables 3.3-5 through 3.3-7 depict extremely large quantities of heavy metals, materials from munitions and explosives, and other debris that have been and will continue to be expended annually from the existing and proposed testing and training activities, about 85% of which appear to be in California offshore waters. As we have requested from the Navy in numerous past reviews of various proposals, we would appreciate an analysis of whether any of these materials could be retrieved and removed from the marine environment. For example, we note that over 20,000 parachutes are currently being expended in California waters each year (and this number is proposed to increase by over 50%, to approximately 37,000 under Alternative 2). Has the Navy studied how long it takes for these parachutes to break down in deep ocean conditions? Is it possible to retrieve some of these parachutes? We would appreciate a discussion of the feasibility of removal of these and other debris materials listed in these tables, as well as an analysis of their persistence in the marine environment if they cannot be removed.	While the Navy has not conducted specific studies on the time required for expended materials such as parachutes to decompose in the ocean, the information regarding potential effects of these materials to marine resources is included in Chapter 3 (e.g. for entanglement with Sea Turtles in Section 3.5.3.4.2, Impacts from Parachutes) of the EIS/OEIS. Of note, the Navy continues to look for ways to lessen its environmental impacts, including research into biodegradable parachutes, for example.

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
CCC-08	Finally, we wish to commend the Navy for its current analytical framework, which we believe is more realistic than previous Navy analyses have acknowledged, and which accepts the possibility that greater numbers of marine mammals and other species may be occurring during Navy training and testing activities, in particular those activities involving mid-frequency sonar use. However we are disappointed that the proposed avoidance, minimization, and mitigation measures have, for the most part, remain relatively unchanged compared to those included in previous years' training and testing activities. As we pointed out that during our above-cited reviews of past Navy SOCAL training and testing activities, clearly any efforts the Navy adopts to further avoid or minimize loud mid-frequency sonar use in areas or seasons where significant concentrations of marine mammals are present, would also inherently benefit the Navy's testing and training itself, by reducing delays and stoppages necessitated by the presence of marine species in the mitigation zones. Accordingly, we again urge the Navy to consider incorporating measures such as those listed in Appendix A, including, to the maximum extent feasible, avoiding testing and training involving loud underwater noise generation in areas (and/or seasons) with significant concentrations of marine mammals, adoption of larger mitigation safety zones, reduced power during periods of reduced visibility and when surface ducting is present, increased monitoring during choke point exercises, and expanded baseline monitoring. Thank you for this opportunity to comment on this important military program EIS/OEIS. If you have any questions about these information requests, or about preparation of a consistency determination, please feel free to contact me at (415) 904-5289.	Through careful exploration of all mitigation measures to determine which were the most effective, the Navy has chosen the measures that will mitigate potential impacts to marine mammals while still being able to meet its operational needs to train for real world conditions. Specific mitigation measures are outlined in the following sections: Section 5.3.1 (Lookout Procedural Measures), Section 5.3.2 (Mitigation Zone Procedural Measures), and Section 5.3.3 (Mitigation Areas). Specifically, Section 5.3.3.1 (Marine Mammal Habitats) addresses important habitat areas. The Navy used the best available data (including data on animal density, distribution, and occurrence) to support its impact analyses in the DEIS/OEIS. Variability in animal presence within relatively small ocean sub-areas is often strongly correlated with daily, weekly, seasonal, and even decadal changes in prey availability, with prey availability being driven by changes in both local and basin-wide oceanographic conditions. Any specific area of high animal density at a given time may have low animal density the following day, week, or year, depending on the biotic and abiotic factors affecting the prey distribution. Blue whales, for example, "integrate food resources (i.e., search for food) over a large area due to the dietary needs of such a large animal" (D. Crull, UCSC, personal communication 2007). Operationally, there is some variability in where Navy major exercises may occur within the SOCAL Range Complex. Location is determined by individual strike group needs. Furthermore, exercises are relatively short in duration (hours to days) and separated in time, so no ocean area within SOCAL OPAREAs is subject to continuous sonar use. Finally, it must be acknowledged that ASW activities have been conducted without incident for decades in SOCAL OPAREAs. In fact, many populations of Endangered Species Act (ESA) species and non-ESA species alike have been increasing in SOCAL OPAREAs over the last several decades. Given the natural variation of marine mammal location over time within the SOCAL OPAREAs, operational variability of Navy ASW operations, and the absence of scientific information demonstrating broad-scale impacts that are either injurious or of significant biological impact to marine mammals, there is little relative risk to marine mammal populations from ASW training exercises.

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
California Office of Historic Preservation (Written)	Pursuant to 36 CFR Part 800, the regulations implementing Section 106 of the National Historic Preservation Act, the United States Navy (Navy) is requesting my concurrence with a finding of No Historic Properties Affected. The Navy plans to renew training and testing activities in the waters off of Southern California, Hawaii, and the Open Ocean Transit corridor between these two regions. The majority of activities off of California will occur within the Southern California Operating Area (OPAREA), including the waters surrounding San Clemente Island, boat lanes and anchorages offshore of the Silver Strand Training Complex (SSTC), and the bayside training areas within San Diego Bay. Activities specific to this undertaking include gunnery and explosive exercises as well as the use and maintenance of sonar equipment. The project area also includes select pier side locations within San Diego Bay where Navy surface ship and sonar maintenance testing occurs. The Navy defines the Area of Potential Effects (APE) for this activity as the open ocean areas in the Southern California Range Complex with the OPAREA, and boat lanes and anchorages offshore of the SSTC, including the bayside training areas within San Diego Bay. In addition to your letter, you have provided maps and a CDR containing environmental studies undertaken in the project area. Training and testing activities are consistent with actions currently conducted in the above-referenced areas. For example, artillery and explosive exercises will take place within the Open Ocean or near-shore areas, away from where there are any known cultural or historical resources. Pile driving for elevated causeway training at SSTC will subject near shore sediments to vibration, disruption, and compaction at SSTC and will occur only in the Oceanside Boat Lanes 1-10 and in the Bayside Bravo Training Area. Proposed activities area consistent with activities currently conducted in these areas. Having reviewed your submittal, I concur with your Finding of Effect. I also agree that you have adequately determined the undertaking's APE. Please be advised that in the event of a change in project description or an inadvertent discovery, you may have additional responsibilities under 36 CFR Part 800.	Thank you for participating in the NEPA process.
California State Lands Commission-01 (Written)	After review of the information provided and in-house records, CSLC staff has determined that the proposed project will be located within: • Ungranted sovereign lands of the Pacific Ocean and under the leasing jurisdiction of the CSLC. • Lands granted to Orange County pursuant to Chapter 321, Statutes of 1961, with minerals reserved to the State. • Lands granted to the city of Oceanside pursuant to Chapter 846, Statutes of 1979, with minerals reserved to the State. • Lands granted to the city of San Diego pursuant to Chapter 937, Statutes of 1931, with minerals reserved to the State. • Lands granted to the city of San Diego pursuant to Chapter 688, Statutes of 1933, with mineral reserved to the State.	No dredging activities are part of the Proposed Action.

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	• Lands granted to the city of San Diego pursuant to Chapter 2139, Statutes of 1963, with minerals reserved to the State. • Lands granted to the city of San Diego pursuant to Chapter 2140, Statutes of 1963, with minerals reserved to the State. • Lands granted to the U.S.A. pursuant to Chapter 89, Statutes of 1937, with minerals reserved to the State. • Lands granted to the city of Avalon pursuant to Chapter 303, Statutes of 1943, with minerals reserved to the State HSTT activities proposed in areas of ungranted sovereign lands under the leasing jurisdiction of the CSLC may require a lease from the CSLC. Additionally, any dredging activities on ungranted sovereign lands, or granted lands for which minerals were reserved for the State, would require a dredging lease from the CSLC. The CSLC's surface lease application can be found at www.slc.ca.qov. Please contact Michelle Andersen, Public Land Manager, at the number listed at the end of this letter regarding any questions regarding leasing.	
CSLC-02	Additionally, the EIS/OEIS indicates on page 2-40 that training and testing activities may include Synthetic Aperture Sonar, "in which active acoustic signals are post-processed to form high-resolution images of the seafloor." Please be aware that geophysical and geological surveys conducted in State waters require a geophysical survey permit from the CSLC pursuant to California Public Resources Code section 6826. For more information on these survey permits, please contact Richard Greenwood at the contact information listed at the end of this letter.	The Navy is not proposing to conduct geophysical or geological surveys under the Proposed Action of this EIS/OEIS.
CSLC-03	Although the EIS/OEIS specifies that certain activities, such as anti-submarine warfare training events, would occur further offshore and outside of State jurisdictional waters, and that certain activities, such as mine-detection sonar, would generally occur in shallower waters, the EIS/OEIS lacks an overall, broader discussion or table, separately identifying the training and testing activities that might occur in state waters and, therefore, potentially affect California's public trust resources. Although CSLC staff understands that the particular location and frequency of the various Project activities at any given time change according to the Navy's needs, CSLC staff requests that the EIS/OEIS provide further information on activities that may occur in California state waters and, if available, an estimate of the frequency of particular activities in State waters. Such a discussion would help CSLC staff with leasing and management activities in the Study Area, both with the Navy and other lease applicants or lessees, and would be useful in determining potential use conflicts with other ocean users in the Study Area in the future.	The flexibility required by the Navy in conducting realistic training means that some activities' locations require broad definitions. To the level of detail that the activities can be predicted, they are described in Chapter 2 of the EIS/OEIS, and specifically in Tables 2.8-1 through 2.8-5. Further, the activities described in this EIS/OEIS are similar in type, frequency, and location as those conducted for decades in the Southern California area.
CSLC-04	The EIS/OEIS should also mention that the title to all abandoned shipwrecks, archaeological sites, and historic or cultural resources on or in the tide and submerged lands of California is vested in the State and under the jurisdiction of the CSLC. The	The Draft EIS/OEIS included language regarding the Abandoned Shipwreck Act in Section 3.0.1.1 (Federal Statutes). This text has been revised in the Final EIS/OEIS to include language that the Act

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	recovery of objects from any submerged archaeological site or shipwreck may require a salvage permit under Public Resources Code section 6309. On statutorily granted tide and submerged lands, a permit may be issued only after consultation with the local grantee and a determination by the CSLC that the proposed salvage operation is not inconsistent with the purposes of the legislative grant. CSLC staff requests that the Navy consult with Senior Staff Counsel Pam Griggs at the contact information noted at the end of this letter, should any cultural resources be discovered during Project activities.	stipulates title to shipwrecks that meet the criteria for inclusion in the National Register of Historic Places will be transferred to the appropriate State.
CSLC-05	Thank you for the opportunity to comment on the EIS/OEIS for the Project. Because part of the proposed Project involves use of State sovereign lands and may require issuance of a lease or permit, the CSLC would need to rely on an environmental document that meets CEQA requirements. The CSLC will review the final document and determine whether it has met the requirements identified in this letter for use in lieu of a separate EIR. If it does not, the CSLC would be required to prepare and circulate a separate environmental document that complies with CEQA prior to taking action on approval of a lease or permit.	Thank you for your comment. The Navy looks forward to continuing the good relationship and communication with the California State Lands Commission.
City of Coronado, Community Development-01	Section 2.7.1 Proposed Adjustments to Baseline Training Activities p. 2-64: This section describes the various adjustments but with the exception of two activities, does not indicate where these adjusted training activities will occur. What training activities of those listed will occur within the SSTC?	Section 2.7.1 (Proposed Adjustments to Baseline Training Activities) is a summary of changes that are more fully described in Table 2.8-1, where the location for each activity is listed. As shown in Table 2.8-1, the changes from current activity (the No Action Alternative) to proposed activities (Alternatives 1 and 2) within SSTC would be 1) the increase in underwater detonations in the SSTC Boat Lanes from 408 annually to 414 (p. 2-92), 2) an increase in the annual number of airborne mine countermeasure – mine detection activities—in the Boat Lanes from 248 to 372 (p. 2-93), 3) an increase in the number of mine neutralization – remotely operated vehicle activities from 208 annually to 312 (p. 2-04), and 4) a decrease in the number of annual marine mammal system activities from 208 to 175 (p. 2-94).
Coronado-02	Section 2.7.2 Proposed Adjustments to Baseline Testing Activities p. 2-67: Similar comment as above. This section describes the adjustments to the baseline testing activities; however does not identify the areas where this would occur. What components of the SSTC testing activities would be adjusted? Please clarify the acronym OPAREA that is referenced several times in Section 2.7.2 above. Does it stand for Ocean Operating Areas Outside the Bounds of Existing Range Complexes?	Section 2.7.2 (Proposed Adjustments to Baseline Testing Activities) is a summary of changes that are more fully described in Tables 2.8-2 through 2.8-5, where the location for each testing activity is listed. No testing activities are proposed to be conducted at SSTC. As described on p. 2-3 of the EIS/OEIS, an OPAREA stands for "Operating Area." The full definition and two examples are included on p. 2-3.
Coronado-03	Proposed Platforms and Systems p. 2-68. Aircraft F-35 Joint Strike Fighter: The document notes that the F-35 Joint Strike Fighter Lightning II will complement the Navy's F/A-18E/F and the F-35 is expected to make up about one-third of Navy's strike inventory by 2020. It notes the F-35 will operate similarly to the	The purpose of the HSTT EIS/OEIS is to analyze only the training and testing activities associated with the F-35 aircraft and other new systems and platforms. Homebasing actions for the F-35C are addressed in the EIS for U.S. Navy F-35C West Coast Homebasing.

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	aircraft it replaces or complements, and that no new activities will result from the introduction of the F-35. Where will the F-35 be home-based? Will it be at NASNI? What type of supportive facilities will be required for general maintenance/service/housing of the replacement F-35's? What about personnel changes associated with the F-35? How do the noise levels generated by the aircraft compare? EA-18G Airborne Electronic Attack Aircraft: This aircraft will replace the EA-6Bs and operate in similar training areas and capacities. The same question as noted for the strike fighter applies to the EA-18G. Where will these be home-based? What types of new supportive facilities will be required, personnel, etc? How much noise does this aircraft generate in comparison to existing?	The draft EIS was released for public review in February 2013 and is available for review at: http://www.navyf35cwestcoasteis.com. Navy prepared an EA in November 2005 addressing the replacement of the EA-6B by the EA18-G in 2005 and signed a Finding of No Significant Impact on July 19, 2005. The decision was to homebase all EA-18G aircraft at NAS Whidbey Island, WA. However, these aircraft will conduct training in the HSTT Study Area.
Coronado-04	Proposed Platforms p. 2-68. Ships The document indicates the CVN-21 Program is designed to replace the Nimitz class carriers with the first carrier CVN 78 expected in 2015. Where will this new carrier be home-based, at NASNI? What type of new supportive/maintenance facilities will be required? How frequently is maintenance required? How many new personnel are associated with this carrier?	The purpose of the HSTT EIS/OEIS is to analyze only the training and testing activities associated with the CVN-21 and other new systems and platforms. All homeporting questions raised in the comment are not associated with this study, and would be addressed in separate Navy homeporting environmental planning documentation.
Coronado-05	Proposed Platforms p. 2-71 Missiles/Rockets/Bombs The document indicates Guided Rocket Systems will be introduced and used on the MH-60 helicopters. The MH-60's were recently relocated to NASNI. Where will this new training take place with the rocket systems and MH-60's and how many events over a month and year's period are expected to occur and what is the decibel level? Kinetic Energy Weapons will use electromagnetic kinetic energy weapons to accelerate projectiles to supersonic velocities. It notes these weapons will be operated from ships, firing projectiles toward land targets. What land area would be recipient of firing projectiles? Would this occur within the SSTC? It is not clearly identified where many of the other platforms will occur. Clarify which activities would occur within the SSTC.	The annual number and location of all training activities are included, along with any ordnance expended, in Table 2.8-1, beginning on p. 2-77 of the Draft EIS/OEIS. Regarding the rocket systems, all missile and rocket firings would occur well offshore, beyond sight and hearing of Southern California. The only use of kinetic energy weapons would be testing at the Pacific Missile Range Facility in the Hawaii Range Complex. Neither the kinetic energy weapons testing, nor any missile or rocket firings would occur in or near SSTC.
Coronado-06	Proposed New Activities: p. 2-73 Where will the surface-to-surface missile exercises occur? What will be the frequency of these exercises and how much noise will be generated?	The annual number and location of all training activities are included, along with any ordnance expended, in Table 2.8-1, beginning on p. 2-77 of the Draft EIS/OEIS.
Coronado-07	Alternative 2 p. 2-74 Alternative 2 is the preferred alternative and identifies the establishment of new range capabilities as well as adjustments to type and tempo of training and testing and establishment of additional locations to conduct activities between the range complexes. Please clarify what type and quantity of "adjustments" will be made to type and tempo of training and testing as it relates to SSTC. Will the training be intensified beyond what was addressed in the EIS completed for the SSTC? The EIS for the SSTC indicated there would not be measurable increases in personnel or associated traffic; however, the City disagreed. Again, there appears to be an	The annual number and location of all training activities are included, along with any ordnance expended, in Table 2.8-1, beginning on p. 2-76 of the Draft EIS/OEIS. As shown in Table 2.8-1, no activities located at SSTC will increase over those analyzed in the SSTC EIS.

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	incremental expansion of activities, noise, personnel and associated traffic within Coronado due to expanded/intensified operations; notably, p. 2-75 indicates a 10% increase; however, these impacts are not being analyzed nor is any mitigation proposed.	
Coronado-08	Table 2.8-1 Baseline and Proposed Training Activities: There are significant increases in activity levels with the preferred alternative 2. Revise/clarify the table to clearly illustrate where the activities within the SOCAL area will occur. Please clarify volumes/activities within the SSTC.	The activities listed in Table 2.8-1 are described both by location, and by number of annual events. Those occurring at SSTC clearly state SSTC under "Location" in the table. If an activity does not specifically list SSTC, then it would not occur there.
State of Hawaii, Department of Business, Economic Development, and Tourism, Office of Planning	It is the responsibility of the Department of the Navy, pursuant to 15 CFR 930, Subpart C, to demonstrate to the Hawaii CZM Program that the activities proposed in the HSTT EIS/OEIS remain consistent with the activities outlined and conclusions made in the 2008 Hawaii Range Complex EIS/OEIS CZMA coastal consistency determination. The 2009 Navy De Minimis Activities List is not applicable to activities that are subject to the EIS level of NEPA compliance, such as the activities included in the HSTT EIS/OEIS. We will provide the Navy with guidance and assistance for consistency determinations in accordance with 15 CFR 930.34(d), if requested. In order for the Hawaii CZM Program to provide consistency guidance, the Navy must identify and compare the activities proposed in the HSTT EIS/OEIS with the activities included in the 2008 Hawaii Range Complex EIS/OEIS CZMA coastal consistency determination. Specifically, activities that must be identified include: activities that are new and/or different from those activities reviewed in 2008; activities that are a continuation of the activities reviewed in 2008; and activities that are a continuation of the activities reviewed in 2008, but have changed in scope, size, operation, scale, intensity, and/or frequency. This information is necessary to identify the applicable Hawaii CZM Program enforceable policies. Continuity of consistency from the Navy's 2008 federal consistency determination cannot be presumed for the HSTT activities. In order for us to determine whether the 2008 HRC CZMA consistency determination can be applied to the HSTT activities, the Navy must provide a comparative CZMA consistency analysis between the 2008 HRC activities and the HSTT activities. It is our position that a new CZMA consistency determination is required for HSTT activities, as explained in response no. 3, below. The 2009 Navy CZMA De Minimis Activities List, which was developed cooperatively by the Hawaii CZM Program and the Department of the Navy, and approved by the Office of Planning on July 9, 2009, is not applicable to activities that are subject to the EIS level of NEPA compliance. EIS level activities, such as the activities included in the HSTT EIS/OEIS, are not de minimis activities. Therefore, we disagree with the application of the Navy CZMA De Minimis Activities List to HSTT activities. We disagree with the Navy's position that, "no further CZMA federal consistency review is required." A CZMA consistency determination is required for all HSTT activities that were not previously reviewed by the Hawaii CZM Program. The HSTT EIS/OEIS by itself does not fulfill the content requirements of a consistency determination. The required	The Navy submitted a Consistency Determination to the State of Hawaii for the entirety of the Hawaii Training and Testing activities. Subsequent correspondence between the Hawaii Office of Planning and the Navy is included in Appendix C (Agency Correspondence).

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	content of a consistency determination is identified in 15 CFR 930.39. The CZM consistency determination must also include the activities that were reviewed m the 2008 HRC EIS/OEIS CZMA coastal consistency determination, but have either changed, will result in a cumulative impact with the new HSTT activities, or were issued consistency objections that remain unresolved. In addition, information in the HSTT EIS/OEIS that was not available to us in 2008 will cause us to reevaluate previously reviewed activities. For example, the 2008 Hawaii Range Complex Final EIS/OEIS, Section 4.1.2.3 Environmental Consequences- Sea Turtles, indicates that activities proposed under Alternatives 1 and 2, i.e., sonar use and underwater detonations, would not affect sea turtles, and for compliance under ESA the "Navy finds that these activities are not likely to affect green, olive ridley, loggerhead, hawksbill, or leatherback sea turtles." However, the HSTT Draft EIS/OEIS, Section 3.5 Sea Turtles, indicates that activities involving acoustic stressors, physical disturbances, and strike stressors, "may affect and are likely to adversely affect green, hawksbill, olive ridley, leatherback, and loggerhead sea turtles." The substantial difference in reported anticipated impacts to sea turtles, which are State of Hawaii coastal resources, warrants supplemental federal consistency review pursuant to 15 CFR Section 930.46. There is also new evidence that Navy SINKEX exercises can cause spikes in PCB levels in fish (Honolulu Star Advertiser, March 5, 2012). This new information will cause us to reevaluate our previous consistency concurrence for SINKEX. Please note that the Office of the Planning is the authorized lead agency for the Hawaii CZM Program. All future correspondence regarding the Hawaii CZM Program should be sent directly to the Office of Planning at the above mailing address. We are confident that we can arrive at a solution that allows the Navy to carry out its mission while ensuring consistency with the CZMA, both of which are important to the public health and safety of the people of the United States. If you have any questions, please call John Nakagawa of our CZM Program at 587-2878.	
State of Hawaii, Department of Health, Environmental Planning Office	The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your letter, dated May 3, 2012. Thank you for allowing us to review and comment on the subject document. The document was routed to the various branches of the Environmental Health Administration. We have no comments at this time, but reserve the right to future comments. We strongly recommend that you review all of the Standard Comments on our website;. www.hawaii.gov/health/environmental/env-planning/landuse/landuse.html. Any comments specifically applicable to this application should be adhered to. The United States Environmental Protection Agency (EPA) provides a wealth of information on their website including strategies to help protect our natural environment and build sustainable communities at: http://water.epa.gov/ infrastructure/sustain/ . The DOH encourages State and county planning departments, developers, planners, engineers and other interested parties to apply these strategies and environment	Thank you for participating in the NEPA process.

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	principles whenever they plan or review new developments or redevelopments projects. We also ask you to share this information with others to increase community awareness on healthy, sustainable community design. If there are any questions about these comments please contact me.	
State of Hawaii, Department of Land and Natural Resources-01	The Department of Land and Natural Resources (Department) has reviewed the Navy's Hawaii-Southern California Training and Testing Activities Draft Environmental Impact Statement/Overseas Environmental Impact Statement (DEIS/OEIS) made available in May, 2012. We understand that this DEIS/OEIS supports a request for a new letter of authorization for incidental take of marine mammals for January 2014 through December 2018. We also understand that a Marine Mammal Protection Act letter of authorization for the take of marine mammals may require the National Marine Fisheries Service to support additional mitigation measures or monitoring beyond those contained in the DEIS/OEIS. The Department has concerns that the DEIS/OEIS does not acknowledge the scientific documentation of strandings of marine mammals that may be associated with the types of activities proposed by the Navy. For example, the work of Wang & Yang (2006) indicating pygmy killer whales stranded in Taiwan as a result of active sonar & seismic operations is dismissed as "not supported by the data available" on page 3.4-45. In addition, there is no mention of the concurrent and unusual melon-headed whale activity in Hanalei Bay, Kaua'i and Sasanhaya Bay, Rota, Northern Mariana Islands in 2004. These "strandings" are both included in the report "Marine Mammal Strandings Associated with U.S. Navy Sonar Activities" (April 2012) associated with the Atlantic Fleet Training and Testing EIS (http://aftteis.com/Portals/4/aftteis/Supporting%20Technical%20 Documents/Marine%20Mammal_Stranding_Report_ v02.pdf). We suggest that the Hawaii-Southern California DEIS/OEIS include details of the Hanalei Bay incident and that it acknowledge the heightened risk for certain species documented to strand during Naval activities. In addition to melon-headed whales, beaked whales are considered to be especially vulnerable to injury and death associated with Navy sonar (five beaked whale stranding events with potential links to Navy sonar activity are described in the Atlantic EIS cited above). Although such strandings of beaked whales associated with Naval exercises have not been seen in Hawai'i, the science indicates that animals affected by Navy sonar in Hawai'i may not be easily detectable (Faerber and Baird 2010). We recommend that the Navy expand its description of potential impacts to include a more thorough treatment of historical stranding information as done for the Atlantic EIS and acknowledge that species such as melon-headed whales and beaked whales have higher risks for injury and death to sonar. Potentially, a variable regarding higher risk should be incorporated into the model for calculating the take of these species.	The Navy fully acknowledged and considered all relevant and applicable research regarding strandings. The reference cited in the comment was evaluated as described in the EIS/OEIS. Regarding additional research, the Marine Mammal Stranding Report is included on the HSTTEIS.com website on the "Documents and References" page, under "HSTT Documents" and "Supporting Technical Documents." See: http://hstteis.com/DocumentsandReferences/HSTTDocuments/SupportingTechnicalDocuments.aspx

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
Hawaii DLNR-02	Page 3.4-95 of the DEIS/OEIS states, "As a result, no marine mammals addressed in this analysis are given differential treatment due to the possibility for acoustically mediated bubble growth." Regardless of the mechanism, it is clear that certain species, like the beaked and melon-headed whales, are affected by mid-frequency sonar. Bemaldo de Quiros et al. (2012b) found that deep diving marine mammals have a higher risk of decompression illness; that risk should be considered in terms of how this affects the level of take associated with sonar activities. New approaches for examining whether decompression has occurred have recently been published and should be included in established protocols for necropsy (Bernal do de Quiros et al. 2012a, 2012b).	The potential risk from sonar and other sound sources affecting the behavior of marine mammals, including the potential for acoustically mediated bubble growth, was taken into account in the Draft EIS/OEIS analysis. The discussion of this phenomenon is presented in the EIS/OEIS in Section 3.4.3.1.2.2 (Nitrogen Decompression). As noted in that section, recent modeling by Kvadsheim, Miller, et al. (2012) determined that while behavioral and physiological responses to sonar have the potential to result in bubble formation, the actually observed behavioral responses of cetaceans to sonar did not imply any significantly increased risk of over what may otherwise occur normally in individual marine mammals. The reports cited in the comment (Bernal de Quiros et al. 2012a, 2012b) were reviewed, but do not add any substantive new information to the analysis of proposed actions covered in this EIS/OEIS.
Hawaii DLNR-03	Although not described in detail, five stranding events identified as including U.S. Navy exercises as a contributing cause are listed on page 3.4-113. This and other stranding events illustrate the need for mitigation plans for live and dead strandings. Although we are aware that the Navy has participated in carcass removal and necropsy in past strandings in Hawai'i, we encourage the Navy to develop a more formal mitigation plan as part of the DEIS/OEIS. We understand that a regional stranding implementation plan is being developed collaboratively between the Navy and NOAA. We encourage the Navy (and NOAA) to seek input from the State (and territories) and to incorporate cultural considerations into protocols. This does not require the Navy to take formal responsibility for causing any marine mammal stranding, but it would make the Navy a formal partner in the activities necessary to deal with stranded animals. This should include monetary support for removal of animals and appropriate necropsy and sampling.	Although the comment is correct in that the EIS discusses five stranding events, including this discussion is for comprehensiveness and not meant to infer that Navy was a contributing cause to each of those strandings. Regarding the second part of the statement, in 2009, the Navy and NMFS developed stranding protocols and plans for each range complex that provide guidelines for response to strandings during Navy major training exercises (MTEs). Additionally, the Navy and NMFS signed a National MOU (PR-055) for stranding investigations that establishes a framework consistent with federal fiscal law requirements whereby the Navy may assist NMFS with response to and investigation of Uncommon Stranding Events (USEs) during MTEs. One component of the MOU is the regional stranding implementation plans (RSIAP) for Hawaii and Southern California that you reference. The RSIAPs delineate what the Navy and NMFS can contribute in regards to services in response to a marine mammal stranding during an MTE. The RSIAP does not have provisions for directing NOAA's handling of the stranding (including cultural practices), guiding the necropsy, nor specify direct Navy financial participation. Instead it provides guidance on things such as access to Navy installations for necropsies, availability of specialized equipment and other logistic considerations to assist stranding investigations.
Hawaii DLNR-04	Because the Navy's model of biologically significant population consequences of Navy activities included abundance estimates, the Navy DEIS/OEIS analyzed what are now considered separate populations of marine mammals associated with individual Hawaiian Islands regions. This is biologically inappropriate and does not account for the	The analysis of impacts to marine mammals in the Hawaiian Islands uses the best available science and was undertaken with National Marine Fisheries Service (NMFS) in a role as a cooperating agency for the EIS/OEIS. This included review and comment by NMFS staff

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	lack of dispersal among island regions. Because populations of many odontocete species are scientifically documented to be local and island-associated, an analysis of impact by population is necessary to assess affects to these populations. If this assessment cannot be performed now because of the need to use abundance estimates in the model, we suggest the following. These local populations are separate should be acknowledged and described, with a full literature review, in the DEIS/OEIS. The letter of authorization and DEIS/OEIS should also include language that reflects a commitment to do new calculations as abundance estimates become available. With the new Guidelines for Marine Mammal Stock Assessments being finalized and the new research that is becoming available, there should be new abundance estimate determinations for many of these stocks before the next reauthorization.	marine biologists in their role as the federal regulator for the Marine Mammal Protection Act (MMPA). Full and complete information was provided in the EIS/OEIS (see Section 3.4, Marine Mammals) with regard to the present knowledge regarding stocks ("populations") of marine mammals. This includes coordination with NMFS scientists on the latest emergent data presented in the draft Pacific Stock Assessment Report for 2012 which had yet to be finalized (as of Nov 2012). NMFS will determine the appropriate Terms and Conditions for the MMPA Letter of Authorization and the Navy will continue to coordinate with them in their regulatory role.
Hawaii DLNR-05	The Department supports the continued implementation of Marine Species Awareness Training and the use of lookouts. We suggest that mitigation measures should also include passive acoustic monitoring to help detect cryptic and long-diving marine mammals. The DEIS/OEIS mentions that marine mammals are sometimes detected this way, but does not include passive acoustic detection in protocols for mitigation, with the exception of increased vigilance by lookouts. Passive acoustic detection and localization of marine mammals has progressed significantly in the last few years. The Journal of the Acoustical Society of America will be publishing a special issue on methods for marine mammal passive acoustics later this year. We encourage the Navy to continue to get the latest information to inform mitigation that includes passive acoustic monitoring and detection.	The Navy is using both passive acoustic monitoring and visual detection when feasible, and will continue to use the latest information in developing mitigation measures. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring), there are limitations to the effectiveness of passive acoustic monitoring. Passive systems are capable only of detecting vocalizing marine mammals within the frequency bands monitored by Navy personnel. Passive acoustic detections would not provide range or bearing to detected animals, and therefore cannot provide locations of these animals.
Hawaii DLNR-06	The Navy's main mitigation measures include visual detection within a radius of the activity and cessation of the activity until the marine mammal has not been seen for 30 minutes. This may not cover the beaked whales and sperm whales well, as these species can be submerged for more than an hour at a time. We suggest movement to a new area or at least an hour without seeing these species before restarting activities. We also encourage as much wait time as possible for cryptic species that are difficult to see, such as pygmy and dwarf sperm whales.	Dive behavior varies amongst species. As described in the Dive Distribution and Group Size Parameters for Marine Species Occurring in Navy Training and Testing Areas in the North Atlantic and North Pacific Oceans technical report, a 30 minute waiting period accounts for the dive capabilities typical of most species. Post-sighting activity recommencement wait periods longer than 30 minutes would be impracticable to implement and would decrease realism of activities. For activities involving platforms restricted by fuel or other constraints (e.g., helicopters), the wait times have been adjusted based on operational need and practicability of implementation. A discussion of the effectiveness of each wait time is provided in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) for each activity. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
		not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
		are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website. Lastly, species-specific identification of marine mammals is not a Lookout requirement; therefore, a single activity-specific waiting time is needed for all species.
Hawaii DLNR-07	The Navy acknowledges on page 3.4-92 that long-beaked dolphins have been directly killed by Navy activity in an incident involving explosives. This illustrates the importance of the use of mitigation zones. Some odontocetes are more cryptic and surface less often than long-beaked dolphins. As such, we recommend that the Navy not reduce any of the mitigation zones used in the previous EIS/OEIS. Smaller mitigation zones, as proposed in the DEIS/OEIS, will only increase risk to marine mammals. Even if animals are not at risk for direct injury by the sound, it is clear that behavioral responses of marine mammals can be contributing factors to injury and death, suggesting that mitigation zones should be conservatively large to account for behavior-induced injury.	The Navy revised its mitigation measures following the incident described in the comment. The mitigation measures for explosives training using both positive control firing devices and time-delay firing devices are described in the Final EIS/OEIS in Sections 5.3.2.1.2.4 and 5.3.2.1.2.5 respectively. The decrease in mitigation zone size will allow for a more focused survey effort over a smaller area, and will consequently increase the likelihood of avoidance of injury and larger threshold shifts that would result in recovery (i.e., TTS) to marine mammals.
Hawaii DLNR-08	The Department is aware that the Navy has considered and discarded a list of mitigation measures described on pages 5-52 and 5-53. The Department encourages the Navy to reconsider some of these measures. These include sharing marine mammal sighting data to augment scientific information, minimizing testing and training activity that takes place during sea states or light levels at which marine mammals are unlikely to be seen by, and avoiding "hot spots" of marine mammal activity, particularly for those animals that are listed or candidate species under the Endangered Species Act. The Navy should identify known "hot spots" for species and preferentially avoid hot spots for Endangered, Threatened, and Candidate marine mammals unless deemed necessary. There is already some mitigation of that nature in place for humpback whales. There is research on monk seal and false killer whale movements (e.g. Baird et al. 2012) that should be considered in the DEIS/OEIS as areas to avoid Navy activity if possible. The Department recognizes that the Navy must have the flexibility to train and test under a variety of circumstances, but we encourage the Navy to avoid training and testing in and near any state marine protected areas as much as is possible.	The Navy's overall approach to assessing potential mitigation measures was based on two principles: (1) mitigations will be effective at reducing potential impacts on the resource; and (2) from an operational perspective, the mitigations are practicable and executable while not compromising safety and readiness. Through extensive discussion, NMFS and Navy have identified mitigation measures that are practicable and reasonably effective. For example, the safety zones proposed will reduce the likelihood of physiological harm, the number of marine mammals exposed, and the intensity of those exposures. With regard to sharing marine mammal sighting data, the Navy has adopted an integrated comprehensive monitoring program (see Final EIS/OEIS Section 5.5, Monitoring and Reporting) that does provide information that is available and useful to the scientific community in annual monitoring reports. The Navy has proposed several Mitigation Areas (such as the Humpback Whale Cautionary Area), and the mitigation measures identified throughout Chapter 5 will apply to all marine mammals year round, and will be applied regardless of the location of the activity. However, any future

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
		determination of "hot spots" or biologically important areas will require an intense effort in gathering expert opinion. In that regard, Navy has, and will continue to support the Cetacean and Sound Mapping (CetMap) project, including representation on the CetMap Density and Distribution Mapping Working Group. Navy is an active sponsor and participant in CetMap, and the CetMap process is based on the same process Navy used to estimate population density in the HSTT EIS/OEIS and LOA Application. In 2012, the CetMap panel of experts determined that no biologically important areas (the panel determined that "hot spots" is not an appropriate term) could be identified based on data availability and information at hand. Furthermore, no follow-on products have identified areas of recommended avoidance. It is important to note that the areas appearing on the CetMap website are a preliminary draft that needs considerable additional input from the larger biological community before being used to identify biologically important areas in the ocean.
Hawaii DLNR-09	The DEIS/OEIS states that no consultation is needed with the Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS) and for the new letter of authorization. As the co-manager of the HIHWNMS, the State of Hawai'i disagrees with this point. We request that the Navy engage in a formal consultation with the HIHWNMS, as the preferred alternative (2), does include changes to activities and level of activities that could affect humpback whales. The DEIS/OEIS also includes information to support the LOA request to increase in the number of vessel strikes to large whales. We are supportive of the mitigation already in place for protecting whales in sanctuary waters, but we believe a new consultation is needed with the new proposed activity in alternative 2. The National Marine Sanctuaries Act and the implementing act of the HIHWNMS allow management of activities outside sanctuary waters if those activities affect sanctuary resources, so even if new activities will not take place within the boundaries of the sanctuary, the sanctuary should be consulted for any new activities that could impact humpback whales.	For the HSTT EIS activities, the Navy will continue to conduct anti-submarine warfare training and testing, consisting of mid- and high-frequency active sonar use. This type of activity occurs throughout the range complex, and overlaps with the boundaries of the sanctuary primarily around the islands of Maui, Lanai, and Molokai. Navy activities within the HIHWNMS are specifically identified in Appendix F of the Final Management Plan/Final EIS Volume II (National Oceanic and Atmospheric Administration 1997). These Navy activities are exempt from the prohibitions in the Sanctuary. The Navy does not propose new or modified activities in the HIHWNMS, or activities that are different from those currently conducted in this area. Therefore, proposed activities are consistent with those activities currently conducted in this area, and those described in the sanctuary's Final Management Plan/Final EIS. These HSTT activities would continue to be exempt from the prohibitions identified in the Sanctuary's regulations. HSTT activities within the HIHWNMS would be conducted with an extensive set of mitigations measures (see Chapter 5) and will avoid to the maximum extent practicable any adverse impacts on the Sanctuary resources and qualities.
Hawaii DLNR-10	For other non-marine mammal issues, underwater explosions on the seafloor within the Hawaii Range Complex are proposed for depths between 6' to 100' (pg 3.3-14) on soft-bottom habitats to reduce impacts. Charges should also be set not only in soft-bottom	The Navy conducts explosive training in locations used consistently for these activities for decades. These locations are sufficiently distant from live corals. Large explosive charges occur farther from shore,

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
	habitats but sufficiently away from live corals to minimize live coral trauma. Large explosive charges should be used outside of State marine waters.	outside of State marine waters.
Hawaii DLNR-11	The Navy should conduct studies on the effects of explosives on marine fishes within the Range Complex (chapter 3.9.3.1) to document the extent of kills associated with various fleet training operations. The studies could estimate the total numbers and species of marine life that are known to have been killed during different types of operations. This could provide important information on which operations cause the most kills and potentially ways to mitigate such losses.	The Navy is relying on the best available research regarding explosive effects to marine fishes. The EIS/OEIS analysis of all impacts to fishes is a reflection of this research.
Hawaii DLNR-12	Unexploded munitions (chapters 3.3.3.2.5 & 3.7.3.2.2) should be carefully tracked to enable subsequent removal, especially if they fall within State marine waters or in sensitive habitat areas. Such unexploded ordnances should be removed immediately to minimize encrusting organisms from covering the ordnance, making finding and removing such ordnance more difficult with the passage of time.	All explosive ordnance such as bombs, missiles, and other projectiles are used outside Hawaii State marine waters. Any unexploded ordnance settles to the ocean bottom in very deep water, making it extremely impractical to recover. The fate of these military munitions in the marine environment is analyzed in Section 3.1.3.1.5 (Fate of Military Munitions in the Marine Environment) of the EIS/OEIS.
Hawaii DLNR-13	Chapter 3.5 Marine sea turtles appears to be missing from the documents as Vol. I ends at chapter 3.4 Marine Mammals, and Vol. 2 begins at chapter 3.6 Seabirds.	This mistake was limited to the volume uploaded to the HSTTEIS.com website and has been corrected. Thank you for bringing this to the Navy's attention.
Hawaii DLNR-14	Amphibious vessels would intentionally contact the seafloor (pg 3.3-19). To the extent practical, such landings should be limited to sand beaches or soft-bottom habitats to minimize impacts to hard bottom. The operational routes of the amphibious vessels should also be pre-determined to avoid live coral beds or hard bottom habitats. In the past, the routes used have been over hard bottoms, and groundings have caused damage to both the sea floor habitat and to the vessels. Unforeseen vessel groundings should be reported to the State immediately so that damage assessments can be conducted and corrective actions taken, as needed. The Navy should work collaboratively with the State throughout such operations to minimize damage. The State of Hawai'i appreciates the value of military readiness but also believes strongly in protection of all state marine resources and culture that make a Hawai'i unique and special place. We encourage collaboration and dialogue among our agencies and the Navy to provide the best protection to both our people and our environment.	All amphibious landings occur only on pre-determined and routinely used sites where a pre-landing analysis has confirmed the absence of corals.
State of Hawaii, Department of Land and Natural Resources,	Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources (DLNR) Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comments. At this time, enclosed are comments from (I) Land Division - Oahu District; (2) Land Division - Hawaii District; (3) Land Division - Maui District; (4) Engineering Division; (5)	Thank you for participating in the NEPA process.

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
Land Division	Division of Boating & Ocean Recreation; and (6) Commission of Water Resource Management, on the subject matter. No other comments were received as of our suspense date.	
State of Hawaii Department of Land and Natural Resources, Land Division-Oahu District	We have no comments.	Thank you for participating in the NEPA process.
State of Hawaii Department of Land and Natural Resources, Land Division-Hawaii District	We have no objections.	Thank you for participating in the NEPA process.
State of Hawaii Department of Land and Natural Resources, Land Division-Maui District	We have no comments.	Thank you for participating in the NEPA process.
State of Hawaii Department of Land and Natural Resources, Engineering Division	We have no objections.	Thank you for participating in the NEPA process.
State of Hawaii Department of Land and Natural Resources, Division of Boating and	We have no comments.	Thank you for participating in the NEPA process.

Table E.3-1: Responses to Comments from Agencies (continued)

Commenter	Comment	Navy Response
Ocean Recreation		
Department of Emergency Management, City and County of Honolulu	The City supports the U.S. Navy's mission to maintain, train and equip combat-ready military forces capable of winning wars, deterring aggression and maintaining freedom of the seas. Furthermore, the City appreciates the U.S. Navy's open communication with the community through scheduled and announced open house public meetings (i.e. Friday, June 15, 2012, McKinley High School); representatives of OEM will participate in this open house. Upon review of the Draft EIS/OEIS we believe the U.S. Navy's standard operating procedures, mitigation measures and active monitoring will assure that operation, training and testing impacts to the people of Honolulu, its lands and waters are minimal. We believe the proposed use of active sonar and explosives in the Study Area in compliance with existing national environmental policies will have minimal impact upon public health and safety to citizens, cultural resources, general and unique Hawaiian marine life. We defer to our sister counties and the State of Hawai'i, comments in reference to portions of the HSTT activities which impact their local area.	Thank you for participating in the NEPA process.
Department of Parks and Recreation, City and County of Honolulu	Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement for the subject training and testing activities of the United States Navy. The Department of the Parks and Recreation has no comment, as the proposed activities will have no impact to any program or facility of the Department. you may remove us as a consulted party to the balance of the EIS process.	Thank you for participating in the NEPA process.

Table E.3-2 contains comments from Native American Tribes received during the public comment period and the Navy's response. Responses to these comments were prepared and reviewed for scientific and technical accuracy and completeness. Comments appear as they were submitted and have not been altered.

Table E.3-2: Responses to Comments from Native American Tribes

Commenter	Comment	Navy Response
Pala Tribal Historic Preservation Office	We have consulted our maps and determined that the project as described is not within the boundaries of the recognized Pala Indian Reservation. The project is also beyond the boundaries of the territory that the tribe considers its Traditional Use Area (TUA). Therefore, we have no objection to the continuation of project activities as currently planned and we defer to the wishes of Tribes in closer proximity to the project area. We appreciate involvement with your initiative and look forward to working with you on future efforts.	Thank you for participating in the NEPA process.
Soboba Band of Luiseno Indians	The Soboba Band of Luisei'io Indians appreciates your observance of Tribal Cultural Resources and their preservation in your project. The information provided to us on said project(s) has been assessed through our Cultural Resource Department, where it was concluded that although it is outside the existing reservation, the project area does fall within the bounds of our Tribal Traditional Use Areas. At this time the Soboba Band does not have any specific concerns regarding this project, but wishes to defer to the to other tribes closer to the project area. The tribe requests notification of any inadvertent discoveries that may be discovered during the course of the project.	Thank you for participating in the NEPA process.

Table E.3-3 contains comments from non-governmental organizations received during the public comment period and the Navy's response. Responses to these comments were prepared and reviewed for scientific and technical accuracy and completeness. Comments appear as they were submitted and have not been altered.

Table E.3-3: Responses to Comments from Organizations

Commenter	Comment	Navy Response
Animal Inc. (Electronic)	I greatly urge you to protect dolphins and whales along the west coast who lately have been at risk of dying out because of dangerous toxins coming from boats, and fishing nets. Some people might be thinking the navy is responsible for this. Thank you for reading this letter, Ellie Rose Mattoon Manager of Mammal department Animal INC.	Thank you for participating in the NEPA process.
Aquarium Maintenance-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. The increase in harassment levels is due to several contributing factors that make it inappropriate to compare takes from previous studies: • An increase in training and testing activities and the inclusion of more activities and sources, such as pierside sonar testing, to meet emerging requirements • This EIS/OEIS now covers most testing, which was previously covered under other environmental analyses. • This EIS/OEIS now includes a number of previously unanalyzed sound sources • Combined geographical areas (inclusion of both SOCAL and Silver Strand Training Complexes, and areas not previously analyzed such as San Diego Bay) • Included activities conducted along a transit corridor between SOCAL and Hawaii that account for additional potential harassments • Updated marine mammal density information that reflects current species abundance • New acoustic effects model that provides a more accurate prediction of animal movement and therefore, potential exposures

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		• New acoustic threshold criteria based on the best available science that is more protective of marine mammals, extends the ranges to effects of sound sources, and results in higher numbers of predicted level A takes. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis.
Aquarium Maintenance-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life. These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
Audubon Society, San Diego -01 (Electronic)	The San Diego Audubon Society has attended outreach sessions and reviewed the Subject EIS. We urge that the Navy seriously consider the following comments and upgrade the Final EIS to incorporate them to actually minimize the environmental impacts of this Training and Testing project. If these issues are not addressed, the EIS will clearly fail to satisfy the intent and the letter of NEPA. PROTECTION OF SEABIRDS Section 3.6.3, Environmental Consequences states: "Certain activities take place in specific locations or depth zones within the Study Area outside of the range or foraging abilities of seabirds. Therefore, seafloor device strike, cable and wire entanglement, parachute entanglement, and ingestion of munitions were not carried forward in this analysis for seabirds." However other activities, such as those near San Diego, the Channel Islands, Coronado Island, the Hawaiian Islands, etc. will take place well within range and foraging range of seabirds including those listed as threatened and endangered. So, an analysis of the impacts of those activities must be included in the EIS for those areas. It is especially difficult to accept the cavalier dismissal of those impacts for the endangered California Least Terns. Their foraging range is only known for breeding adults and fledglings during nesting season. Their foraging area for the rest of the year is assumed to be at sea somewhere, but the distribution is not known. If the Navy is basing its assumption on information on the distribution of Least Terns that is not available to the regulatory and ornithological community, the EIS must provide that information for their assessment. Failing that, the EIS must address these potential impacts. The document identifies several species of seabirds that warrant protection under the Endangered Species Act and the International Migratory Species Act. Some of these species dive many feet underwater to find and catch fish. The EIS includes an acoustical/physiological analysis addressing a range of impacts on marine mammals, from temporary hearing loss to mortality, as a function of the distance between the mammal and the transmitting sonar platform. But, the EIS asserts that no damage will be done to diving seabirds by high power sonar transmissions. We did not find any analysis to support that very unlikely conclusion. We urge that the likely impacts to seabirds be quantified and presented in the EIS. The EIS states "… military readiness activities are exempt from the take prohibitions of the Migratory Bird Treaty Act provided they do not result in a significant adverse effect on a population of a migratory seabird species." But, to satisfy NEPA, the EIS needs to assess, quantify, and present the likely impacts to these species, even if no mitigation will be required under the Migratory Bird Treaty Act. Otherwise reviewers will not be able to assess whether the project is likely to or not likely to result in a significant adverse effect on a population of a migratory seabird species or specific population of that species. The EIS mentions that marine mammals are detected by trained observers with	A thorough analysis of acoustic impacts to seabirds appears in Section 3.6.3.1 (Acoustic Stressors) which was based on the best available science. This section addressed deep diving birds. The EIS/OEIS concluded there would be no long-term impacts from sonar to Marine Habitats (3.3) or Fish (3.9), and no indirect impacts are expected for seabirds. Because the Navy's proposed activities are not likely to result in impacts to birds, identification of birds by Navy Lookouts would provide no discernable benefit. In conjunction with the NEPA process, the Navy has completed consultations with USFWS and NMFS under the ESA and MSFCMA, and required coordination under all other applicable laws.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	binoculars. We urge that those observers also be trained to detect the listed threatened or endangered seabirds that are known to frequent the training and testing areas and that high power sonar transmissions be delayed while the threatened and endangered species are foraging within a range that could cause damage to the seabirds.	
Audubon, SD-02	ALTERNATIVES The document states that having trained lookouts with binoculars on transmitting ships will adequately reduce the impacts of high power sonar transmissions on marine mammals This is a very crude approach considering the technology available to the Navy. Lookouts may be effective in some ideal situations, but the Navy should address alternatives that might be more effective to significantly reduce impacts on marine mammals. The Navy has a large scientific staff that is uniquely appropriate for addressing technical solutions to undersea problems such as the detection and tracking of marine mammals. We will list a few alternatives in the following paragraphs, but the Navy should have addressed all of these and more in the preparation of this EIS. Marine mammals are typically more visible from the air than from the bridge of a ship. Helicopters or drones could be used to detect and track whales at longer ranges than observers on the bridge. Doing so would give the Navy the flexibility to have the ship change course and or speed to avoid proximity instead of only having the option to terminate transmissions when a marine mammal is nearby – the only option available if on-board lookouts are the only sensor system being used. Much of the activity under this project will be located in training and testing ranges that have a variety of sensors and analysis equipment that evaluate the performance of the systems being tested. Can these instruments be used to determine the relative locations of ships and marine mammals? If not, can they be modified to do so? These test ranges have range support vessels that are, or can be, equipped with low power, medium resolution sonar systems and additional locations for lookouts that can be used to detect and keep track of marine mammals in the test ranges. Using such vessels to track whales in the vicinity of a transmitting ship could substantially reduce the likelihood of inadvertently damaging a marine mammal. The blow of a large marine mammal has a large heat signature. The EIS should investigate using heat detection systems on the transmitting ship and/or on support craft to increase the likelihood of detecting a marine mammal before it gets close enough to be damaged by a high power active sonar transmission. Woods Hole Oceanographic Institute has developed sonar buoys to provide information for the protection of Right Whales from shipping on the East Coast. The use of the WHOI-type buoys or conventional sonobuoys or other remote acoustic sensors should have been addressed and analyzed in the EIS. The Navy's existing undersea surveillance system might be useful to detect and localize vocalizations of larger marine mammals in a large portion of the operating and transit area of this project to avoid	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. Through consultation and permitting with NMFS, the Navy refined the mitigation measures, which are now presented in Chapter 5 of this Final EIS/OEIS. Through careful exploration of all mitigation measures to determine which were the most effective, the Navy has chosen the measures to mitigate potential impacts to marine mammals while still being able to meet its operational needs to train for real-world conditions. Specific mitigation measures are outlined in the following sections: Section 5.3.1 (Lookout Procedural Measures), Section 5.3.2 (Mitigation Zone Procedural Measures), and Section 5.3.3 (Mitigation Areas). Specifically, Section 5.3.3.1 (Marine Mammal Habitats) addresses important habitat areas. The Navy uses airborne search assets when available, and the use of acoustic monitoring is not always warranted, nor practicable from an operational standpoint. Some events do use passive acoustic monitoring as part of the mitigation when practicable, including Improved Extended Echo Ranging Sonobuoys, Explosive Sonobuoys using 0.6-2.5 Pound Net Explosive Weight, Explosive Torpedo Testing, and Sinking Exercises. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	impacts in real time. But, it was not addressed in the EIS. CONCLUSIONS The populations of many threatened, endangered, and other species are declining due to declining fisheries, declining nesting opportunities, increasing predation, climate change, ocean litter, etc. We urge that this EIS be reissued and modified to seriously analyze and quantify the project's impacts to seabirds and identify means to reduce those impacts. The populations of many species of marine mammals are also declining because of collisions with ships, noise pollution, declining fisheries, climate change, etc. This project needs to seriously minimize its contribution to the decline of these species. Its reliance on lookouts with binoculars instead of also addressing a range of other promising alternatives does not fulfill the letter or the intent of NEPA. We urge that the Navy reissue this EIS with a serious and positive review of alternatives that will significantly reduce the project's impacts on marine mammals. This EIS is obviously very costly due to its size. The environment, the Navy, and taxpayers would have benefited if the emphasis had been on quality and rigor instead of volume. We urge that it be rewritten and reissued with that emphasis. In case of questions or follow-up, I can be reached at 619-224-4591 or peugh@sandiegoaudubon.org	
Center for Biological Diversity (Oral-Oahu)	I'm Miyoko Sakashita, Center for Biological Diversity, and we also will be submitting some written comments. And I think that the main thing I want to do is express concern about the sheer number of takes that are associated with the DEIS. It looks like it's about 14 million, and that it -- in Hawaii alone it's about a 400 percent increase from the prior activities. And while I think it's good that the modeling has become better and is probably a more accurate assessment of impact on marine mammals and other species, but this is a very large number and a primary concern. Those concerns for us, you know, first of all, are sonar impact on marine mammals, the ability to cause hearing loss, and even in 2004 was supposedly to be associated with about 200 whales stranding in Hanalei Bay, as well as other impacts, especially on fish, that really need to be taken into account. There are reports of other known acoustic disturbances that have caused problems with fish with hearing loss with reproductive issues and developmental issues, and in areas where there have acoustic activities, there's been noticed catch decreases for fishermen on the order of about 40 to 80 percent, so we think that should be looked at. Other concerns in addition to the sonar impacts are things like the toxins that will be released from ordnances, ammunitions, sinking ships that can potentially get into the food chain and affect marine life and get in the fish and affect people. I guess underwater explosions and their direct impact on killing species and disturbing habitat is another concern. And then we -- I know -- I think that the primary reason that I raise these	The increase in harassment levels is due to several contributing factors that make it inappropriate to compare takes from previous studies: • An increase in training and testing activities and the inclusion of more activities and sources, such as pierside sonar testing, to meet emerging requirements • This EIS/OEIS now covers most testing, which was previously covered under other environmental analyses. • This EIS/OEIS now includes a number of previously unanalyzed sound sources • Combined geographical areas (inclusion of both SOCAL and Silver Strand Training Complexes, and areas not previously analyzed such as San Diego Bay) • Included activities conducted along a transit corridor between SOCAL and Hawaii that account for additional potential harassments • Updated marine mammal density information that reflects current species abundance • New acoustic effects model that provides a more accurate prediction of animal movement and therefore, potential exposures

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	concerns is the real need to look at a very significant alternative that protects the most biologically sensitive areas, and things like that would be potentially coastal areas, proposed monk seal habitat, and other areas that are marine managed areas that should be considered in the alternative. Well, thank you for your time, and we of course would like to see full compliance with the Endangered Species Act, Environmental Protection Act, Migratory Bird Treaty Act, and all that other slew of environmental laws out there to protect the animals.	• New acoustic threshold criteria based on the best available science that is more protective of marine mammals, extends the ranges to effects of sound sources, and results in higher numbers of predicted level A takes. Also based on response to comments, Navy has supplemented the discussion regarding hearing loss as a general topic. Please see the project web site (www.HSTTEIS.com) for the Marine Mammal Stranding Report which has a full review of the scientific record concerning marine mammal strandings and sonar use, including the Hanalei Bay event, and sonar use. Regarding impacts to fish, a thorough analysis of acoustic impacts to fish appears in Section 3.9 (Fish) of the Draft EIS/OEIS. The EIS/OEIS concluded there would be no long-term impacts from sonar to fish, and there is no evidence or research indicating decreased fish catch resulting from Navy activities. Regarding toxins entering the food chain, the EIS/OEIS includes analysis of this issue in two sections; Section 3.1 (Sediments and Water Quality) and Section 3.9 (Fish). In both sections, the conclusions indicate that all levels of metals, chemicals, and other byproducts would be either below detectable levels or at levels below existing standards, regulations, and guidelines. In conjunction with the NEPA process, the Navy has completed consultations under the ESA and MSFCMA, and required coordination under all other applicable laws.
Cetacean Commonwealth (Electronic)	As to our comments on this Draft EIS, we respectfully request that in whatever ways you can express our concerns for the wellbeing of our People of the Sea, you offer them on our behalf. As the articles in the Hawaii Tribune-Herald June 6 & 7th point out there are many more deaths through fishing nets and lines, pollution, toxins, dead zones, off shore seismic testing and so on. We know this, of course. We have learned first- hand of your efforts in extra mitigation and being super mindful through our visits to PMRF and appreciate the work done. Shifting the dates of these exercises to times and locations when the waters are largely empty of Cetacea in numbers would be a Miracle, leaving them to breed and calve in relative security. Surely with all the sophisticated technology at the Navy’s finger tips a way can be found to keep the ships and their trainings with live fire and sonar well away from these makamae (precious) Global Treasures, each and every one of them. On Behalf of the Cetacean Commonwealth, Star Newland Domestic Harmony Awareness*Action Initiative www.planetpuna.com	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. Through consultation and permitting with NMFS and USFWS, the Navy refined the mitigation measures, which are now presented in Chapter 5 of this Final EIS/OEIS.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
The Chamber of Commerce of Hawaii (Written)	The Chamber of Commerce of Hawaii and its Military Affairs Council are in full support of the recommendation to adopt Alternative 2 (preferred alternative) as outlined in the Hawaii-Southern California Training and Testing Activities, Draft Environmental Impact Statement/Overseas Environmental Impact Statement, dated 12 May 2012. The rising security concerns in the Asia Pacific region have required the US to step up its security and foreign policy strategies to deter and contain military aggression. Moreover, more than 50% of the world's commerce and trade flows through the region and any breakdown in security would serve to seriously threaten the economies of the US and our Asia Pacific partners. Based on our review of the EIS/OEIS, it is our understanding that Alternative 2 provides for consolidating three previously approved environmental documents into one planning document. This reassessment would provide for reauthorizing previous approvals granted under the Marine Mammal Act (MMA) and the Endangered Species Act (ESA). Alternative 2 further provides for the expansion of Study Area boundaries and specifies adjustments in the location, types, and tempo of training and testing activities. We believe that the actions proposed in the EIS/OEIS satisfy the requirements outlined in the NEPA, MMPA, and ESA, and would enable the US Navy to satisfactorily meet the requirements placed on the 21" century naval force. We are not clear on NEPA procedures, but The Chamber suggests that the Navy seek written concurrences of federal agencies that are responsible for monitoring compliance with the NEPA, MMA, ESA, and other governing regulations. We believe that this validation is essential to demonstrating to the public that the governing agencies agree that the US Navy has satisfactorily met the requirements established in federal laws prior to the rendering of a Record of Decision.	Thank you for participating in the NEPA process.
Earthjustice-01 (Electronic)	Earthjustice submits these comments on behalf of the Center for Biological Diversity in response to the U.S. Navy's request for public input on the draft environmental impact statement/overseas environmental impact statement ("DEIS") for Hawaii-Southern California Training and Testing Activities, 77 Fed. Reg. 27,743 (May 11, 2012). These comments necessarily will be brief because, frankly, the Navy has failed to provide the public with adequate time to wade through the over 1600 pages of the DEIS's two volumes. Allowing a mere fifteen days beyond the 45-day bare minimum the National Environmental Policy Act ("NEPA") requires for public review of even abbreviated draft EIS's is far short of what is required to give the public a meaningful opportunity for input. See 40 C.F.R. § 1506.10(c); California v. Block, 690 F.2d 753, 770 (9th Cir. 1982) ("NEPA's public comment procedures are at the heart of the NEPA review process"). If the Navy truly wished to hear from the people of Hawai'i regarding their concerns about the potential environmental impacts associated with this project, it would have given them more time. We are aware that other parties are submitting comments on the deficiencies of the Navy's analysis of proposed training activity impacts and proposed	The Navy has complied with all NEPA notification requirements under 40 C.F.R. Part 1506. NEPA regulations require that agencies not allow less than 45 days for comments on a Draft EIS. Please note that public comments are very important to the NEPA process. The Navy included an extra 15 days for review of this document for an extended comment period of 60 days total. The Navy also offered various opportunities for the public to learn about and comment on this proposal, including a project website that allowed viewing, downloading and commenting on the EIS/OEIS, and six public meetings across Southern California and Hawaii.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	mitigations, and we share their concerns.	
Earthjustice-02	Given the limited time to review the DEIS, we will focus our comments on highlighting a fatal flaw that can only be cured by issuance of a revised DEIS (with, hopefully, improved analysis): the Navy's total failure to evaluate a true "no action" alternative. NEPA commands all federal agencies, including the Navy, to prepare an environmental impact statement ("EIS") for all "major Federal actions significantly affecting the quality of the human environment." 42 U.S.C. § 4332(2)(C). "The primary purpose of an [EIS] is to serve as an action-forcing device to insure that the policies and goals defined in [NEPA] are infused into the ongoing programs and actions of the Federal Government." 40 C.F.R. § 1502.1. An EIS must "provide full and fair discussion of significant environmental impacts and [must] inform decisionmakers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment." Id. An EIS must discuss, among other things: the environmental impact of the proposed federal action, any adverse and unavoidable environmental effects, any alternatives to the proposed action, and any irreversible and irretrievable commitment of resources involved in the proposed action. 42 U.S.C. § 4332(2)(C); see also id. § 4332(2)(E). The alternatives section "is the heart of the environmental impact statement." 40 C.F.R. § 1502.14. In this section, the Navy must "[r]igorously explore and objectively evaluate all reasonable alternatives," devoting "substantial treatment to each alternative considered in detail ... so that reviewers may evaluate their comparative merits." Id. § 1502.14(a), (b). NEPA specifically mandates that every EIS "[i]nclude the alternative of no action." Id. § 1502.14(d). The core purpose of the alternatives analysis is to "sharply defin[e] the issues and provid[e] a clear basis for choice among options by the decisionmaker and the public." Id. § 1502.14. NEPA's goal is to ensure "that federal agencies infuse in project planning a thorough consideration of environmental values." Conner v. Burford, 836 F.2d 1521, 1532 (9th Cir. 1988). "The consideration of alternatives requirement furthers that goal by guaranteeing that agency decisionmakers '[have] before [them] and take [ ] into proper account all possible approaches to a particular project (including total abandonment of the project) which would alter the environmental impact and the cost-benefit balance.'" Bob Marshall Alliance v. Hodel, 852 F.2d 1223, 1228 (9th Cir. 1988) (citation omitted). The Ninth Circuit has emphasized that "[i]nformed and meaningful consideration of alternatives-including the no action alternative-is … an integral part of the statutory scheme." Id. (emphasis added). In the DEIS, the Navy purports to consider a "no action" alternative, but fails to do so. The DEIS asserts that the "no action" alternative may be "thought of in terms of continuing with the present course of action until that action is changed." DEIS at 2-63. Accordingly, rather than analyze a "no action" alternative that involves ceasing training and testing activities, the DEIS evaluates only the continuation of "currently conducted training and testing activities (baseline activities) and force structure (personnel, weapons and assets) requirements as defined by existing Navy	The Navy's selection and analysis of alternatives in the EIS/OEIS meets all NEPA requirements. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. As stated in Section 2.6 (No Action Alternative), the Council on Environmental Quality "allows the No Action Alternative to be thought of in terms of continuing with the present course of action until that action is changed. The No Action Alternative for this EIS/OEIS would continue currently conducted training and testing activities (baseline activities) and force structure (personnel, weapons and assets) requirements as defined by existing Navy environmental planning documents." It is erroneous to assume the Navy's training and testing is conducted pursuant to MMPA incidental take authorizations. The training and testing activities are continuing pursuant to the Navy's Title 10 responsibilities and the Fleet Readiness Training Plan that implements those requirements.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	environmental planning documents." Id. The flaw in the Navy's logic is that current training and testing activities occur pursuant to Marine Mammal Protection Act ("MMPA") incidental take authorizations, issued by the National Marine Fisheries Service ("NMFS"), and those authorizations will expire in early 2014. Id. at 1-3. Thus, to conduct training and testing beyond early 2014, the Navy needs new authorizations from NMFS. The Navy knows this; the DEIS expressly states that it is "needed to support the Navy's request to obtain an incidental take authorization from NMFS" for the next phase of operations and that "[t]he Navy will use this new analysis to support incidental take authorizations under the MMPA." Id.; see also id. at 1-12 ("this document will serve as NMFS's NEPA documentation for the rule-making process under the MMPA"). Presumably, NMFS also intends to rely on this round of NEPA analysis to support any incidental take statements issued pursuant to the Endangered Species Act. In situations involving "federal decisions on proposals for projects," such as whether to issue a new incidental take authorization for proposed Navy training and testing, the Council on Environmental Quality has stated that "no action" means "the proposed activity would not take place." 46 Fed. Reg. 18,026, 18,027 (Mar. 23, 1981). Thus, to support NMFS's permitting decision, the Navy was obliged, but failed, to evaluate a true "no action" alternative involving denial of the request for incidental take authorization. See, e.g., Western Watersheds Project v. Rosenkrance, 2011 WL 39651, at *10 (D. Idaho Jan. 5, 2011) ("Most troubling is that BLM did not consider a real no action alternative. … If BLM truly did take no action, then the old grazing permits would expire, no new permits would issue, and no range improvements would occur. No action would be no action. This is a reasonable, and obvious, alternative to issuing new grazing permits."); Ocean Mammal Institute v. Gates, 546 F. Supp. 2d 960, 977 (D. Haw. 2008) ("The Court … fails to see how a 'no action' alternative that involves the continuation of individual training exercises using MFA sonar subject to the Navy's discretionary environmental review falls within NEPA's explicit alternatives analysis requirement"). Having failed to evaluate the required "no action" alternative, the Navy may not proceed with finalizing the DEIS. See ʻĪlioʻulaokalani Coalition v. Rumsfeld, 464 F.3d 1083, 1101 (9th Cir. 2006) (failure to consider reasonable alternative "renders the Army's EISs inadequate"). Rather, the Navy must issue a revised DEIS that analyzes a true "no action" alternative (i.e., no incidental take authorizations), providing the requisite "benchmark" to permit the public and Navy "decisionmakers to compare the magnitude of environmental effects of the action alternatives." 46 Fed. Reg. at 18,027. The Navy then must circulate the revised DEIS for another round of public review and comment. See 40 C.F.R. § 1502.9. Thank you for your consideration of these comments. Please feel free to contact me via email (dhenkin@earthjustice.org) or telephone (808-599-2436, ext. 6614) if you would like to discuss our concerns.	

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
Humane Society, Hawaii (Oral-Hilo)	I'm Inga Gibson. I'm the Hawaii State Director with the Humane Society, United States. We will be submitting formal written comments, but I wanted to make a few comments for the record, if I may. We are very concerned, obviously, with the potential impacts on marine mammals and other animals in the Pacific and Hawaii. We're especially concerned about the potential permanent and temporary hearing loss, lung injuries, gastrointestinal injuries, and death. We understand that there's no presentation or analysis of alternatives at this time that would in any way significantly reduce the unprecedented impacts and level of harm to these marine animals, many of which are protected under both the MMPA and the SMR, or in some cases are critically endangered, such as the Hawaiian monk seal. We are concerned with the Navy's mitigation scheme, centered on the ability of lookouts for whales and dolphins, and do not believe that it will result in an appreciative decrease in marine mammal take. Furthermore, we are concerned that the Navy appears to dismiss what is acknowledged to be the most effective means to reduce marine mammal take and avoiding areas associated with high marine mammal density. That, again, is what we would like to see, is an avoidance and a better scheme in avoiding altogether some of the areas where there is strong marine mammal presence. We also encourage the Navy in their continued efforts to be seen as an effective steward of the ocean environment to take steps to significantly reduce the level of harm in training and testing activities. Again, we'll be submitting formal more detailed written comments. There is also concern about the significant increase in the proposed takes under the new DEIS from the prior EIS and the numbers of animals potentially impacted. Also a concern with the verification of take, and the methods used to verify take, if that is even verified. Again, thank you for this opportunity.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures must be estimated scientifically using complex modeling, but it is only an estimate, not a prediction. This estimate needs to encompass the capacity of what could occur to ensure Navy's permits are not exceeded. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Also based on response to comments, Navy has supplemented the discussion regarding hearing loss as a general topic.
Koholā Leo-01 (Electronic)	To Whom it may concern This DEIS is fatally flawed and fails to comply with the basic requirements of NEPA. And it fails to properly analyze impacts on marine mammals. The Navy's assessment of impacts is consistently undermined by its failure to meet these fundamental responsibilities of scientific integrity, methodology, investigation, and disclosure. The DEIS disregards a great deal of relevant information adverse to the Navy's interests,	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	uses approaches and methods that would not be acceptable to the scientific community, and ignores whole categories of impacts. In short, it leaves the public with an analysis of harm—behavioral, auditory, and physiological—that is at odds with established scientific authority and practice. The Navy must revise its acoustic impacts analysis, including its thresholds and risk function, to comply with NEPA. The DEIS fails to address other impacts to marine mammals including: stress & indirect effects.	Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Navy has used the best available science in the development of this EIS/OEIS, and is fully compliant with all applicable environmental laws, including NEPA.
Koholā Leo-02	The DEIS fails to address effects of toxic chemicals, hazardous materials and waste oil spills on cetaceans and all marine life. The Navy must adequately evaluate impacts and propose mitigation for each category of harm for all species marine life. And each individual federal activity that is to have a significant environmental impact should have its own environmental analysis. For example RIMPAC and DARPA each need their own separate EIS. To comply with NEPA, an agency must discuss measures designed to mitigate its project's impact on the environment. See 40 C.F.R. § 1502.14(f). There is a large and growing set of options for the mitigation of noise impacts to marine mammals and other marine life, some of which have been imposed by foreign navies—and by the Navy itself, in other contexts—to limit harm from high-intensity sonar exercises. Yet here the Navy does little more than set forth an abbreviated set of measures, dismissing effective measures out of hand. The Navy's reliance on visual observation as the mainstay of its mitigation plan is therefore profoundly misplaced. The Navy can, and must, do more to mitigate the harm on marine wildlife.	The reasonably foreseeable effects of chemicals and other materials were fully analyzed in the Draft EIS/OEIS in Section 3.1 (Sediments and Water Quality) for their direct effect on water quality, and in Section 3.4 (Marine Mammals), Section 3.5 (Sea Turtles), Section 3.6 (Seabirds), Section 3.7 (Marine Vegetation), Section 3.8 (Marine Invertebrates), and Section 3.9 (Fish) for their potential secondary impacts to marine life. The Navy used the best available science and a comprehensive review of past, present and reasonably foreseeable actions to develop a robust Cumulative Impacts analysis. See Chapter 4 of the EIS/OEIS. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment,

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		accessible on the NMFS Office of Protected Resources website. The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Koholā Leo-03	Given the scope of the proposed action, the deficiencies of the Navy's cumulative impacts assessment represents a critical failure of the DEIS. In relation Sonar impact on cetaceans the likely cause of mass strandings are panic, bubble formation and/or decompression sickness (based on real scientific published papers): 1) Sonar caused panic reactions leading to strandings followed by death 2) Sonar caused decompression sickness (the bends) followed by death 3) The bends caused by sonar even in the absence of panic These three points were either not included or not addressed in a scientifically relevant matter. The following five papers must be included in the EIS and the data should be researched and analyzed by NON-Navy scientists and contractors: J. R. POTTER;, 'A Possible Mechanism for Acoustic Triggering of Decompression Sickness Symptoms in Deep-Diving Marine Mammals' Paper presented at the IEEE International Symposium on Underwater Technology 2004, Taipei Taiwan, April 2004. PARSONS, E. C. M.; SARAH J. DOLMAN; ANDREW J. WRIGHT; NAOMI A. ROSE and W. C. G. BURNS. MARINE POLLUTION BULLETIN 56(7):1248-1257. 2008. Navy sonar and cetaceans: Just how much does the gun need to smoke before we act? TYACK, PETER L. JOURNAL OF MAMMALOGY 89(32):549-558. 2008. Implications for marine mammals of large-scale changes in the marine acoustic environment. WRIGHT, A. J.; N. AGUILAR SOTO; A. BALDWIN; M. BATESON; C. BEALE; C. CLARK; T. DEAK; E. EDWARDS; A. FERNANDEZ; A. GODINHO; L. HATCH; A. KAKUSCHKE; D. LUSSEAU; D. MARTINEAU; L. ROMERO; L. WEILGART; B. WINTLE; G. NOTARBARTOLO DI SCIARA and V. MARTIN. INTERNATIONAL JOURNAL OF COMPARATIVE PSYCHOLOGY 20(2-3):274- 316. 2007. Do marine mammals experience stress related to anthropogenic noise? FAERBER, M .M., R. W. BAIRD. 2010.	Discussion of the general topics ("panic, bubble formation and/or decompression sickness") noted in the comment were thoroughly discussed in the Draft EIS/OEIS. In particular see Section 3.0.5.7.1.3 (Physiological Responses) for the presentation of the conceptual framework for analysis and Section 3.4.3.1.2.1 (Direct Injury). For a specific discussion of strandings, see Section 3.4.3.1.2.7 (Stranding) and note that a more detailed presentation was offered in a companion Cetacean Stranding Technical Report ("Marine Mammal Strandings Associated with U.S. Navy Sonar Activities") that is referenced in the DEIS/OEIS and available on the HSTT EIS/OEIS website (HSTTEIS.com). The three points raised ["1) Sonar caused panic reactions leading to strandings followed by death 2) Sonar caused decompression sickness (the bends) followed by death 3) The bends caused by sonar even in the absence of panic"], are covered within the material as described above. With regard to the references noted, while these particular five references were not cited, all were reviewed during preparation of the Draft EIS/OEIS except Potter (2004), which discusses a hypothesis covered in the Draft EIS/OEIS using the following more recent science and data from seven references: Dennison et al. (2011); Fahlman et al. (2006); Hooker et al. (2009); Moore et al. (2009); Southall et al (2007); Tyack et al. (2006); Zimmer and Tyack (2007). Finally, the EIS/OEIS has been created with National Marine Fisheries Service acting as a cooperating agency with input to both the Draft and Final versions. The team also includes a number of non-governmental scientists and subject matter experts.
Koholā Leo-04	Does a lack of observed beaked whale strandings in military exercise areas mean no impacts have occurred? A comparison of stranding and detection probabilities in the Canary and main Hawaiian Islands. Marine Mammal Science DOI: 10.1111/j.1748-7692.2010.00370.x In the DIES the Navy also fails to include data from the July 2004 Hanalei Bay event, in which 150-200 melon-headed whales were embayed for more than 24 hours during the Navy's Rim of the Pacific exercise. According to the Navy's analysis, predicted mean received levels (from mid-frequency sonar) inside and at the	Please see the project web site (www.HSTTEIS.com) for the Marine Mammal Stranding Report which has a full review of the scientific record concerning marine mammal strandings, including the Hanalei Bay event, and sonar use. Information regarding distribution of marine mammals around the Hawaiian Islands is provided in the Draft EIS/OEIS based on the best available information.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	mouth of Hanalei Bay ranged from 137.9 dB to 149.2 dB. The Navy has from the beginning denied any connection between its major international exercise and the mass stranding. However, the Navy's specious reasoning is at odds with the stranding behavior observed during the event and with NMFS' report on the matter, which ruled out every other known potential factor and concluded that sonar was the "plausible if not likely" cause. The Navy's failure to incorporate these numbers into its methodology as another data set is unjustifiable. Hawaii is very different from other areas. The EIS needs to identify areas where the species are for each island. On October 28, 2004 the European Parliament passed a resolution that is probably one of the strongest statements by an international body yet on the issue of military sonar and its impact on cetaceans. This resolution called on the European Commission and the Member States to: ''adopt a moratorium on the deployment of high-intensity active naval sonars until a global assessment of their cumulative environmental impact on marine mammals, fish and other marine life has been completed"; and ''immediately restrict the use of high-intensity active naval sonars in waters falling under their jurisdiction"; as well as to ''set up a Multinational Task Force to develop international agreements regulating noise levels in the world's oceans, with a view to regulating and limiting the adverse impact of anthropogenic sonars on marine mammals and fish." (European Commission, 2004) Indeed, the greatest user of military sonars in the world, the US Navy, appears to be in denial about the situation and dismissive of the concerns of the majority of the population and other nations. And the most shocking part of the document is the "justification" for the NOAA Marine Fisheries "take" permit to harm and kill endangered marine mammals more than 33 million times during five years of testing and training with sonar and explosives. Including more than five million instances of temporary hearing loss, 16,000 instances of permanent hearing loss (since no one involved in this DEIS seems to understand science, here is an important fact: a deaf cetacean is a dead cetacean), almost 9,000 lung injuries, and more than 1,800 deaths. These numbers are unconscionable and unacceptable! So, again we state your "science" in the DEIS is severely flawed and inadequate! We request this DEIS be re-done by non-Navy professionals. For the whales and healthy oceans, Sincerely, Koholā Leo (Whale Voice) http://www.koholaleo.com/	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Na Kupuna Moku O Keawe	Please excuse me. I am grossly unprepared for this. I did not even know of this meeting or that the process had gone this far until yesterday afternoon. One of my major concerns is, is that I've been involved with the military buildup here in the islands. Aloha. My name is Hanalei Fergerstrom. I am a spokesman for Na Kupuna Moku O Keawe, which encompasses all six major districts of the island of Hawaii. So for those of you who do not know, this is the council of the elders. I'm also a haumana of the Heiau O Lono. This is a religious organization (inaudible). Anyway, I have been involved with the military buildup here for over 12 years. I was involved with the low sonar frequency	The Navy shares your desire to preserve marine life. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	testing that was done here, I believe, about 12 years ago. I actually filed suit against the Navy. During that time, my suit was denied because it was basically moot. You were just pulling out of Hawaii. But I am on your mailing list, so I am very shocked that this has gone this far and I have not been provided with information. As you know, information is critical for a proper response. I have been working with different branches. I've spent the last two years working with the Army on the Pohakuloa buildup, which is actually coupled with this in some fashion or form. Again I'm a little bit outraged because I do not have this information. I am grossly unprepared, but I have to try to do something. I have been successful in getting myself on the mailing list. People are aware of me. I've been promised a hard copy because I need the hard copy to make a proper response by your July 10th deadline. Of course when I looked at your timeline, this has been going on for quite some time, and if I had had this information from the start, perhaps I would not feel so intimidated and overwhelmed. One of the things that is extremely important to add into this fray of things is that the environment includes me. I am a part of this environment. The Hawaiian people, the Hawaiian Islands are part of this environment. It is not just the ocean. Secondly, because a lot of this testing that is going to be done or this project that is going to be deployed is going to be done in large part in international waters, and when you talk about in the EIS, it affects many countries -- and I refer to subjects such as RIMPAC -- that other countries also need to be informed of where you are and participate in the EIS process because it affects all the Pacific region. Sorry. You threw me off with that one-minute thing. Please don't hold me to that. As long as we make sure, I'd like to utilize the time. Again I am grossly unprepared. I did not find out about this meeting until last evening. And interestingly enough I went to the Pacific Command to try to get some information, and Google cited it as an unsafe link. That's something that you should be aware of. As I said 12 years ago, the kohola and the nai'a that are the most impacted that have been most frequently (inaudible) are not just large fish. They are my family, my blood, my blood, which can be established through the Kumulipo, the Hawaiian creation chant. I am also a Hiapo Na Koa O Pu'ukohola, or the Warriors from the Mound of the Whale. So we are very familiar with this. We are very, very concerned that a whole lot of things are not being considered. You refer to the larger species of mammals like the porpoises and the whales, but we are island people, and so the effect on smaller fish and the crustaceans and how it affects -- Okay. So you see the problem we have here, not being able to talk about this because how can you possibly do this if you're constantly cut off after three minutes? Thank you, and I want to register my objection. Thank you.	monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Navy is not aware of any documented cases of sonar harming people. Also based on response to comments, Navy has supplemented the discussion regarding hearing loss as a general topic.
Natural Resources Defense Council (NRDC)-1	The Navy's compliance with the National Environmental Policy Act ("NEPA"), 42 U.S.C. 4321 *et seq*., for its training and testing activities in the Pacific Ocean is entering a new phase. For the first time, the Navy is providing a more comprehensive picture of the training and testing activities it is conducting and plans to conduct from January 20 14 to January 20 19 in Hawaii and Southern California waters and the impacts to the	The Navy shares your desire to preserve marine life. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
(Written)	environment from those activities. Unfortunately, it is a picture of unprecedented harm: over 14 million instances of "take" (behavioral impacts, harassment, injury) over five years (from January 2014 to January 2019), including almost 3 million instances of temporary hearing loss, over 5,000 instances of permanent hearing loss, almost 3,000 lung injuries, and 1,000 deaths from the use of sonar and explosives. DEIS at 3.4-167 to 168; 3.4-171 to 172. While these predictions of injury are shocking - and, we believe, still underestimate the harm to marine mammals from the Navy's activities they confirm what stranding events have evidenced, scientists have studied, and the public has believed for years: Navy training and testing activities endanger whales and dolphins at intolerable levels.	broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. An integrated monitoring plan for the activities in the HSTT Study Area is also planned as presented in Section 5.5.1.1 (Integrated Comprehensive Monitoring Program) of the EIS/OEIS. In addition, the Navy implements, to the maximum extent practicable, mitigation measures during its training and testing events as developed with NMFS as the regulatory agency under MMPA and ESA. The Navy will continue to implement the monitoring and research programs where training has been occurring to determine if there are identified impacts as a result of those activities and will do so in the HSTT Study Area associated with future training occurring there. The Navy will continue to be a leader in funding of research to better understand the potential impacts of Navy training activities and to operate with the least possible impacts while meeting training and testing requirements.
NRDC - 2	While the scale of impacts does not change the Navy's obligations under NEPA, it highlights why it so important that the Navy's DEIS fully comply with both the letter and spirit of the law. As Congress intended when it passed NEPA, faced with such harm, the DEIS must help decision makers make fully informed decisions on the proposed activities; after reviewing the DEIS, decision makers must understand the breadth of harm to impacted species, must be able to choose a course of action from a range of alternatives that provide options for meeting the Navy's goals while still reducing harm to species, and must have at their disposal a range of mitigation measures that will significantly lessen environmental impacts. For the reasons discussed in detail below, we believe that the DEIS fails to meet these requirements and does so in such a way that the failures cannot be remedied through the issuance of a final EIS. Accordingly, we believe that the document must be thoroughly revised and reissued as a draft for further public review and comment.	The Navy complies with all applicable environmental laws, including NEPA. As such, the Navy has developed this EIS/OEIS to meet the requirements of these laws. Please see Chapter 2 (Description of Proposed Action and Alternatives), which includes selection criteria and alternatives considered but eliminated (Section 2.5.1 Alternatives Eliminated from Consideration). Please see Chapter 3 (Affected Environment and Environmental Consequences) for the description of the affected environment and environmental consequences of the Navy's Proposed Action. Chapter 4 contains a comprehensive cumulative impacts analysis. Information on mitigation measures can be found in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS. Please see *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis* technical report on the project web site for a discussion of the acoustic impact

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		modeling approach, which addresses the scientifically established criteria for injury, mortality, and harassment under the MMPA.
NRDC - 3	Our overriding concern is the Navy's failure to protect biologically important areas for marine mammals within the Hawaii-Southern California Training and Testing ("HSTT") Study Area. There is a general consensus among the scientific community, as NOAA has recognized, that "[p]rotecting marine mammal habitat is ...the most effective mitigation measure currently available" to reduce the harmful impacts of midfrequency sonar on marine mammals(2) Nonetheless, other than a relatively small "cautionary area" for humpback whales off Hawaii, the DEIS does not consider establishing any additional protection zones in the HSTT Study Area where training or testing could be limited or excluded, despite the common-sense efficacy of such measures. (2) See Letter from Jane Lubchenco, Under Secretary of Commerce for Oceans and Atmosphere to Nancy Sutley, Chair, Council on Environmental Quality dated Jan. 19,2010, available at http://www.nrdc.org/medialdocsIl00119.pdf; see also Agardy, T., Aguilar Soto, N., Cafiadas, A., Engel, M., Frantzis, A., Hatch, L., Hoyt, E., Kaschner, K., LaBrecque, E., Martin, V., Notarbartolo di Sciara, G., Pavan, G., Servidio, A., Smith, B., Wang, J., Weilgart, L., Wintle, B., and Wright, A. A global scientific workshop on spatio-temporal management of noise. Report of workshop held in Puerto Calero, Lanzarote, (June 4-6,2007); ECS Working Group: Dolman, S., Aguilar Soto, N., Notabartolo di Sciara, G., Andre, M., Evans, P., Frisch, H., Gannier, A., Gordon, J., Jasny, M., Johnson, M., PapanicolopuJu, I., Panigada, S., Tyack, P., and Wright, A. Technical report on effective mitigation for active sonar and beaked whales. Working group convened by European Cetacean Society, (2009); OSPAR Commission, Assessment of the environmental impact of underwater noise. OSPAR Biodiversity Series, (2009); Parsons, E.C.M., Dolman, S.J., Wright, A.J., Rose, N.A., and Burns, W.C.G. Navy sonar and cetaceans: just how much does the gun need to smoke before we act? Marine Pollution Bulletin 56: 1248-1257 (2008).	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. The Navy has undertaken consultation with NMFS for the proposed and ongoing activities in the Study Area. The Navy refined the mitigation measures, which are now presented in Chapter 5 of this Final EIS/OEIS. Through careful exploration of all mitigation measures to determine which were the most effective, the Navy chose the measures to mitigate potential impacts to marine mammals while still being able to meet its operational needs to train for real-world conditions. The Navy's specific mitigation measures are outlined in the following sections: Section 5.3.1 (Lookout Procedural Measures), Section 5.3.2 (Mitigation Zone Procedural Measures), and Section 5.3.3 (Mitigation Areas). Specifically, Section 5.3.3.1 (Marine Mammal Habitats) addresses important habitat areas.
NRDC - 4	The Navy's failure is in stark contrast to both the unprecedented level of harm and the varied activities taking place over such a large area. In all, the HSTT Study Area encompasses over 2 million square nautical miles across the Pacific Ocean from Southern California to the International Date Line, with the majority of training and testing activities focused in an area 1.5 times the size of Texas, about 355,000 nm^2• The Navy's preferred alternative would use many different sources and frequencies of active sonar, including over 25,500 hours from mid-frequency sources every year. DEIS at 3.0-46. These training exercises would also employ a battery of other acoustic sources and explosives detonations in ocean surface and undersea areas, special use airspace, and training land areas. The Navy's failure is particularly troubling in light of the emerging scientific consensus about biologically important areas in the HSTT Study Area. For the last year and a half,	The Navy has and will continue to support the Cetacean and Sound Mapping project, including providing representation on the Cetacean Density and Distribution Mapping Working Group (CetMap). This working group has two objectives: First, to create regional cetacean density and distribution maps that are time- and species-specific, using survey data and models that estimate density using predictive environmental factors. With the exception of the Atlantic and Gulf of Mexico, the Navy has considered this information as part of the impact and mitigation assessment process. For the Atlantic and Gulf of Mexico, the Navy OPAREA Density Estimates on the Spatial Decision Support System for the Strategic Environmental Research and Development Program (available at http://seamap.env.duke.edu/serdp_map.php), are still considered the

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	the National Oceanic and Atmospheric Administration ("NOAA") has been guiding the work of two working groups to improve the tools available to agencies, including the Navy, to evaluate and mitigate the impacts of anthropogenic noise on marine mammals. The Working Groups' draft products were recently released and one key product of this effort was the Cetacean Density and Distribution Mapping Working Group's (CetMap) identification of marine mammal "hot spots" in the HSTT Study Area - biologically important areas for marine mammals as evidenced by increases in density and distribution or modeled based on important habitat. Because CetMap's products were not released prior to the completion of the DEIS, the information was not incorporated into the Navy's analysis through the development of reasonable alternatives or examined as possible mitigation measures based on limiting or excluding training and testing activities in these hot spots. The fact that the Navy must analyze this new information and determine how it will impact its development of alternatives and mitigation measures supports a revision of the DEIS, which would place the Navy's analysis of this critical information before the public, giving the public an opportunity to comment thereon.	best available data (Read and Halpin 2010[1]). Second, and separately, to augment the more quantitative density mapping and provide additional context for impact analyses, the CetMap also identifies areas of specific importance for cetaceans, such as reproductive areas, feeding areas, migratory corridors, and areas in which small or resident populations are concentrated, otherwise referred to as "biologically important areas." The working group determined that "hot spots" is not an appropriate term and chose to call them Biologically Important Areas. Biologically important areas information was based largely on observational data of animals exhibiting biologically important behaviors. The biologically important areas were only characterized for species, areas, and seasons where there were enough data to support the biologically important areas identification within the U.S. Exclusive Economic Zone. Most of these assessments are not based on CetMap density work products but on published and often unpublished data held by individual researchers. They only characterized the observational data available and did not use density or habitat-based models to determine the biologically important areas. Biologically important areas are not being designated by CetMap for the purpose of identifying areas off limit to human activities like sonar. Instead, information is being collected to provide additional context within which to examine potential interactions between cetaceans and human activities. This information can assist resource managers with planning, analyses, and decisions regarding how to reduce adverse impacts to cetaceans resulting from human activities. Some preliminary draft results are currently being released on http://cetsound.noaa.gov/important.html. The CetMap Working Group is also undertaking external review of the documents by subject matter experts outside National Oceanic and Atmospheric Administration and is preparing a collection of manuscripts focused on the biologically important areas that will be submitted to a scientific journal for external peer review by subject matter experts. The Navy also recommended to NMFS that a formal expert elicitation on biologically important areas results be conducted, including data review by a larger body of marine scientists and stakeholders. When appropriate, NMFS provides draft CetMap information for Navy consideration. As part of the ESA and MMPA processes, NMFS requested the Navy to consider some specific preliminary draft areas

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		as part of its mitigation analysis. As of the date of publication of the Final EIS/OEIS, this process is still ongoing; however, the results will be summarized in the Navy's Record of Decision and in NMFS Biological Opinion. If additional biologically important areas are identified by NMFS after the Navy's Record of Decision, the Navy and NMFS will use the Adaptive Management process to assess whether any additional mitigation should be considered in those areas. [1] Read, A. J. and P. Halpin. 2010. Predictive Spatial Analysis of Marine Mammal Habitats. Final Report. SERDP Project SI-1390. January 2010. 292 pp.
NRDC - 5	As you know, NEPA requires the Navy to employ rigorous standards of environmental review, including a full explanation of potential impacts, a comprehensive analysis of all reasonable alternatives, a fair and objective accounting of cumulative impacts, and a thorough description of measures to mitigate harm. Unfortunately, the DEIS released by the Navy falls far short of these mandates and fails to satisfy the Navy's legal obligations under NEPA. Thus, the Navy must revise the environmental impacts, alternatives, cumulative impacts and mitigation analysis in the DEIS (described in detail in Appendix A) and reissue the document for public review and comment. It must also fully address the considerable scientific record that has developed around sonar and whale injury and mortality, and adjust its acoustic impacts analysis and assessment model accordingly (discussed in Appendices B and C).	The Navy complies with all applicable environmental laws, including NEPA. As such, the Navy has developed this EIS/OEIS to meet the requirements of these laws. Please see Chapter 2 (Description of Proposed Action and Alternatives), which includes selection criteria and alternatives considered but eliminated (Section 2.5.1, Alternatives Eliminated from Consideration). Please see Chapter 3 (Affected Environment and Environmental Consequences) for the description of the affected environment and environmental consequences of the Navy's Proposed Action. Chapter 4 contains a comprehensive cumulative impacts analysis. Information on mitigation measures can be found in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS. Please see *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis* technical report on the project web site for a discussion of the acoustic impact modeling approach, which addresses the scientifically established criteria for injury, mortality, and harassment under the MMPA. For a complete analysis of stranding events, please see the Marine Mammal Stranding Report, found on the HSTTEIS.com website at: http://hstteis.com/Portals/0/hstteis/SupportingTechnicalDocs/.
NRDC - 6	The Navy Has Not Taken a "Hard Look" Under NEPA NEPA requires that the potential environmental impacts of any "major Federal actions significantly affecting the quality of the human environment" be considered through the preparation of an environmental impact statement ("EIS"). Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 348 (1989); 42 U.S.C. § 4332. The fundamental purpose of an EIS is to compel decision-makers to take a "hard look" at a particular action - both at the environmental impacts it will have and at the alternatives and mitigation measures available to reduce those impacts - before a decision to proceed is made. 40 C.F.R. §§ l500.l(b), 1502.1; Baltimore Gas & Electric v. NRDC, 462 U.S. 87,97 (1983); Robertson,	The EIS/OEIS has taken a "hard look" at potential environmental consequences of the Proposed Action and alternatives, and provides sufficient information for careful agency decision-making. The Navy considered the best available science in preparation of this EIS/OEIS and is in consultation with NMFS as the regulator and a cooperating agency with regard to the Proposed Action, the potential environmental impacts, and any resultant mitigation measures as conditions of anticipated authorizations under the MMPA or reasonable and prudent measures resulting from issuance of a

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	490 U.S. at 349. While NEPA "does not commend the agency to favor an environmentally preferable course of action," an agency may only make a decision to proceed after taking a "hard look" at environmental consequences. Sabine River Auth. v. Dep't of Interior, 951 F.2d 669, 676 (5th Cif. 1992)(internal citations omitted).	Biological Opinion under ESA.
NRDC - 7	As the DEIS makes clear, the proposed activities pose a significant risk to whales, fish, and other wildlife that depend on sound for breeding, feeding, navigating, and avoiding predators-in short, for their survival. Under every Alternative, the Navy would employ mid-frequency active sonar, which has been implicated in mass injuries and mortalities of whales around the globe.[4] The same technology is known to affect marine mammals in countless other ways, inducing panic responses, displacing animals, and disrupting crucial behavior such as foraging. In addition, the Navy's training and testing with explosives will kill wildlife and leave animals with permanent injuries to their internal organs. The Navy expects to take more than 40 different species of marine mammals, including 7 species listed as endangered or threatened under the Endangered Species Act ("ESA"). DEIS at 3.4-2 to I 1. The Pacific Fleet's training and testing activities would also affect fisheries and essential fish habitat, injure tens of thousands of sea turtles, and release a large amount of hazardous and expended materials into the waters. See Appendices A and B for a detailed discussion of impacts. Footnote 4.. Military sonar generates intense sound that can induce a range of adverse effects in whales and other species - from significant behavioral changes to injury and death. The most widely reported and dramatic of these events are the mass strandings of beaked whales and other marine mammals that have been associated with military sonar use. A brief summary of the stranding record appears in Appendix B.	The Navy shares your desire to preserve marine life. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a species-level risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. An integrated monitoring plan for the activities in the HSTT Study Area is also planned as presented in Section 5.5.1.1 (Integrated Comprehensive Monitoring Program) of the EIS/OEIS. In addition, the Navy implements, to the maximum extent practicable, mitigation measures during its training and testing events as developed with NMFS as the regulatory agency under MMPA and ESA. The Navy will continue to implement the monitoring and research programs where training has been occurring to determine if there are identified impacts as a result of those activities and will do so in the HSTT Study Area associated with future training occurring there. The Navy will continue to be a leader in funding of research to better understand the potential impacts of Navy training activities and to operate with the least possible impacts while meeting training and testing requirements.
NRDC - 8	While the Navy has made progress in assessing the impacts its activities have on the environment, it continues to underestimate harm by disregarding a great deal of relevant information and using approaches that are the opposite of precautionary when factoring uncertainty. As discussed in Appendix C, in revising its DEIS, the Navy must adjust its thresholds for impact and modeling by incorporating the considerable scientific record showing that impacts are even greater than the Navy estimates.	The criteria and thresholds for determining potential effects to marine species used in the HSTT EIS/OEIS and related consultation documents were carefully revised from that used in previous Navy EISs based on best available science, which included lowering the thresholds over much of the hearing range of many species of marine mammals. This included revising the permanent threshold shift threshold for all marine mammal species based on best available science.
NRDC - 9	The Navy Fails to Identify and Analyze Reasonable Alternatives As you are aware, both of the Navy's action alternatives (Alternative 1 and 2) would dramatically increase the amount of training and testing in Hawaii and Southern	The differences between Alternatives 1 and 2 are detailed in Sections 2.7 (Alternative 1: Expansion of the Study Area Plus Adjustments to the Baseline and Additional Weapons, Platforms, and Systems) and 2.8 (Alternative 2: Includes Alternative 1 Plus Increased Tempo of

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	California and subject marine mammals to an unprecedented level of harm, including death, lung injuries, gastro-intestinal injuries, hearing loss, and significant behavioral reactions like habitat abandonment. Neither alternative presents an option that would significantly reduce the predicted harm to the marine environment and wildlife. For example, both of the Navy's alternatives result in the exact same number of marine mammal takes from training with sonar - over 2.5 million per year. For training then, the DEIS offers no alternative for a decision maker wishing to reduce the harm to marine mammals.	Training and Testing Activities) of the Final EIS/OEIS. The Navy developed the alternatives considered in this EIS/OEIS after careful assessment of the Navy's training and testing requirements by subject matter experts, including military units and commands that perform the training and testing, and Navy environmental managers and scientists. A reduction in training and testing activities would fail to meet the Purpose and Need and would not allow the Navy to meet its obligations under Title 10 of the United States Code. Refer to Section 2.5 (Alternatives Development) of the Final EIS/OEIS for an explanation of the development of alternatives.
NRDC - 10	It is obvious that the Navy's alternatives were not selected to "inform decision-makers and the public" of how it could "avoid or minimize adverse impacts or 'enhance the quality of the human environment." 40 C.F.R. § 1502.1. While the Navy purportedly presents two reasonable alternatives, it leaves no room for decision makers to choose anything but its preferred alternative, which "is contingent upon [and allows for] potential budget increases, strategic necessity, and future training and testing requirements." DEIS at ES-8; 2-74 (emphasis added). A decision maker that wishes to meet the Navy's needs is compelled to choose the preferred alternative. In addition, even if Alternative I also met the Navy's strategic necessity and future training and testing requirements and a decision maker felt free to considering choosing it over the Navy's preferred alternative, he or she would be hard pressed to identify which alternative works to avoid or minimize adverse environmental impacts, let alone enhance the quality of the human environment. Both alternatives inflict an unprecedented amount of harm on marine life. Neither alternative was developed with an eye to minimizing adverse environmental impacts, but instead reflect differences entirely unrelated to the proposed action's environmental impacts. Such differences in capabilities, tempo, and locations are entirely based on operational needs, not on factors related to environmental impacts. As such, they fail to provide the public and decision makers with any options for significantly limiting the impact to marine wildlife. The development of alternatives in this manner violates NEPA, reflecting a classic post hoc rationalization for a decision unlawfully made before environmental impacts and reasonable alternatives were considered.	The EIS/OEIS reviewed potential environmental consequences (Chapter 3, Affected Environment and Environmental Consequences) of the Proposed Action and alternatives, and provides sufficient information for careful agency decision making. The Navy attempted to establish alternatives based on geographical alternatives (Section 2.5.1, Alternatives Eliminated From Further Consideration and Section 5.2.2.1, Lessons Learned from Previous Environmental Impact Statements/Overseas Environmental Impact Statements), but this approach proved to not be feasible. The Navy is not obligated by NEPA to consider alternatives that are not feasible. Therefore, the only reasonable alternatives for the Navy to consider to meet its purpose and need must differ in training tempo, capabilities, and locations. The alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. The selection of an alternative by the decision maker will be based on a review of all relevant facts, impact analyses, comments received via the EIS/OEIS public participation process, and the requirements of the Navy in order to fulfill its mission. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. Most impacts from the Proposed Action are expected to be brief and recoverable. Long-term impacts to a small number of individuals are not expected to have long-term population consequences.
NRDC - 11	In addition, even if Alternative I also met the Navy's strategic necessity and future training and testing requirements and a decision maker felt free to considering choosing it over the Navy's preferred alternative, he or she would be hard pressed to identify which alternative works to avoid or minimize adverse environmental impacts, let alone enhance the quality of the human environment. Both alternatives inflict an unprecedented amount of harm on marine life. Neither alternative was developed with	The Navy complied with NEPA requirements in the development and consideration of alternatives. This EIS/OEIS analyzes all alternatives in Sections 2.5 through 2.8 and explains why the Navy has considered but eliminated alternatives in Section 2.5.1 (Alternatives Eliminated from Further Consideration). The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	an eye to minimizing adverse environmental impacts, but instead reflect differences entirely unrelated to the proposed action's environmental impacts. Such differences in capabilities, tempo, and locations - are entirely based on operational needs, not on factors related to environmental impacts. As such, they fail to provide the public and decision makers with any options for significantly limiting the impact to marine wildlife. The development of alternatives in this manner violates NEPA, reflecting a classic post hoc rationalization for a decision unlawfully made before environmental impacts and reasonable alternatives were considered.	under Title 10. Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) includes mitigation measures designed to reduce potential impacts.
NRDC - 12	The Navy Fails to Consider Effective Mitigation There is general consensus that protection areas - in which the use of mid-frequency sonar would not occur - represent the most effective means currently available to reduce the impacts of mid-frequency sonar on marine mammals.[5] In 2010, the National Oceanic Atmospheric Administration ("NOAA") completed a review of the Navy's sonar mitigation. It concluded that "ongoing mitigation efforts, in our view, must do more" to address uncertainties and protect marine mammals.[6] Nonetheless, the Navy's OEIS proposes the same mitigation scheme that NOAA found lacking. While NOAA emphasized the importance of habitat identification and avoidance, stating that "[p]rotecting important marine mammal habitat is generally recognized to be the most effective mitigation measure currently available," the Navy makes no provision for protecting areas in the HSTT Study Area in addition to the limited area for humpback whales.?	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. Through consultation and permitting with NMFS, the Navy refined the mitigation measures, which are now presented in Chapter 5 of this Final EIS/OEIS. Through careful exploration of all mitigation measures to determine which were the most effective, the Navy has chosen the measures to mitigate potential impacts to marine mammals while still being able to meet its operational needs to train for real-world conditions. Specific mitigation measures are outlined in the following sections: Section 5.3.1 (Lookout Procedural Measures), Section 5.3.2 (Mitigation Zone Procedural Measures), and Section 5.3.3 (Mitigation Areas). Specifically, Section 5.3.3.1 (Marine Mammal Habitats) addresses important habitat areas.
NRDC - 13	Appendix A contains a detailed description of mitigation measures that the Navy can and should - adopt.	Through careful exploration of all mitigation measures to determine which were the most effective, the Navy has chosen the measures to mitigate potential impacts to marine mammals while still being able to meet its operational needs to train and test for real world conditions. Specific mitigation measures are outlined in the following sections: Section 5.3.1 (Lookout Procedural Measures), Section 5.3.2 (Mitigation Zone Procedural Measures), and Section 5.3.3 (Mitigation Areas). Specifically, Section 5.3.3.1 (Marine Mammal Habitats) addresses important habitat areas. The Navy is in consultation with NMFS as the regulator and a cooperating agency with regard to the Proposed Action, the potential environmental impacts, and any resultant mitigation measures as conditions of anticipated authorizations under the MMPA or reasonable and prudent measures resulting from issuance of a Biological Opinion under ESA.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
NRDC - 14	At a minimum, however, the Navy must assess the value of marine mammal habitat in the HSTT Study Area and protect any higher-value areas identified.	The mitigation measures identified throughout Chapter 5 will apply to protect all marine mammals year round, and will be applied regardless of the location of the activity. In 2012, the CetMap panel of experts determined that no biologically important areas could be identified based on data availability and information at hand. Furthermore, no follow-on products have identified areas of recommended avoidance. It is important to note that the areas appearing on the CetMap website are a preliminary draft that needs considerable additional input from the larger biological community before being used to identify biologically important areas in the ocean.
NRDC - 15	As noted, NOAA recently completed a series of workshops designed to learn more about marine mammal "hot spots." The results of these workshops are now available and the Navy must assess the information and develop mitigation measures based on protecting important marine mammal habitat. To offer full protection to the marine mammals found in these "hot spots," the Navy should develop mitigation measures that bar the use of sonar in the areas and provide a buffer for them that limits the received level of sound. At a minimum, the Navy should establish cautionary areas in these habitats.	The Navy has and will continue to support the Cetacean and Sound Mapping project, including providing representation on the Cetacean Density and Distribution Mapping Working Group (CetMap). This working group has two objectives. First, to create regional cetacean density and distribution maps that are time- and species-specific, using survey data and models that estimate density using predictive environmental factors. With the exception of the Atlantic and Gulf of Mexico, the Navy has considered this information as part of the impact and mitigation assessment process. For the Atlantic and Gulf of Mexico, the Navy OPAREA Density Estimates on the Spatial Decision Support System for the Strategic Environmental Research and Development Program (available at http://seamap.env.duke.edu./serdp/serdp_map.php), are still considered the best available data (Read and Halpin 2010[1]). Second, and separately, to augment the more quantitative density mapping and provide additional context for impact analyses, the CetMap is also identifying areas of specific importance for cetaceans, such as reproductive areas, feeding areas, migratory corridors, and areas in which small or resident populations are concentrated, otherwise referred to as “biologically important areas.” The working group determined that "hot spots" is not an appropriate term and chose to call them Biologically Important Areas. Biologically important areas information was based largely on observational data of animals exhibiting biologically important behaviors. The biologically important areas were only characterized for species, areas, and seasons where there were enough data to support the biologically important areas identification within the U.S. Exclusive Economic Zone. Most of these assessments are not based on CetMap density work products but on published and often unpublished data held by individual researchers.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		They only characterized the observational data available and did not use density or habitat-based models to determine the biologically important areas. Biologically important areas are not being designated by CetMap for the purpose of identifying areas off limit to human activities like sonar. Instead, information is being collected to provide additional context within which to examine potential interactions between cetaceans and human activities. This information can assist resource managers with planning, analyses, and decisions regarding how to reduce adverse impacts to cetaceans resulting from human activities. Some preliminary, draft results are currently being released on http://cetsound.noaa.gov/important.html. The CetMap Working Group is also undertaking external review of the documents by subject matter experts outside National Oceanic and Atmospheric Administration and is preparing a collection of manuscripts focused on the biologically important areas that will be submitted to a scientific journal for external peer review by subject matter experts. The Navy also recommended to NMFS that a formal expert elicitation on biologically important areas results be conducted, including data review by a larger body of marine scientists and stakeholders. When appropriate, NMFS provides draft CetMap information for Navy consideration. As part of the ESA and MMPA processes, NMFS requested the Navy to consider some specific preliminary draft areas as part of its mitigation analysis. As of the date of publication of the Final EIS/OEIS, this process is still ongoing; however, the results will be summarized in the Navy's Record of Decision and in NMFS Biological Opinion. If additional biologically important areas are identified by NMFS after the Navy's Record of Decision, the Navy and NMFS will use the Adaptive Management process to assess whether any additional mitigation should be considered in those areas. [1] Read, A. J. and P. Halpin. 2010. Predictive Spatial Analysis of Marine Mammal Habitats. Final Report. SERDP Project SI-1390. January 2010. 292 pp.
NRDC - 16	Conclusion Our organizations recognize the Navy's important role in ensuring national security. We also value the security a clean and healthy environment provides. National security and environmental integrity are not mutually exclusive, and we encourage the Navy to train and test in ways that protect Hawaii's and Southern California's valuable natural resources. Thus, for the reasons set forth above and in greater detail in the Appendices below and attached critique by Dr. David Bain, we urge the Navy to satisfy its obligations under NEPA and other applicable laws by revising its DEIS, taking a "hard	The Navy complies with all applicable environmental laws, including NEPA. The EIS/OEIS has taken a "hard look" at potential environmental consequences of the Proposed Action and alternatives, and provides sufficient information for careful agency decision-making. The Navy considered the best available science in preparation of this

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	look" at impacts and identifying and analyzing reasonable alternatives and mitigation measures that will significantly reduce the impact to the marine environment.[8] Upon revision the DEIS should be released to the public for review and comment.	EIS/OEIS and is in consultation with NMFS as the regulator and a cooperating agency with regard to the Proposed Action, the potential environmental impacts, and any resultant mitigation measures as conditions of anticipated authorizations under the MMPA or reasonable and prudent measures resulting from issuance of a Biological Opinion under ESA.
NRDC - 17	APPENDIX A As set forth below, the Navy's DEIS does not meet the rigorous standards set forth in the National Environmental Policy Act. We urge the Navy to revise and then reissue its DEIS, substantially altering the approach it has taken thus far. The Navy's scope of review must be expanded, its alternatives analysis broadened, its mitigation plan significantly improved, and its impact assessment revised to reflect the scientific evidence of mid-frequency sonar's effects on marine life. These critical steps must be undertaken if the Navy's EIS is to comply with federal law. I. Legal Framework: The National Environmental Policy Act The National Environmental Policy Act of 1969 ("NEPA") "declares a broad national commitment to protecting and promoting environmental quality." Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 348 (1989). NEPA establishes a national policy to "encourage productive and enjoyable harmony between man and his environment" and "promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man." 42 U.S.C. § 4321. In order to achieve its broad goals, NEPA mandates that "to the fullest extent possible" the "policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with [it]." 42 U.S.C. § 4332. Central to NEPA is its requirement that, before any federal action that "may significantly degrade some human environmental factor" can be undertaken, agencies must prepare an EIS. Steamboaters v. F.E.R.C., 759 F.2d 1382, 1392 (9th Cir. 1985) (emphasis in original). The requirement to prepare an EIS "serves NEPA's action-forcing purpose in two important respects." Robertson, 490 U.S. at 349. First, "the agency, in reaching its decision, will have available, and will carefully consider. detailed information concerning significant environmental impacts[,]" and second, "the relevant information will be made available to the larger audience that may also play a role in both the decisionmaking process and the implementation of that decision." Id. (emphasis added). As the Supreme Court explained: "NEPA's instruction that all federal agencies comply with the impact statement requirement. .. 'to the fullest extent possible' [cit. omit.] is neither accidental nor hyperbolic. Rather the phrase is a deliberate command that the duty NEPA imposes upon the agencies to consider environmental factors not be shunted aside in the bureaucratic shuffle." Flint Ridge Development Co. v. Scenic Rivers Ass'n, 426 U.S. 776, 787 (1976). The fundamental purpose of an EIS is to force the decision-maker to take a "hard look"	As explained above, the Navy's statement of the purpose and need for the Proposed Action is detailed and specific, the scope of the Proposed Action is described in exhaustive detail after careful assessment of training and testing requirements, and the alternatives have been developed in accordance with NEPA standards. The EIS/OEIS is the product of extensive analysis applying best available science, including methodologies for analyzing impacts of mid-frequency active sonar on marine mammals that were developed in close consultation with NMFS, a cooperating agency in the development of this EIS/OEIS, the recognized experts in the marine environment, and the agency designated by law under the MMPA with jurisdiction over the protection of the marine environment. The Navy has developed, refined and adopted mitigation measures to address environmental impacts in every affected resource area, and has identified any unavoidable impacts of the Proposed Action. The Navy has further conducted an appropriate analysis of cumulative effects of its Proposed Action. The EIS/OEIS takes a "hard look" at potential environmental consequences of the Proposed Action and alternatives, and provides sufficient information for careful agency decision-making.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	at a particular action - at the agency's need for it, at the environmental consequences it will have, and at more environmentally benign alternatives that may substitute for it before the decision to proceed is made. 40 C.F.R. §§ 1500.I(b), 1502.1; Baltimore Gas & Electric v. NRDC, 462 U.S. 87,97 (1983). This "hard look" requires agencies to obtain high quality information and accurate scientific analysis. 40 C.F.R. § 1500.1 (b). "General statements about possible effects and some risk do not constitute a hard look absent a justification regarding why more definitive information could not be provided." Klamath-Siskiyou Wilderness Center v. Bureau of Land Management, 387 F.3d 989, 994 (9th Cir. 2004) (quoting Neighbors of Cuddy Mountain v. United States Forest Service, 137 F.3d 1372, 1380 (9th Cir. 1998». The law is clear that the EIS must be a pre-decisional, objective, rigorous, and neutral document, not a work of advocacy to justify an outcome that has been foreordained. In nearly every respect, despite the length and information provided, the Navy's DEIS fails to meet the high standards of rigor and objectivity required under NEPA. The Navy has failed to conduct the "hard look" necessary to thoroughly examine the many environmental consequences of its proposed action.	
NRDC - 18	The Navy Fails to Properly Analyze Impacts on Marine Mammals The Navy's OEIS does not properly analyze environmental impacts. Despite the unprecedented level of harm the Navy predicts, its analysis nonetheless understates the potential effects of its training and testing activities on marine wildlife and fails to acknowledge risks posed to a wide range of marine species from its activities. The DEIS concludes that no "marine mammal strandings or mortality will result from the operation of sonar or other acoustic sources during Navy exercises within the Study Area." DEIS at 3.4-152. The Navy reaches this conclusion despite acknowledging the importance of sound to marine mammal existence and the hundreds of thousands of instances of hearing loss its activities will inflict on marine mammals. For example, the Navy states that "it is likely that a relationship between the duration, magnitude, and frequency range of hearing loss could have consequences to biologically important activities (e.g., intraspecific communication, foraging, and predator detection) that affect survivability and reproduction." OEIS at 3.4-97 to 98. The Navy's statements are clearly contradictory; on the one hand the Navy states that a connection between survivability and hearing loss is likely, which must be placed in the context of its prediction of 3 million instances of temporary hearing loss, while on the other it concludes that no mortality will result from the use of sonar. The Navy's conclusions are unsupported by its own analysis. Finally, as discussed in detail in Appendix C and the attached critique by Dr. David Bain, the Navy's assessment of acoustic impacts is also highly problematic and likely underestimates the impacts to marine mammals.	The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS, using the most current, relevant scientific information. The number of marine mammal harassment exposures must be estimated scientifically using complex modeling, but the resulting estimates must then be analyzed in context of the limitations of that modeling. Since the Draft EIS/OEIS was released, adjustments were made to the quantified results of the marine mammal acoustic effects analysis. These changes were presented in the Navy's Letter of Authorization application to NMFS and are reflected in this Final EIS/OEIS. Modifications to the requested take numbers outlined in the Draft EIS/OEIS were presented in the Proposed Rule and are a result of consultation with NMFS, as well as refinements to training and testing modeling inputs and minor changes to Navy training and testing as a result of emerging requirements. In consultation with NMFS, the Navy made post-model adjustments to further refine the numerical analysis of acoustic effects so as to include by considering animal avoidance of sound sources, avoidance of areas of activity before use of a sound source or explosive, and implementation of mitigation. Section 3.4.3.1.5.5 (Marine Mammal Avoidance of Sound Exposures) and Section 3.4.3.1.5.6 (Implementing Mitigation to Reduce Sound Exposures), describes in detail the post-model adjustments made to further refine the numerical analysis of acoustic effects. Also based on response to comments, Navy has supplemented the discussion regarding hearing loss as a general

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		topic. With regard to the critique by Dr. David Bain, this same critique was provided as comment on the 2009 HRC EIS/OEIS so was certainly considered in the development of the present HSTT EIS/OEIS. As noted in response then and presented in the current document, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts.
NRDC - 19	Acoustic Impacts on Marine Mammals NEPA requires agencies to ensure the "professional integrity, including scientific integrity," of the discussions and analyses that appear in EISs. 40 C.F.R. § 1502.24. To that end, they must make every attempt to obtain and disclose data necessary to their analysis. See 40 C.F.R. § IS02.22(a). Agencies are further required to identify their methodologies, indicate when necessary information is incomplete or unavailable, acknowledge scientific disagreement and data gaps, and evaluate indeterminate adverse impacts based upon approaches or methods "generally accepted in the scientific community." 40 C.F.R. §§ 1502.22(2), (4), 1502.24. Such requirements become acutely important in cases where, as here, so much about a program's impacts depend on newly emerging science. In this case, the Navy's assessment of impacts is consistently undermined by its failure to meet these fundamental responsibilities of scientific integrity, methodology, investigation, and disclosure. As set forth in greater detail in Appendix C and the attached critique by Dr. Bain, the DEIS disregards a great deal of relevant information adverse to the Navy's interests, uses approaches and methods that would not be acceptable to the scientific community, and ignores whole categories of impacts. In short, it leaves the public with an analysis of harm-behavioral, auditory, and physiological-that is at odds with established scientific authority and practice. The Navy must revise its acoustic impacts analysis, including its thresholds and risk function, to comply with NEPA.	The marine mammal acoustical analysis is based on the use of the best available science (see Section 3.4, Marine Mammals) as it applies to mid-frequency and high-frequency sources used during training and testing in the HSTT Study Area. The Navy has been thorough in its use of all relevant data and studies available on the marine environment as required by NEPA.
NRDC - 20	Other Impacts on Marine Mammals The activities proposed for the HSTT Study Area may have impacts that are not limited to the effects of ocean noise. Unfortunately, the Navy's analysis of these other impacts is cursory and inadequate. First, the Navy fails to adequately assess the impact of stress on marine mammals, a serious problem for animals exposed even to moderate levels of sound for extended periods.[9] DEIS at 3.4-99 to 100. As the Navy has previously observed, stress from ocean noise-alone or in combination with other stressors, such as biotoxins-may weaken a cetacean's immune system, making it "more vulnerable to parasites and diseases that normally would not be fatal."[10] Moreover, according to	Exposure to mid or high frequency active sonar will not result in a chronic noise environment in the HSTT Study Area. Sonar pings are brief and intermittent with an animal exposed at most approximately two times a minute for several minutes if the animal is undetected by Navy Lookouts. Given the manner in which sonar is typically used, and the movement of the participants, it is extremely unlikely that individual animals would be exposed to sonar long enough for stress or injury to occur. Studies of odontocetes chased during purse seining of tuna showed

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	studies on terrestrial mammals, chronic noise can interfere with brain development, increase the risk of myocardial infarctions, depress reproductive rates, and cause malformations and other defects in young-all at moderate levels of exposure. I t Because physiological stress responses are highly conservative across species, it is reasonable to assume that marine mammals would be subject to the same effects and recent research is bearing this out. A study of North Atlantic right whales produced evidence showing that exposures to low-frequency ship noise may be associated with chronic stress in whales. 12 For the Navy, Stich studies should be particularly relevant when assessing impacts on those marine mammal populations that are subjected to stress inducing impacts from training and testing activities on a regular basis. Nonetheless, despite the potential for stress in marine mammals and the significant consequences that can now from it, the Navy unjustifiably assumes that such effects would be minimal. <J See National Research Council, Ocean Noise and Marine Mammals. 10 Navy, Hawaii Range Complex Draft Environmental Impact Statement! Overseas Environmental Impact Statement at 5-19 to 5-20 (2007). Additional evidence relevant to the problem of stress in marine mammals is summarized in A.J. Wright, N. Aguilar Soto. A.L. Baldwin, M. Bateson, C.M. Beale, C.Clark, T. Deak, E.F. Edwards, A. Fernandez, A. Godinho, L. Hatch, A. Kakuschke, D.Lusseau, D. Martineau, L.M. Romero, L. Weilgart, B. Wintle, G. Notarbartolo di Sciara, and V. Martin, Do marine mammals experience stress related to anthropogenic noise?, 20 International Journal of Comparative Psychology, 274-316 (2007): see also T.A. Romano, M.J. Keogh, C. Kelly, P. Feng, L. Berk, C.E. Schlundt, D.A. Carder, and 1.1. Finneran, Anthropogenic Sound and Marine Mammal Health: Measures of the Nervous and Immune Systems Before and After Intense Sound Exposure, 61 Canadian Journal of Fisheries and Aquatic Sciences 1124, 1130-31 (2004). 11 See, e.g., E.F. Chang and M.M. Merzenich, Environmental Noise Retards Auditory Cortical Development, 300 Science 498 (2003) (rats); S.N. Willich, K. Wegscheider, M. Stallmann, and T. Keil, Noise Burden and the Risk of Myocardial Infarction, European Heart Journal (2005) (Nov. 24,2005) (humans); F.H. Harrington and A.M. Veitch, Calving Success of Woodland Caribou Exposed to Low Level Jet Fighter Overflights, 45 Arctic vol. 213 (1992) (caribou) 12 R. M. Rolland, S. E. Parks, K. E. Hunt. M. Castellote. P. J. Corkeron, D. P. Nowacek. S. K. Wasser, and S. D. Krauss. 2012. "Evidence That Ship Noise Increases Stress in Right Whales." Proceedings of the Royal Society of Biology. 10. 1098/rspb.2011.2429.	stress effects when pursued for long periods (30-40 minutes) but most of those animals recovered (Edwards 2007 International Journal of Comparative Psychology, 20: 217-227). Since the impact from noise exposure and the Navy training and testing events in general should be transitory given the movement of the participants, any stress responses should be short in duration and have less than biologically significant consequences.
NRDC - 21	Second, in the course of its training activities, the Navy would release a host of toxic chemicals, hazardous materials and waste into the marine environment that could pose a threat to marine mammals over the life of the range. For example, under its preferred alternative, the Navy plans to abandon approximately 370,000 pounds of potentially toxic metals in HSTT Study Area waters. DEIS at 3.1-44 to 45. Nonetheless, the OEIS fails to adequately consider the cumulative impacts of these toxins on marine mammals from past, current, and proposed training exercises. Careful study is needed into the way	This statement is inaccurate. Chapter 3.1 (Sediments and Water Quality) did not state that 370,000 pounds of potentially toxic metals would be abandoned. The chapter concludes that chemical, physical, or biological changes to sediment or water quality would be measurable but below applicable standards, regulations, and guidelines, and would be within existing conditions or designated uses. Neither state nor federal standards or guidelines would be violated.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	toxins might disperse and circulate within the area and how they may affect marine wildlife.	
NRDC - 22	The Navy's assumption that expended materials and toxics would dissipate or become buried in sediment leads to a blithe conclusion that releases of hazardous material would have no adverse effects. Given the amount of both hazardous and nonhazardous materials, this discussion is inadequate under NEPA.	The EIS/OEIS document presents a thorough description and analysis in Section 3.1.3 (Environmental Consequences) of amounts and types of specific training materials as well as chemical composition and breakdown processes of expended materials. Based on the best available science, the impact of explosives, explosion byproducts, and metals on sediment and water quality would be both short- and long-term, and localized. Chemical, physical, or biological changes in sediment or water quality would be measurable, but below applicable standards and guidelines, and would be below or within existing conditions or designated uses. The impact of chemicals other than explosives and other materials on sediment and water quality would be both short- and long-term, and localized. Chemical, physical, or biological changes in sediment or water quality would not be detectable, and would be below or within existing conditions or designated uses. Therefore, no water or sediment toxicity would occur, so no adverse effects on marine organisms would be expected.
NRDC - 23	In addition, the Navy also plans to abandon cables, wires, and other items that could entangle marine wildlife, including more than 67,000 parachutes. DEIS at 3.3-26. Acknowledging that entanglement is a serious issue for marine mammals (e.g., "From 1998-2005, based on observer records, five fin whales (CA/OR/WA stock), 12 humpback whales (Eastern North Pacific stock), and six sperm whales (CA/OR/WA stock) were either seriously injured or killed in fisheries off the mainland West Coast of the U.S." DEIS at 3.4-250), the DEIS nonetheless dismisses the threat posed by abandoning 67,000 parachutes, claiming without support that a marine mammal that did become entangled could easily become free. DEIS at 255. Again, this discussion and analysis is inadequate under NEPA.	The studies regarding marine mammal entanglement involve primarily fishing gear, which include items designed to ensnare and result in entanglement. Unlike typical fishing nets and lines, the Navy's equipment is not designed for trapping or entanglement purposes. The Navy deploys equipment designed for military purposes and strives to reduce the risk of accidental entanglement posed by any item it releases into the sea.
NRDC - 24	Third, the Navy fails to consider the risk of ship collisions with large cetaceans, as exacerbated by the use of active acoustics. For example, right whales have been shown to engage in dramatic surfacing behavior, increasing their vulnerability to ship strikes, on exposure to mid-frequency alarms above 133 dB re 1 μPa (SPL)-a level of sound that can occur many tens of miles away from the sonar systems slated for the range. 13 It should be assumed that other large whales (which, as the OEIS repeatedly notes, are already highly susceptible to vessel collisions) are subject to the same hazard. As the Navy notes, "[v]essel strikes from commercial, recreational, and Navy vessels are known to affect large whales in the HSTT Study Area and have resulted in serious injury and	Ship strikes were discussed in the Draft EIS/OEIS, Section 3.4.3.3.1 (Impact from Vessels). Results of the research by Nowacek et al (2004) where right whales reacted to an "alert stimuli," used a sound source that was designed to cause a reaction in right whales and has almost no correlation to any sound source used by the U.S. Navy. The results of the Nowacek et al (2004) study were not used in the Navy's ship strike analysis; however, the results were used to develop the risk function from which the quantification of predicted exposures was derived. With regard to the vessel strike calculations, those were done

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	occasional fatalities to cetaceans." DEIS at 3.4-235. And while the Navy analyzes the threat of ship strikes generally (DEIS at 3.4-234 to 245), it uses a basic probability calculation as opposed to the kind of modeling for take that it uses for other impacts (e.g., acoustic sources), which can underestimate the impact from ship strikes.	using years of National Oceanic and Atmospheric Administration historical strike data to assess the probability of ship strike. The use of historical trend data is considered to be the most accurate means to assess the probability of future strikes since there is no scientific method to otherwise make such an assessment.
NRDC - 25	Fourth, the Navy does not adequately analyze the potential for and impact of oil spills. As evidenced by the 1989 Exxon Valdez oil spill and the 2010 BP Deepwater Horizon disaster, there is a risk of an oil spill in areas where oil is produced and transported, such as areas of Southern California. This risk is exacerbated by increasing the tempo and intensity of Navy training, which will involve more vessels, more transits, and longer missions throughout the HSTT Study Area.[14] In light of this history and the extraordinarily valuable and sensitive natural resources that occur in Southern California, the Navy must evaluate its spill response plan and station salvage equipment accordingly. 14- We note that the Navy should include in its analysis and disclose to the public a chart that shows how its operating areas overlap shipping lanes, recommended routes, and Areas to Be Avoided as an indication of the potential for conflict with other vessels.	The analysis presented in the EIS/OEIS is limited to the activities and reasonable outcomes of such activities. As accidents involving other vessels and oil spills are not reasonably foreseeable, nor anticipated, the impact of such occurrences are not addressed or analyzed. The Navy has plans and procedures for preventing, reporting, and responding to oil spills. Although the number of training and testing activities is likely to increase, multiple activities usually occur from the same vessel, thus increased number of activities is not expected to result in an increase in vessel use or transit.
NRDC - 26	Finally, the Navy's analysis cannot be limited only to direct effects, i.e., effects that occur at the same time and place as the training exercises that would be authorized. 40 C.F.R. § 1508.8(a). It must also take into account the activity's indirect effects, which, though reasonably foreseeable (as the DEIS acknowledges), may occur later in time or are further removed. 40 C.F.R. § 1508.8(b). This requirement is particularly critical in the present case given the potential for sonar exercises to cause significant long-term impacts not clearly observable in the short or immediate term (a serious problem, as the National Research Council has observed). 15 Thus, for example, the Navy must not only evaluate the potential] for mother-calf separation but also the potential for indirect effects-on survivability-that might arise from that transient change. 40 C.F.R. § 1502. 16(b). Without further consideration of these impacts, and mitigation and alternatives developed to address those impacts, the DEIS does not pass NEPA muster. 15 "Even transient behavioral changes have the potential to separate mother-offspring pairs and lead to death of the young, although it has been difficult to confirm the death of the young." National Research Council. Ocean Noise and Marine Mammals at 96.	The potential for indirect effects on marine mammals has been considered in Section 3.4 (Marine Mammals) in developing the methodology for assessing acoustic impacts, and it is thereby acknowledged that direct acoustic harassment of an individual can lead to other, indirect effects. As depicted in Figure 3.0-18, the Navy's analysis considers all potential impacts resulting from exposure to acoustic sources. In figure 3.0-18, the effects are shown in terms of physiological responses, behavioral responses, potential costs to the animal, recovery, and long-term consequences. The likely existence of such effects is accounted for in the estimation of "take" and they are otherwise not predictable or amenable to quantification. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
NRDC - 27	Other Impacts on Wildlife The same concerns that apply to marine mammals - such as injury or death from midfrequency active sonar, collisions with ships, bioaccumulation of toxins, and stress apply to sea turtles, birds and other biota as well. The Navy must adequately evaluate impacts and propose mitigation for each category of harm. 40 C.F.R. §§ 1502.14, 1502.16. The Navy limits its analysis of the effects of mid-frequency active sonar on sea turtles on the grounds that their best hearing range appears to occur below 1 kHz. DEIS at 3.55 to 6; 3.5-40. Nevertheless, even with this limitation, the Navy predicts nearly 8,000 instances of temporary hearing loss for sea turtles, over 700 instances of permanent hearing loss, 65 instances of gastrointestinal injury, and 25 deaths from acoustic sources, like sonar, and explosives over five years. DEIS at 3.5-42; 3.5-47. Given the endangered status of sea turtles, there is little room for error in assessing impacts. While predicting death and permanent injury to members of these species and acknowledging a complete lack of density data for the species in open ocean conditions, the Navy nonetheless concludes that "population level impacts are not expected." DEIS at 3.5-42. Yet such conclusions are made without analyzing the impacts against the specific status of each species, even while acknowledging that many of the species have decreasing long-term population trends (e.g., hawksbiII sea turtles at DEIS 3.5-13) and that studies indicate that many populations in the HSTT Study Area may be genetically distinct and require independent management (e.g., green sea turtles at OEIS 3.5-7). The Navy must rigorously analyze predicted impacts against the status of the species in the HSTT Study Area before concluding that no population-level impacts are expected.	The Navy has analyzed potential impacts from ship strikes, bioaccumulation of toxins, and stress on multiple species within the applicable marine resources sections. The Navy has included mitigation measures for each resource within each respective section and within Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring). Regarding sea turtles, while there are some sea turtles that may be able to hear sounds at 1 kHz, there is a very large difference between sounds at 1 kHz and sounds at 3.5 kHz than would be evident in simply looking at the difference between the numbers (a delta of -2.5). Current best available science and all available indications are that they are not likely able to hear mid-frequency sonar. Potential impacts related to bioaccumulation are discussed in the EIS/OEIS in Section 3.4.3.7 (Secondary Stressors). Finally, in the absence of scientific studies, reliance on professional judgment is required. Statements on the behavior of animals contained in the EIS/OEIS are based on the best available science. The Navy consulted with the U.S. Fish and Wildlife Service as appropriate.
NRDC - 28	Nor is the Navy's reasoning with regard to seabirds any more sound. Although the Navy acknowledges that "[t]here is little published literature on the hearing abilities of birds underwater... [and] no measurements of the underwater hearing of any diving birds" (DEIS at 3.6-8), it then inexplicably concludes that "any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population." DEIS at 3.6-27. Such reasoning does not bear up to any serious scrutiny. See, e.g., the entirely unsupported assertion that "[s]eabirds would avoid any additional exposures during a foraging dive when they surface" (OEIS at 3.6-24). Seabirds occur in the HSTT Study Area, dive underwater (in some cases to depths of hundreds of feet), and are sensitive to the frequencies used by the Navy's acoustic sources. They must receive further analysis in the DEIS, both for the direct impacts they may suffer on exposure to the Navy's acoustic sources and for the impacts they may incur indirectly through depletion of prey species and hard bottom habitat. 40 C.F.R. § l502.16(a), (b). Without further consideration of these species, the Navy's review is incomplete.	A thorough analysis of acoustic impacts to seabirds appears in Section 3.6.3.1 (Acoustic Stressors) which is based on the best available science. This section addressed deep diving birds. The EIS/OEIS concluded there would be no long-term impacts from sonar to marine habitats (see Section 3.3 [Marine Habitats]) or fish (see Section 3.9 [Fish]), and therefore no indirect impacts are expected for seabirds.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
NRDC - 29	The Navy Failed to Analyze the Impacts on Fish and Fisheries The HSTT Study Area is a highly productive region for fish and invertebrate populations. It supports some of the most productive and commercially important fisheries in the United States (including market squid, pacific sardine, swordfish, and tuna). The HSTT Study Area supports hundreds of other species, many with federally designated essential fish habitat in the Study Area. In its OEIS, the Navy discusses many of the unknowns regarding impacts from training and testing on fish (e.g., "While statistically significant losses were documented in the two groups impacted, the researchers only tested that particular sound level once, so it is not known if this increased mortality was due to the level of the test signal or to other unknown factors." DEIS at 3.9-30), while also acknowledging that "potential impacts on fish from acoustic and explosive stressors can range from no impact brief acoustic effects, tactile perception, and physical discomfort, to slight injury to internal organ and the auditory system do death of the animal" DEIS at 3.9-57. Nonetheless, the DEIS concludes that that its training activities - including both the use of mid-frequency active sonar and underwater detonations - would have no significant impact on fish, fisheries and essential fish habitat. The Navy's conclusion not only contradicts the available scientific literature on noise but also ignores the valid concerns of fishermen. For example, fisherman concerned with declining catch rates wrote letters opposing the Navy's proposal to build an Undersea Warfare Training Range off the coast of North Carolina in 2005. Those fishermen reported sharp declines in catch rates in the vicinity of Navy exercises. Decline in Catch Rates For years, fisheries in various parts of the world have complained about declines in their catch after intense acoustic activities (including naval exercises) moved into the area, suggesting that noise is seriously altering the behavior of some commercial species. A group of Norwegian scientists attempted to document these declines in a Barents Sea fishery and found that catch rates of haddock and cod (the latter known for its particular sensitivity to low-frequency sound) plummeted in the vicinity of an airgun survey across a 1600-square-mile area. In another experiment, catch rates of rockfish were similarly shown to decline. I? Drops in catch rates in these experiments range from 40 to 80 percent. 18 A variety of other species, herring, zebrafish, pink snapper, and juvenile Atlantic salmon, have been observed to react to various noise sources with acute alarm. In their comments On the Navy's Draft Environmental Impact Statement for the proposed Undersea Warfare Training Range off the coast of North Carolina, several fishermen and groups of fishermen independently reported witnessing sharp declines in catch rates of various species when in the vicinity of Navy exercises. - These reports are also indicative of behavioral changes -such as a spatial redistribution of fish within the water column - that could similarly affect the fisheries in the HSTT Study Area. 16 See "'Noisy' Royal Navy Sonar Blamed for Falling Catches," Western Morning News, Apr. 22, 2002 (sonar off the U.K.); Percy J. Hayne, President of Gulf Nova Scotia Fleet	While the EIS/OEIS concludes there will be impacts from the Proposed Action to fish, those impacts do not translate into impacts to socioeconomic resources. Impacts analyzed in the EIS/OEIS consider the individual and the population. Impacts to single individuals do not translate to impacts on the entire population or the resource as a whole. The conclusions presented in the EIS/OEIS are fully supported in the analysis. Concerns of commercial fisherman were addressed in the EIS/OEIS (see Section 3.11.3 [Environmental Consequences]). Favored fishing areas change over time with fluctuations in fish populations and communities, preferred target species, or fishing modes and styles. Declines in fishing rates can be attributed to several factors both natural and anthropogenic. Section 3.9 (Fish) concluded no long-term impacts to fish populations are anticipated, therefore, Section 3.11 (Socioeconomic Resources) correctly concluded there would be no indirect impacts to commercial and recreational fishing.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	Planning Board, "Coexistence of the Fishery & Petroleum Industries," www.elements.nb.ca/theme/fuels/percy/hayne.htm (accessed July 10,2012) (airguns off Cape Breton); R.D. McCauley, J. Fewtrell, A.J. Duncan, C. Jenner, M.-N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, 1. Murdoch, and K. McCabe, Marine Seismic Surveys: Analysis and Propagation of Air-Gun Signals, and Effects of Air-Gun Exposure on Humpback Whales, Sea Turtles, Fishes, and Squid 185 (2000) (airguns in general). 17 A. Engas, S. L¢kkeborg, E. Ona, and A.V. Soldal, Effects of Seismic Shooting on Local Abundance and Catch Rates of Cod (Gadus morhua) and Haddock (Melanogrammus aeglefinus), 53 Canadian Journal of Fisheries and Aquatic Sciences 2238-49 (1996); J .R. Skalski, W.H. Pearson, and C.I. Malme, Effects of Sound from a Geophysical Survey Device on Catch-Per-Unit-Effort in a Hook and- Line Fishery for Rockfish (Sebastes spp.l, 49 Canadian Journal of Fisheries and Aquatic Sciences 1357-65 (1992). See also S. L¢kkeborg and A.V. Soldal, The Influence of Seismic Exploration with Airguns on Cod (Gadus morhual Behaviour and Catch Rates, 196 ICES Marine Science Symposium 6267 (1993). 18 Id. 19 See J.H.S. Blaxter and R.S. Batty, The Development of Startle Responses in Herring Larvae, 65 Journal of the Marine Biological Association of the U.K. 737-50 (1985); F.R. Knudsen, P.S. Enger, and O. Sand, Awareness Reactions and Avoidance Responses to Sound in Juvenile Atlantic Salmon. 20 See comments compiled by the Navy and posted on the Undersea Warfare Training Range EIS site, Available at http://www.projects.earthtech.com/USWTR (e.g., comments of S. Draughon, S. Fromer, L. and F. Gromadzki, D. Pendergrast, and North Carolina Watermen United).	
NRDC - 30	Permanent Injury and Mortality The Navy's conclusion that underwater noise will result in only "minimal harm" to fish ignores the scientific literature. A number of studies, including one on non-impulsive noise, show that intense sound can kill eggs, larvae, and fry outright or retard their growth in ways that may hinder their survival later.[21] Significant mortality for fish eggs has been shown to occur at distances of 5 meters from an airgun source; mortality rates approaching 50 percent affected yolk sac larvae at distances of 2 to 3 meters.[22] With respect to mid-frequency sonar, the Navy itself has noted that "some sonar levels have been shown [in Norwegian studies] to be powerful enough to cause injury to particular size classes of juvenile herring from the water's surface to the seafloor."[23] Also, larvae in at least some species are known to use sound in selecting and orienting toward settlement sites.[24] Acoustic disruption at that stage of development could have significant consequences.[25] Although the Navy acknowledges studies showing that eggs and larvae are more susceptible to sound, it tries to distinguish them by stating that they "were laboratory studies, however, and have not been verified in the field." DEIS at 3.9-	The approach to analysis (Section 3.0.5.4, Resource-Specific Impacts Analysis for Individual Stressors) states the analysis begins with individual organisms and their habitats, and then addresses populations, species, communities, and representative ecosystem characteristics, as appropriate. Impacts on a resource, not listed as a federally protected species, are not based on impacts on individuals, but rather to the entire population. Section 3.9.3.1.2 (Impacts from Sonar and Other Non-Impulsive Acoustic Sources) and Section 3.9.3.1.3 (Impacts from Explosives and Other Impulsive Acoustic Sources) address potential impacts from all acoustic sources on fish, including non-impulsive noise and swimmer defense airguns. The conclusions reached in the EIS/OEIS are based on the best available science and are fully supported by the science and the analysis.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	32. However, federal law does not allow the Navy to ignore the valid scientific studies that have already been conducted simply because they are contrary to its interest. As the Navy is aware after recently completing consultation with both NMFS (for salmon) and the U.S. Fish and Wildlife Service (for bull trout) over its Explosive Ordinance Disposal ("EOD") training exercises in Puget Sound, underwater explosions are responsible for high direct mortality to fish species present in the area. Indeed, the underwater detonation of just five pounds of plastic explosives has been observed to kill over 5,000 fish with swim bladders, with more accurate estimates ranging as high as 20,000 fish. There are a variety of live-fire training exercises, some of which involve underwater explosions of torpedoes and other ordnance that will take place in the HSTT Study Area. Given the variety of fish and fisheries inhabiting these waters, the Navy's failure to analyze these effects in significant detail is stunning. 21 See,e.g., C. Booman, J. Dalen, H. Leivestad, A. Levsen, T. van der Meeren, and K. Toklum, Effecter av luftkanonskyting pa egg. larver og yngel (Effects from Airgun Shooting on Eggs, Larvae, and Fry), 3 Fisken og Havet 1-83 (1996) (Norwegian with English summary); J. Dalen and G.M. Knutsen, Scaring Effects on Fish and Harmful Effects on Eggs, Larvae and Fry by Offshore Seismic Explorations, in H.M. Merklinger. Progress in Underwater Acoustics 93-102 (1987); A. Banner and M. Hyatt, Effects of Noise on Eggs and Larvae of Two Estuarine Fishes, I Transactions of the American Fisheries Society 134-36 (1973); L.P. Kostyuchenko, Effect of Elastic Waves Generated in Marine Seismic Prospecting on Fish Eggs on the Black Sea, 9 Hydrobiology Journal 45-48 (1973). 22 Booman et al., Effecter av luftkanonskyting pa egg. larver og yngel at 1-83. 23 Navy, Draft Environmental Impact Statement! Overseas Environmental Impact Statement for the Southern California Range Complex 3.7-66 to 3.7-67 (2008). In the HSTT Study Area, the Navy would operate sonar at higher levels than those used in the Norwegian studies. 24 S.D. Simpson, M. Meekan, J. Montgomery, R. McCauley. R., and A. Jeffs, Homeward Sound, 308 Science 221 (2005). 1'; Popper, Effects of Anthropogenic Sounds at 27.	
NRDC - 31	Hearing Loss One series of recent studies showed that passing airguns can severely damage the hair cells of fish (the organs at the root of audition) either by literally ripping them from their base in the ear or by causing them to "explode."[26] Fish, unlike mammals, are thought to regenerate hair cells, but the pink snapper in these studies did not appear to recover within approximately two months after exposure, leading researchers to conclude that the damage was permanent.[27] It is not clear which elements of the sound wave contributed to the injury, or whether repetitive exposures at low amplitudes or a few exposures at higher pressures, or both, were responsible.[28] As with marine mammals,	The Navy has provided the best available science in reviewing impacts to fish from mid-frequency sonar. Section 3.9.3.1 (Acoustic Stressors) and discussion therein explains various studies currently available into the impact of sonar on varying fish species, including a study published by Doksaeter, et al (2009) in which the authors concluded that mid-frequency sonars could be used without substantially affecting the fish. While the effects of sound on all species of fish have not been studied, leaving much unknown, there are reasonable extrapolations that can

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	sound has also been shown to induce temporary hearing loss in fish. Even at fairly moderate levels, noise from outboard motor engines is capable of temporarily deafening some species of fish, and other sounds have been shown to affect the short term hearing of a number of other species, including sunfish and tilapia.[29] For any fish that is dependent on sound for predator avoidance and other key functions, even a temporary loss of hearing (let alone the virtually permanent damage seen in snapper) will substantially diminish its chance of survival.[30] 26 R. McCauley. J. Fewtrell, and A.N. Popper. High Intensity Anthropogenic Sound Damages Fish Ears, 113 Journal of the Acoustical Society of America 640 (2003). 27 Id. at 641 (some fish in the experimental group sacrificed and examined 58 days after exposure). 28 Id. 29 A.R. Scholik and H.Y. Yan, Effects of Boat Engine Noise all the Auditory Sensitivity of tile Fathead Minnow. Pimephales promelas, 63 Environmental Biology of Fishes 203-09 (2002); AR. Scholik and H. Y. Yan, The Effects of Noise on the Auditory Sensitivity of the Bluegill Sunfish. Lepomis macrochirus, 133 Comparative Biochemistry and Physiology Part A at 43-52 (2002); M.E. Smith, A.S. Kane. & A.N. Popper, Noise-Induced Stress Response and Hearing Loss in Goldfish (Carassius auratusl. 207 Journal of Experimental Biology 427-35 (2003); Popper, Effects of Anthropogenic Sounds at 28. 30 See Popper, Effects of Anthropogenic Sounds at 29; McCauley et at., High Intensity Anthropogenic Sound Damages Fish Ears, at 641.	be made based on the general anatomy of fish and from the representative species that have been studied. Based on those studies and as detailed in Section 3.9 (Fish), it is unlikely that sonar will adversely affect most fish given most fish cannot hear in the frequency range of the mid- and high-frequency sonar Navy is proposing to use. In addition, Navy has been conducting these same training activities for many decades in Southern California and Hawaii and both of which support healthy and diverse fisheries.
NRDC - 32	Breeding Behavior NMFS has observed that the use of mid-frequency sonar could affect the breeding behavior of certain species, causing .them, for example, to cease their spawning choruses, much as certain echolocation signals do. The repetitive use of sonar and other active acoustics could thus have significant adverse behavioral effects on some species of fish and those who depend on them.	The EIS/OEIS included findings by Popper et al (2007) who exposed rainbow trout, a fish sensitive to low frequencies, to high-intensity low-frequency sonar (215 dB re 1 μPa^2 170-320 Hz) with receive level for two experimental groups estimated at 193 dB for 324 or 648 seconds. Fish exhibited a slight behavioral reaction, and one group exhibited a 20-dB auditory threshold shift at one frequency. No direct mortality, morphological changes, or physical trauma was noted as a result of these exposures. These results of low-frequency sonar effects on low-frequency sensitive rainbow trout suggests that similar results may be found with mid-frequency active sonar use when applied to mid-frequency sensitive fish. The assessment for the proposed mid-frequency sound sources (at or above the 3.5 kHz center frequency) suggests that with few exceptions, fish cannot hear sounds above about 3 kHz (Popper 2003, Hastings and Popper 2005). Thus, it is expected that most fish species would not be able to hear the mid-frequency sonar proposed for use. If responses to mid-frequency sonar use do occur, behavioral responses would be brief, reversible, and not biologically significant. Sustained

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		auditory damage is not expected. Sensitive life stages (juvenile fish, larvae and eggs) very close to the sonar source may experience injury or mortality, but below the level of loss of larval and juvenile fish from natural causes. The use of Navy mid-frequency sonar would not compromise the productivity of fish or adversely affect their habitat.
NRDC - 33	In sum, the Navy arbitrarily dismisses the potential for adverse impacts on fish. The Navy also capriciously dismisses the notion that fisheries in the area would suffer economic loss, even though - judging by the comments from North Carolina fishermen in 2005 - its training activities appear to have disrupted fishing in the past. Just like the training proposed in North Carolina, the available evidence here underscores the need for a more serious and informed analysis than the Navy currently provides. To comply with the requirements of NEPA, the Navy should rigorously analyze the potential for behavioral, auditory, and physiological impacts on fish, including the potential for population-level effects, using models of fish distribution and population structure and conservatively estimating areas of impact from the available literature. 40 C.F.R. §1502.22. The Navy must also meaningfully assess the economic consequences of reduced catch rates on commercial and recreational fisheries (as well as on marine mammal foraging) in the HSTT Study Area. It should also consider avoiding essential fish habitat, spawning grounds and other areas of important habitat for fish species, especially hearing specialists. Notably, as with marine mammals, the Navy does not consider exclusion of important fish habitat or fisheries in the HSTT Study Area.	The Navy has conducted a thorough and complete analysis considering fish species and habitat. The Navy has found through the analysis that the proposed actions would not impact fish populations or their habitat. Certain types of training activities would not take place in certain habitats, for example, sinking exercises (SINKEXs) can only occur in waters that meet depth and distance from shore requirements. Therefore, a SINKEX could not occur on a seamount that is less than 6,000 feet below sea level.
NRDC - 34	The Navy's Proposed Mitigation Measures Fail to Protect Marine Wildlife To comply with NEPA, an agency must discuss measures designed to mitigate its project's impact on the environment. See 40 C.F.R. § 1502.14(f). There is a large and growing set of options for the mitigation of noise impacts to marine mammals and other marine life, some of which have been imposed by foreign navies[32]--and by the Navy itself, in other contexts-to limit harm from high-intensity sonar exercises. Yet here the Navy does little more than set forth an abbreviated set of measures, dismissing effective measures out of hand. All of the mitigation that the Navy has proposed for sonar impacts boils down to the following: a very small safety zone around the sonar source, maintained primarily with visual monitoring by personnel with other responsibilities, with aid from shipboard passive monitoring when personnel are already using such technology. Under the proposed scheme, operators would power-down the system if a marine mammal is detected within 1,000 yards and shut-down the system if a marine mammal is detected within 200 yards. DEIS at 5-24. 32 See S.J. Dolman, C.R. Weir, and M. Jasny, Comparative Review of Marine Mammal Guidance Implemented during Naval Exercises, _ Marine Pollution Bulletin _ (Dec. 12,2008).	Each nation has its own training and testing needs based on that nation's forces, capabilities and missions. For the U.S. Navy, the ability to conduct anti-submarine warfare around varying underwater topography is critically necessary in order to fight the growing submarine threat. The Navy has comprehensively evaluated mitigation measures used by other navies to determine the benefits of implementing similar measures. Based on its assessment the Navy found that most other navies do not possess an integrated strike group or have other integrated training requirements like the United States. As integrated strike groups, U.S. Navy requirements frequently include operating within defined distances to suitable landing fields for aircraft safety, thereby geographically constraining the entire strike group. In coordination with NMFS, Navy's proposed mitigation measures were carefully customized for effectiveness in reducing potential impacts on an affected resource and to ensure, from a military perspective, that the mitigations are practicable and executable, and that safety and operational readiness can be maintained.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		As described in more detail to specific comments that follow, several measures were eliminated because they were determined to be unfeasible, present a safety risk, provide no known or scientifically-based protective benefits, or have an unacceptable impact on training fidelity. Through careful exploration of all mitigation measures to determine which were the most effective, the Navy has chosen the measures to mitigate potential impacts to marine mammals while still being able to meet its operational needs to train and test for real world conditions. Specific mitigation measures are outlined in the following sections: Section 5.3.1 (Lookout Procedural Measures), Section 5.3.2 (Mitigation Zone Procedural Measures), and Section 5.3.3 (Mitigation Areas). Specifically, Section 5.3.3.1 (Marine Mammal Habitats) addresses important habitat areas. The decrease in mitigation zone size will allow for a more focused survey effort over a smaller area, and will consequently increase the likelihood of avoidance of injury and larger threshold shifts that would result in recovery (i.e., TTS) to marine mammals. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
NRDC - 35	This mitigation scheme disregards the best available science on the significant limits of visual monitoring. Visual detection rates for marine mammals generally approach only 5 percent. Moreover, the species perhaps most vulnerable to sonar-related injuries, beaked whales, are among the most difficult to detect because of their small size and diving behavior. It has been estimated that in anything stronger than a light breeze, only one in fifty beaked whales surfacing in the direct track line of a ship would be sighted; as the distance approaches 1 kilometer, that number drops to zero.[33] Many other whales are also hard to detect, especially depending on seasonality, geography, and behaviors. For example, the visual and acoustic detection rates of blue whales, which are susceptible to ship strikes in Southern California, differ seasonally and geographically, suggesting that a single detection mode (e.g., visual) may be insufficient to detect blue whales in all seasons and regions.[34] The Navy's reliance on visual observation as the	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	mainstay of its mitigation plan is therefore profoundly misplaced. 33 J. Barlow and R. Gisiner, Mitigating. Monitoring, and Assessing the Effects of Anthropogenic Noise on Beaked Whales, 7 Journal of Cetacean Research and Management 239-249 (2006). 34 E.M. Oleson, J. Calambokidis, J. Barlow and J.A. Hildebrand, Blue Whale Visual and Acoustic Encounter Rates in the Southern California Bight, 23(3) Marine Mammal Science 574-597 (2007)	mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
NRDC - 36	The Navy's ineffective mitigation measures are all the more remarkable given its adoption of more protective measures during previous training. For example, the Atlantic Fleet has repeatedly sited exercises beyond the continental shelf and Gulf Stream, relocated exercises out of important habitat and to avoid certain species, and used a technique called "simulated geography" to avoid canyons and near-shore areas on at least three of its major ranges. It has also restricted sonar use at night when marine mammals are harder to detect, as well as minimized the use of sonar from multiple sources at the same time.[35] In this light, the Navy's claims that it cannot implement more protective mitigation measures ring false. DEIS at 5-52 to 57. Although the Navy goes to some pain to describe "mitigation measures considered but eliminated"--primarily because of "unacceptable impacts on the proposed activity"—its previous adoption of the same measures belies its argument. Clearly the Navy has done more to mitigate the harmful effects of sonar in previous exercises than what it proposes for the HSTT activities. It can, and must, do more to mitigate the harm on marine wildlife. 35 Final Comprehensive Overseas Environmental Assessment for Major Atlantic Fleet Training Exercises February 2006, Prepared for United States Fleet Forces Command in accordance with Chief of Naval Operations Instruction 5090.1B pursuant to Executive Order 12114; See also Atlantic Fleet Exercises Using Mid-Frequency Sonar Mitigation Chart.	The Navy acknowledges the limitations of visual shipboard monitoring and uses aerial monitoring and passive acoustic monitoring for multi-faceted monitoring where practical. The EIS/OEIS, Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring), presents the U.S. Navy's mitigation measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training and testing events. In general, there are usually more ships and more observers present on Navy ships, and additional aerial assets engaged in exercise events than used during trackline detection during a survey, therefore increasing the potential to detect marine mammals during a Navy activity. Section3.4.3.1.8.1Model Assumptions and Limitations) in the EIS/OEIS provides a more robust discussion on marine mammal sightability and the inclusion of implementing mitigation measures to reduce the effects of sound exposures on marine mammals. Section 3.4.3.2 (Analysis of Effects on Marine Mammals) has been revised to account for the Navy's mitigation measures and marine mammal behavioral responses to more accurately reflect the predicted potential effects on marine mammals. The measures that Natural Resources Defense Council refers to have not been in place since January 2009, and are not included in the current permits. Section 5.3.4 (Mitigation Measures Considered but Eliminated) includes a complete list of mitigation measures that the Navy has considered but eliminated because the measures are ineffective at reducing environmental impacts, currently have an unacceptable operational impact, or are expected to have an unacceptable operational impact in the future. As described in Section 5.3.4 (Mitigation Measures Considered but Eliminated), it is critical that the Navy be able to conduct anti-submarine warfare training in a variety of environmental and bathymetric conditions, including in the vicinity of canyons and during periods of low visibility. The Navy continuously collects information on the effectiveness of mitigation measures and their impact on military readiness. This accumulation of information helped shaped the Navy's operational assessments throughout Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft and Final EIS/OEIS. As part of the mitigation evaluation process, the Navy did not recommend continuing to

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		implement mitigation measures that were causing unacceptable operational impacts, including interfering with the Navy's ability to meet all or part of its military readiness requirements.
NRDC - 37	Protection Zones As discussed above, there is scientific consensus that geographic mitigation represents the most effective means currently available to reduce the impacts of mid-frequency sonar on marine mammals.[36] It was with that understanding that NOAA launched a multi-year effort to improve the tools available to agencies, including the Navy, for evaluating and mitigating the impacts of anthropogenic noise on marine mammals. One of NOAA's Working Groups, CetMap, is identifying marine mammal "hot spots" in the HSTT Study Area - biologically important areas for marine mammals as evidenced by increases in density and distribution or modeled based on important habitat features. CetMap's identification of these areas should form a basis for creating protection zones where training activities could be barred or limited.	The Navy's overall approach to assessing potential mitigation measures was based on two principles: (1) mitigations will be effective at reducing potential impacts on the resource; and (2) from an operational perspective, the mitigations are practicable and executable while not compromising safety and readiness. Through extensive discussion, NMFS and Navy have identified mitigation measures that are practicable and reasonably effective. For example, the safety zones proposed will reduce the likelihood of physiological harm, the number of marine mammals exposed, and the intensity of those exposures. The Navy has proposed several Mitigation Areas (such as the Humpback Whale Cautionary Area), and the mitigation measures identified throughout Chapter 5 will apply to all marine mammals year round, and will be applied regardless of the location of the activity. However, any future determination of "hot spots" or biologically important areas will require an intense effort in gathering expert opinion. In that regard, Navy has, and will continue to support the Cetacean and Sound Mapping (CetMap) project, including representation on the CetMap Density and Distribution Mapping Working Group. Navy is an active sponsor and participant in CetMap, and the CetMap process is based on the same process Navy used to estimate population density in the HSTT EIS/OEIS and LOA Application. In 2012, the CetMap panel of experts determined that no biologically important areas (the panel determined that "hot spots" is not an appropriate term) could be identified based on data availability and information at hand. Furthermore, no follow-on products have identified areas of recommended avoidance. It is important to note that the areas appearing on the CetMap website are a preliminary draft that needs considerable additional input from the larger biological community before being used to identify biologically important areas in the ocean.
NRDC - 38	The following biologically important areas are but a sample of the kind of areas that should be analyzed by the Navy for the development of protection zones as informed by the results of CetMap: 1) Important habitat for Blainville's beaked whale west of the Big Island.- Satellite tagging data, photo-identification data and survey data dating from 1989 to 2009 indicate the existence of a small, island-associated population of Blainville's beaked whales that	Navy has, and will continue to support the Cetacean and Sound Mapping (CetMap) project, including representation on the CetMap Density and Distribution Mapping Working Group. Navy is an active sponsor and participant in CetMap, and the CetMap process is based on the same process Navy used to estimate population density in the HSTT EIS/OEIS and LOA Application. In 2012, the CetMap panel of experts determined that no biologically important areas (the panel

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	exhibits strong site fidelity to an area on the leeward (west) side of the island of Hawaii.[37] 2) Important habitat for Cuvier's beaked whale around the Big Island.- Long-term photo-identification data indicate high site fidelity of Cuvier's beaked whales off the island of Hawaii.[38] Satellite tagging data indicate individuals are resident to the island using both the east and west sides of the island.[39] Photographic mark-recapture data indicate the population is small and, thus, may need additional protection.[40] 3) Important habitat for Hawaii insular false killer whales between east Oahu and north Maui and off Hawaii Island--Tagging data indicates that two particularly high use areas exist for the insular population of false killer whales, a species of conservation concern.[41] One of these extends from the east side of Oahu to the north side of Maui, and the other lies off the north end of Hawaii Island. 4) Important habitat for Hawaii island resident population of melon-headed whales. A small, demographically isolated population of melon-headed whales has been identified that is resident to the west side of the island, which may need additional protection.[42] 5) Seasonal calving grounds for the humpback whale.- Humpback whales use breeding habitat in the coastal regions and shallow banks within these areas, as established by aerial survey and other effort.[43] For purposes of mitigation, this area would include the Hawaiian Islands Humpback National Marine Sanctuary and, more generally, all waters less than 200m in depth in the Four Island Region, Penguin Bank, Kauai, and Niihau. 6) Important habitat for vulnerable resident odontocele populations around the main Hawaiian Islands.- Biologically important areas should be identified for a number of discrete, island-associated populations, including melon-headed whales,[44] false killer whales,[45] rough-toothed dolphins,[46] spinner dolphins,[47] bottlenose dolphins,[48] pygmy killer whales,[49] pantropical spotted dolphins,[50] short-finned pilot whales,[51] and dwarf sperm whales.[52] 7) Papahanaumokuakea (Northwest Hawaiian Islands) Marine National Monument.- This biologically important area is a marine protected area established by President George W. Bush for its unique biodiversity, including marine mammal biodiversity. The area was also named in a previous court order on LFA as an example of an area from which sonar training should be excluded. 8) Cross Seamount and other seamounts west of the island of Hawaii.- In general, seamounts are known to enhance secondary productivity and concentrate prey, resulting in areas of higher biological density for marine mammals and other species.[53] More specifically, the area around Cross Seamount represents probable offshore feeding habitat for beaked whales, based on acoustic data showing beaked whale foraging echolocation signals occurring there most nights (75%) over a year-long study period.[54] [n addition, scientists have identified three species (false killer whales, rough-toothed dolphins and striped dolphins) on the slopes of Jaggar Seamount, and sperm whales on Indianapolis Seamount.[55]	determined that "hot spots" is not an appropriate term) could be identified based on data availability and information at hand. Furthermore, no follow-on products have identified areas of recommended avoidance. It is important to note that the areas appearing on the CetMap website are a preliminary draft that needs considerable additional input from the larger biological community before being used to identify biologically important areas in the ocean. For additional information regarding specific comments: 1), 3), 4) 8), 9), 10) and 12): Please refer to Section 5.3.4.1.7 (Avoiding Locations Based on Bathymetry and Environmental Conditions) for a discussion of habitat avoidance. 2) Mitigation will be implemented within the mitigation zone for all marine mammals regardless of species. Passive acoustic monitoring will be used to inform visual observations because resources are not available for the Navy to locate vocalizing animals through passive acoustics during training and testing activities. Mitigation specific to beaked whales and “significant aggregations” are not necessary because the mitigation will be implemented for all species. 5) Please refer to Section 5.3.4.1.11 (Avoiding Marine Species Habitats) for discussion of seasonal restrictions. The Navy has proposed several seasonal measures, as discussed in Section 5.3.3 (Mitigation Areas). 6) Please refer to Section 5.3.4.1.6 (Limiting Access to Training and Testing Locations) for a discussion on limiting activities to abyssal waters and offshore habitats. 7) Establishment of the Papahanaumokuakea Marine National Monument included language specifically excluding all military activities from the listed prohibitions as long as the military exercises and activities are “carried out in a manner that avoids, to the extent practicable and consistent with operational requirements, adverse impacts on monument resources and qualities.” The Proclamation’s protection of military activities was confirmed in January 2009 when President George W. Bush stated “…I confirm that the policy of the United States shall be to continue measures established in the Papahanaumokuakea Marine National Monument to protect the training, readiness, and global mobility of U.S. Armed Forces.” Please refer to Section 6.1.2 (Marine Protected Areas) for a discussion on the Marine Protected Areas contained with the Study Area. Please refer to Section 5.3.4.1.3 (Reducing Sonar Source Levels and Total Number of

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	9) Tanner and Cortez Bank.- Compiled survey data and features analysis confirm Tanner and Cortez Banks as relatively high density areas for blue, fin, beaked, sperm, humpback whales and Kogia spp. This feature (including both banks out to the 1000m isobath) accounted for 35% of the total sightings of these species throughout the California Bight region, based on our analysis of 13 surveys conducted between 1975 and 2004.[56] Tanner and Cortez Banks and their southern edge extending into Tanner Canyon appear to be highly important feeding grounds for blue and fin whales (Calambokidis pers. comm.) and possibly beaked and sperm whales as well. Humpback whales are not as common as blue and fin whales in the deeper waters of the Bight, but are also observed at least occasionally around Tanner and Cortez Banks. Earlier pinniped surveys observed high numbers of fur seals near Tanner Bank as well. 10) Areas of importance to beaked whales.- Recently, NMFS' Southwest Fisheries Science Center has conducted a combined visual and towed passive acoustic survey of potential beaked whale habitat off Southern California. Those surveys have identified a few areas with apparent high occurrence of beaked whales, representing portions - and particularly the northern edges - of certain ocean basins. These areas include portions of the Santa Cruz Basin (which lies outside SOCAL but within the Pt. Mugu Sea Range), of the San Nicolas Basin (west of the SCORE range), of the Catalina Basin, and of the San Diego Trough. 11) Channel Islands National Marine Sanctuary ("NMS").- The Channel Islands NMS is an area of enormous marine biodiversity and must be considered for additional protections. 12) Additional areas.- As informed by CetMap, additional areas may include shelf waters north of San Nicholas Island and Lorna and La Jolla Canyons. By failing to design and discuss mitigation for these and similar areas, the Navy failed to comply with NEPA. See 40 C.F.R. § 1502. 14(f). The Navy must revise and reissue its DEIS after fully analyzing the information produced by CetMap and identifying reasonable mitigation that the public can review and submit comments on.	Hours) for a discussion on how the Navy uses active sonar at the lowest practicable source level consistent with mission requirements, and Section 5.5.2 (Reporting) for a discussion on the Navy's reporting requirements. 11) Please refer to Section 6.1.2 (Marine Protected Areas) for a discussion on the Marine Protected Areas contained with the Study Area.
NRDC - 39	Mitigation of Navy Debris and Expended Material The DEIS fails to set forth any mitigation measures concerning the massive amount of discarded debris and expended materials associated with its proposed activities in the HSTT Study Area. The Navy claims that ocean currents will rapidly disperse the expended materials and thus no mitigation is required. "In NEPA's demand that an agency prepare a detailed statement on 'any adverse environmental effects which cannot be avoided should the proposal be implemented,' is an understanding that the EIS will discuss the extent to which adverse effects can be avoided." Robertson, 490 U.S. at 352-53. The Navy's "all-or-nothing approach" is not a sufficient discussion of how the adverse impacts of expended material can be avoided. By failing to explore mitigation measures for expended materials, the Navy does not even attempt to avoid,	The Navy conducted a full analysis of the potential impacts of military expended materials on marine resources and has proposed several mitigation measures to help avoid or reduce those impacts. The analysis is contained throughout Chapter 3 (Affected Environment and Environmental Consequences) of the Draft and Final EIS/OEIS (e.g., Section 3.3.3.2.1, Impacts from Military Expended Materials discusses marine habitats). For example, military expended materials related to training exercises under a worst-case scenario under Alternatives 1 and 2 would not impact more than 0.00009 percent of the available soft bottom habitat annually within any of the range complexes. The Navy has standard operation procedures in place to reduce the

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	minimize, rectify, reduce, or compensate for its dumping of debris - all of which are options included in the CEQ regulation's definition of "mitigation." 40 C.F.R. §1508.20.	amount of military expended materials (Section 5.1.4.2, Weapons Firing Range Clearance), including recovering targets and associated parachutes to the maximum extent practical. In addition, the Navy has developed mitigation areas (Section 5.3.3.2, Seafloor Resources) to avoid and reduce potential impacts of military expended materials on seafloor habitats, including coral and hardbottom habitats.
NRDC - 40	Other Mitigation Measures In addition to considering protection zones and mitigation for expended materials, the Navy should adopt the following measures: I) Seasonal avoidance of marine mammal feeding grounds, calving grounds, and migration corridors;	In cooperation with NMFS, the Navy has developed a suite of mitigation measures that are practicable to implement and that allow training and testing activities to meet their readiness requirements. 1)The balance between Procedural Measures and Mitigation Area measures (see Section 5.2.3, Assessment Method) provide a way for the Navy to mitigate potential impacts while maintaining its military readiness objectives. Please refer to Section 5.3.4.1.11 (Avoiding Marine Species Habitats) for discussion of seasonal restrictions. The Navy has proposed seasonal measures, as discussed in Section 5.3.3 (Mitigation Areas), specifically Section 5.3.3.1.1.1 (Humpback Whale Cautionary Area) where mid-frequency active sonar training will not occur within the Humpback Whale Cautionary Area between 15 December and 15 April.
NRDC - 41	2) Avoidance of, or extra protections in, marine protected areas;	2) The Navy has identified areas and afforded extra protections in certain areas. For example, The Navy has designated a humpback whale cautionary area (described in Section 5.3.2, Mitigation Zone Procedural Measures), which consists of a 5 km (3.1 miles [mi.]) mitigation zone that has been identified as having one of the highest concentrations of humpback whales during the period between 15 December and 15 April. Navy activities within marine protected areas abide by the regulations of the individual marine protected area. Please refer to Section 6.1.2 (Marine Protected Areas) for a discussion on the Marine Protected Areas contained with the Study Area.
NRDC - 42	3) Avoidance of bathymetry likely to be associated with high-value habitat for species of particular concern, including submarine canyons and large seamounts, or bathymetry whose use poses higher risk to marine species;	3) Please refer to Section 5.3.4.1.7 (Avoiding Locations Based on Bathymetry and Environmental Conditions) for a discussion of habitat avoidance.
NRDC - 43	4) Avoidance of fronts and other major oceanographic features, such as the California Current and other areas with marked differentials in sea surface temperatures, which have the potential to attract offshore concentration of animals, including beaked whales;[57] 57 See, e.g., Carretta et al., U.S. Pacific Marine Mammal Stock Assessments: 2007 at 142 (reporting that "Baird's beaked whales have been seen primarily along the	4) As presented in Section 5.3.4.1.7 (Avoiding Locations Based on Bathymetry and Environmental Conditions) the issue of habitat avoidance has been discussed. Also note the same issue was raised and also analyzed in the previous Navy environmental documents for both SOCAL and Hawaii involving training and testing at sea since 2005. As presented in Section 5, there are many reasons why it is not

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	continental slope from late spring to early fall.").	practical or reasonable to avoid broad ocean areas where beaked whales might be located and/or areas where they have co-existed with Navy training and testing activities for decades. There is no direct evidence from Hawaii or Southern California suggesting Navy training and testing over many decades has had or may have any long term consequences to marine mammals. Using beaked whales as an example, based on a series of surveys from 2006 to 2008 and the high number encounter rate, Falcone et al. (2009) proposed that their observations suggested the ocean basin west of San Clemente Island may be an important region for Cuvier's beaked whales. For over three decades, this ocean area west of San Clemente has been the location of the Navy's instrumented training range and is one of the most intensively used training and testing areas in the Pacific, given the proximity to the Naval installations in San Diego. A more detailed discussion and additional information is presented in the last subsection of Section 3.4 titled "Summary of Observations During Previous Navy Activities". It includes details on the Navy's monitoring program (see Navy's monitoring reports available at http://www.navymarinespeciesmonitoring.us/ and also at the NMFS website; www.nmfs.noaa.gov/pr/permits/incidental.htm#applications) in the HSTT Study Area, which includes research, monitoring before, during, and after training and testing events since 2006, and the reports that have been submitted to and reviewed by NMFS. Based on this research, the Navy's assessment is that it is unlikely there will be impacts to populations of marine mammals (such as whales, dolphins and porpoise, seals and sea lions) having any long term consequences as a result of the proposed continuation of training and testing in the ocean areas historically used by the Navy. This assessment of likelihood is based on four indicators from areas in the Pacific where Navy training and testing has been ongoing for decades: (1) evidence suggesting or documenting increases in the numbers of marine mammals present, (2) examples of documented presence and site fidelity of species and long-term residence by individual animals of some species (including beaked whales), (3) use of training and testing areas for breeding and nursing activities, and (4) six years of comprehensive monitoring data indicating a lack of any observable effects to marine mammal populations as a result of Navy training and testing activities.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
NRDC - 44	5) Avoidance of areas with higher modeled takes or with high-value habitat for particular species;	5) Please refer to Section 5.3.4.1.11 (Avoiding Marine Species Habitats) for a discussion on marine species habitats with respect to modeled takes.
NRDC - 45	6) Concentration of exercises to the maximum extent practicable in abyssal waters and in surveyed offshore habitat of low value to species;	6) Please refer to Section 5.3.4.1.6 (Limiting Access to Training and Testing Locations) for a discussion on limiting activities to abyssal waters and offshore habitats.
NRDC - 46	7) Use of sonar and other active acoustic systems at the lowest practicable source level, with clear standards and reporting requirements for different testing and training scenarios;	7) The Navy concurs; please refer to Section 5.3.4.1.3 (Reducing Sonar Source Levels and Total Number of Hours) for a discussion on how the Navy uses active sonar at the lowest practicable source level consistent with mission requirements. See Section 5.5.2 (Reporting) for a discussion on the Navy's reporting requirements, which will be coordinated through NMFS through the permitting process.
NRDC - 47	8) Expansion of the marine species "safety zone" to a 4km shutdown, reflecting international best practice, or 2 km, reflecting the standard prescribed by the California Coastal Commission;[58] 46 California Coastal Commission, Adopted Staff Recommendation on Consistency Determination CD-08606 (2007); Approved Letter from M. Delaplaine, California Coastal Commission, to Rear Adm. Len Hearing, Navy (Jan. 11, 2007).	8) Please refer to Section 5.3.4.1.14 (Increasing the Size of Observed Mitigation Zones) for a discussion on mitigation zone expansion. The Navy recommended mitigation zones represent the maximum area the Navy can effectively observe based on the platform of observation, number of personnel that will be involved, and the number and type of assets and resources available. As mitigation zone sizes increase, the potential for reducing impacts decreases. For instance, if a mitigation zone increases from 1,000 to 4,000 yd. (914 to 3,658 m), the area that must be observed increases sixteen-fold. The Navy recommended mitigation measures balance the need to reduce potential impacts with the ability to provide effective observations throughout a given mitigation zone. There is no internationally recognized best practice with regard to mitigation zone distance. The mitigation zones discussed throughout the Draft EIS/OEIS and Final EIS/OEIS were developed using the latest best available science, are consistent with regulatory requirements and criteria, and are tailored to the Proposed Action; therefore, adopting other mitigation zones would neither be a practical nor effective mitigation scheme for the Proposed Action.
NRDC - 48	9) Suspension or relocation of exercises when beaked whales or significant aggregations of other species are detected by any means within the orbit circle of an aerial monitor or near the vicinity of an exercise;	9) Mitigation will be implemented within the mitigation zone for all marine mammals regardless of species. Passive acoustic monitoring will be used to inform visual observations. The technology is not available for the Navy to locate vocalizing animals through passive acoustics during training and testing activities. Mitigation specific to beaked whales and "significant aggregations" are not necessary because the mitigation will be implemented for all species, and any number of animals observed.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
NRDC - 49	10) Use of simulated geography (and other work-arounds) to reduce or eliminate chokepoint exercises in near-coastal environments, particularly within canyons and channels, and use of other important habitat;	10) The Navy does make use of simulated geography for training purposes. Please refer to Section 5.3.4.1.2 (Replacing Training and Testing with Simulated Activities) and Section 5.3.4.1.7 (Avoiding Locations Based on Bathymetry and Environmental Conditions) for a discussion on simulated activities and the importance of training in near-coastal environments with complex geography. The presence of canyons and channels are not necessarily indicative of important habitat.
NRDC - 50	11) Avoidance or reduction of training during months with historically significant surface ducting conditions, and use of power-downs during significant surface ducting conditions at other times;	11) Please refer to Section 5.3.4.1.9 (Avoiding or Reducing Active Sonar During Strong Surface Ducts) for a discussion of surface ducts. Training in surface ducting conditions is a critical component to military readiness because sonar operators need to learn how sonar transmissions are altered due to surface ducting.
NRDC - 51	12) Use of additional power-downs when significant surface ducting conditions coincide with other conditions that elevate risk, such as during exercises involving the use of multiple systems or in beaked whale habitat;	12) Please refer to Section 5.3.4.1.3 (Reducing Sonar Source Levels and Total Number of Hours) for a discussion of sonar levels and hours and Section 5.3.4.1.9 (Avoiding or Reducing Active Sonar During Strong Surface Ducts) for a discussion of surface ducts. Mitigation measures are implemented equally in all locations where the activity occurs. Refer to Chapter 3.4 (Marine Mammals) and the Navy Marine Species Density Database Technical Report for information on beaked whale habitat within the Study Area. Some species of beaked whales are found throughout the entire Study Area; therefore, implementing additional power-downs throughout the Study Area would cause an unacceptable impact to readiness.
NRDC - 52	13) Planning of ship tracks to avoid embayments and provide escape routes for marine animals;	13) Please refer to Section 5.3.4.1.6 (Limiting Access to Training and Testing Locations) for a discussion of limiting vessel movements. The Navy is not proposing to train or test in areas where marine animals would have no escape. The only location where the Navy has conducted sonar activities was in the Bahamas in 2000, but those conditions are not replicated within the HSTT Study Area.
NRDC - 53	14) Suspension or postponement of chokepoint exercises during surface ducting conditions and scheduling of such exercises during daylight hours;	14) Please refer to Section 5.3.4.1.8 (Avoiding or Reducing Active Sonar at Night and During Periods of Low Visibility) and Section 5.3.4.1.9 (Avoiding or Reducing Active Sonar During Strong Surface Ducts) for a discussion of activities conducted during varying environmental conditions. The Navy proposes to continue chokepoint exercises in Hawaii because of the valuable and necessary training they provide.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
NRDC - 54	15) Use of dedicated aerial monitors during chokepoint exercises, major exercises, and near-coastal exercises;	15) Some events can occur over several hours and is dependent upon multiple variables including, but not limited to, weather, background traffic, training requirements, delays for mitigation, etc., that may make it impractical and unsafe to have dedicated aerial monitors. Additionally some events typically occur near commercial and military airspace that would pose a serious risk to the survey and non-survey aircraft. If an aircraft is participating in the event they are used for survey as described in the mitigation proposed by Navy. While these activities can occur over several hours they often occur overan extended distance from land making a dedicated aerial survey platfrom unsafe and impractical. Navy already has mitigation in place designed to minimize potential effects from these activities. Refer to Section 5.3.4.1.12 (Increasing Visual and Passive Acoustic Observations) for additional discussion on visual observations or specific mitigations designed for activities involving the use of aerial monitors in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring). Please refer to Section 5.3.4.1.13 (Increasing Visual and Passive Acoustic Observations) for a discussion on visual observations.
NRDC - 55	16) Use of dedicated passive acoustic monitoring to detect vocalizing species, through established and portable range instrumentation and the use of hydrophone arrays off instrumented ranges;	16) Please refer to Section 5.3.4.1.13 (Increasing Visual and Passive Acoustic Observations) for a discussion on passive acoustic observations.
NRDC - 56	17) Modification of sonobuoys for passive acoustic detection of vocalizing species;	17) Mid-frequency active sonar training is required year-round in all environments, including night and low-visibility conditions. Training occurs over many hours or days, which requires large teams of personnel working together in shifts around the clock to work through a scenario. Training at night is vital because environmental differences between day and night affect the detection capabilities of sonar. Temperature layers that, which affect sound propagation, move up and down in the water column and ambient noise levels can vary significantly between night and day, which affects sound propagation and could affect how sonar systems are operated from day to night and vice versa. Consequently, personnel must train during all hours of the day to ensure they identify and respond to changing environmental conditions, and not doing so would unacceptably decrease training effectiveness and reduce the crews' abilities. Therefore, the Navy cannot operate only in daylight hours or wait for the weather to clear before training .Please refer to Section 5.3.4.1.13 (Increasing Visual and Passive Acoustic Observations) for a discussion on passive

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		acoustic observations. As described throughout Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring), Passive acoustic monitoring will be conducted with Navy assets, such as sonobuoys, when practicable. Passive sonobuoys are designed to detect submarine-produced sounds. Modifying sonobuoys and receiver equipment to focus on marine mammal vocalizations would detract from their ability to perform their primary mission.
NRDC - 57	18) Suspension or reduction of exercises outside daylight hours and during periods of low visibility;	18) Please refer to Section 5.3.4.1.8 (Avoiding or Reducing Active Sonar at Night and During Periods of Low Visibility) for a discussion of activities conducted during varying environmental conditions.
NRDC - 58	19) Use of aerial surveys and ship-based surveys before, during, and after major exercises;	19) Some events can occur over several hours and is dependent upon multiple variables including, but not limited to, weather, background traffic, training requirements, delays for mitigation, etc., that may make it impractical and unsafe to have dedicated aerial monitors. Additionally some events typically occur near commercial and military airspace that would pose a serious risk to the survey and non-survey aircraft. If an aircraft is participating in the event they are used for survey as described in the mitigation proposed by Navy. While these activities can occur over several hours they often occur overan extended distance from land making a dedicated aerial survey platfrom unsafe and impractical. Navy already has mitigation in place designed to minimize potential effects from these activities. Refer to Section 5.3.4.1.12 (Increasing Visual and Passive Acoustic Observations) for additional discussion on visual observations or specific mitigations designed for activities involving the use of aerial monitors in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring). Please refer to Section 5.3.4.1.13 (Increasing Visual and Passive Acoustic Observations) for a discussion on visual observations. Please refer to Section 5.3.4.1.13 (Increasing Visual and Passive Acoustic Observations) for a discussion on visual observations.
NRDC - 59	20) Use of all available range assets for marine mammal monitoring;	20) The current Navy monitoring program is composed of a collection of range-specific monitoring plans, each of which was developed individually as part of MMPA and ESA compliance processes as environmental documentation was completed. These individual plans establish specific monitoring requirements for each range complex or testing range and are collectively intended to address the Integrated Comprehensive Monitoring Plan top-level goals. Please see Section 5.5 (Monitoring and Reporting) for additional information on the Navy's

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		marine mammal monitoring.
NRDC - 60	21) Use of third-party monitors for marine mammal detection;	21) Please refer to Section 5.3.4.1.15 (Conducing Visual Observations Using Third-Party Observers) for a discussion on third-party observers.
NRDC - 61	22) Application of mitigation prescribed by state regulators, by the courts, by other navies or research centers, or by the U.S. Navy in the past or in other contexts;	22) Please refer to Section 5.3.4.1.16 (Adopting Mitigation Measures of Foreign Navies) for a discussion on foreign navies. Mitigation is developed in cooperation with NMFS and will be further refined through the MMPA and ESA consultation processes. Evaluation of past and present U.S. Navy mitigation measures is included throughout Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring); most measures originated through past environmental analyses and associated consultations with regulators. Mitigation measures are based on the best available science with regard to protection of marine mammals and the practicality of their implementation.
NRDC - 62	23) Avoidance of fish spawning grounds and of important habitat for fish species potentially vulnerable to significant behavioral change, such as widescale displacement within the water column or changes in breeding behavior;	23) This EIS/OEIS describes potential impacts to fish species and concludes that there are no impacts that would justify area avoidance for the Navy's proposed activities. Because of the wide variety of marine species in and around the HSTT Study Area, such avoidance areas as suggested in the comment would serve to exclude proposed activities from the entire Study Area. Please refer to Section 5.3.4.1.11 (Avoiding Marine Species Habitats) for a discussion of habitat avoidance. Also see Section 3.9 (Fish) regarding the effects determinations on fish in the FEIS/OEIS.
NRDC - 63	24) Evaluating before each major exercise whether reductions in sonar use are possible, given the readiness status of the strike groups involved;	24) Please refer to Section 5.3.4.1.3 (Reducing Sonar Source Levels and Total Number of Hours) for a discussion on how the Navy uses active sonar at the lowest practicable source level and number of hours consistent with mission requirements. Strike groups are constantly evaluated and exercises are modified to ensure each strike group receives the training necessary to achieve required readiness levels.
NRDC - 64	25) Dedicated research and development of technology to reduce impacts of active acoustic sources on marine mammals;	25) The Navy provides a significant amount of funding and support to marine research. Navy scientists work cooperatively with other government researchers and scientists, universities, industry, and non-governmental conservation organizations in collecting, evaluating, and modeling information on marine resources. Details on the Navy's involvement with future research will be worked out through the Navy and NMFS adaptive management process, which regularly considers

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		and evaluates the development and use of new science and technologies for Navy applications.
NRDC - 65	26) Establishment of a plan and a timetable for maximizing synthetic training in order to reduce the use of active sonar training;	26) Please refer to Section 5.3.4.1.2 (Replacing Training and Testing with Simulated Activities) for a discussion on simulated activities.
NRDC - 66	27) Prescription of specific mitigation requirements for individual classes (or sub-classes) of testing and training activities, in order to maximize mitigation given varying sets of operational needs; and	27) The Navy has developed mitigation by activity type to reduce potential impacts from the Proposed Action while not causing an unacceptable impact to readiness. Please refer to Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) for a discussion of these measures.
NRDC - 67	28) Timely, regular reporting to NOAA, state coastal management authorities, and the public to describe and verify use of mitigation measures during testing and training activities	28) Navy reporting requirements, including exercise and monitoring reporting, are described in Section 5.5.2 (Reporting). Reports are provided to NMFS as the regulator responsible for protecting marine mammals, and unclassified reports are publicly available on the Navy and NMFS websites. Please refer to Section 5.3.4.1.17 (Increasing Reporting Requirements) for additional discussion.
NRDC - 68	While the Navy considers, and summarily dismisses, many of these measures in its OEIS, it fails to do so in a manner permitted by NEPA and we note that similar or additional measures may be required under the Marine Mammal Protection Act, Endangered Species Act, and other statutes.	Comment noted. The Navy intends to work cooperatively with NMFS, the Navy's cooperating agency and the regulator under the MMPA, to finalize mitigation measures through the permitting and consultation processes for MMPA, ESA, and other laws as required.
NRDC - 69	The Navy Fails to Properly Analyze Cumulative Impacts In order to satisfy NEPA, an EIS must include a "full and fair discussion of significant environmental impacts." 40 C.F.R. § 1502.1. It is not enough, for purposes of this discussion, to consider the proposed action in isolation, divorced from other public and private activities that impinge on the same resource; rather, it is incumbent on the Navy to assess cumulative impacts as well, including the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future significant actions." Id. § 1508.7. A meaningful cumulative impact analysis must identify (1) the area in which the effects of the proposed project will be felt; (2) the impacts that are expected in that area from the proposed project; (3) other actions-past, present, proposed, and reasonably foreseeable-that have had or are expected to have impacts in the same area; (4) the impacts or expected impacts from these other actions; and (5) the overall impact that can be expected if the individual impacts are allowed to accumulate. Grand Canyon Trust v. FAA, 290 F.3d 339, 345 (D.C. Cir. 2002) (quotation and citation omitted). The Navy "cannot treat the identified environmental concern in a vacuum." TOMAC v. Norton, 433 F.3d 852, 863 (D.C. Cir. 2006) (quoting Grand Canyon Trust, 290 F.3d at 345). The Navy's cumulative impact analysis fails to meet these basic requirements.	The Navy used the best available science and a comprehensive review of past, present and reasonably foreseeable actions to develop a robust Cumulative Impacts analysis (Chapter 4, Cumulative Impacts). As required under NEPA, the level and scope of the analysis are commensurate with the potential impacts of the action as reflected in the resource-specific discussions in Chapter 3 (Affected Environment and Environmental Consequences). The EIS/OEIS considered its activities alongside those of other activities in the region whose impacts are "truly meaningful" to the analysis. Furthermore, the entire EIS/OEIS provides the cumulative impacts analysis, not just Chapter 4. Chapter 3, in particular, provides the current effects of past and present impacts and environmental conditions that represent the baseline of the environment as it is; Chapter 3 also discusses the consequences or potential future impacts from Navy activities. Chapter 4, then, discusses the other reasonably foreseeable activities to the extent they are known and the incremental impact of the Navy's proposal when added to past, present, and future impacts.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	Nowhere in its cumulative impact analysis does the Navy consider-let alone reach the conclusion-that the sum of the various environmental impacts that are enumerated will be limited. DEIS at 4-1 to 35. The Navy's analysis cannot provide such support because the Navy fails to explain what the sum of these impacts is expected to be. NEPA requires more than just a recital of possible impacts: it requires the Navy to actually analyze the overall impact of the accumulation of individual impacts. Grand Canyon Trust, 290 F.3d at 345. The DEIS fails to make this analysis.	
NRDC - 70	The Navy apparently believes it is enough to find that cumulative impacts will be "significant" and that, defying logic, impacts from its proposed activities will be relatively low when analysis is not warranted.[59] Yet most well-informed laypeople know that human activities have a significant impact on the marine environment, contributing to population declines, extinctions, and challenges to recovery. The Navy's recitation that it is hard out there for struggling species, offers no insight as to how impacts from its proposed activities should be placed in perspective when assessing cumulative threats to marine wildlife. To the extent that the Navy does offer perspective, it is to claim, without any support, that the relative contribution of its activities is low when compared to other threats. Such assertions are patently absurd given the amount of take - over 14 million instances of marine mammal take over 5 years, including almost 3 million instances of temporary hearing loss - projected to result from the Navy's activities. compared to other actions to support its conclusion that further 59) For marine mammals the Navy states: In summary, based on the analysis presented in Section 3.4 (Marine Mammals) the current aggregate impacts of past and present actions and reasonably foreseeable future actions are expected to result in significant impacts on some marine mammal species in the Study Area. Therefore, cumulative impacts on marine mammals would be significant without consideration of the impacts of Alternatives I or 2. Alternatives I and 2 would contribute to and increase cumulative impacts, but the relative contribution would be low compared to other actions. Further analysis of cumulative impacts on marine mammals is not warranted. DEIS at 4-28. The Navy makes an identical statement for other species. E.g., Sea turtles (DEIS at 431).	The Navy used the best available science and a comprehensive review of past, present and reasonably foreseeable actions to develop a robust Cumulative Impacts analysis (see Chapter 4, Cumulative Impacts). As required under NEPA, the level and scope of the analysis are commensurate with the potential impacts of the action as reflected in the resource-specific discussions in Chapter 3. The EIS/OEIS considered its activities alongside those of other activities in the region whose impacts are "truly meaningful" to the analysis. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures must be estimated scientifically using complex modeling, but it is only an estimate, not a prediction. This estimate needs to encompass the capacity of what could occur to ensure Navy's permits are not exceeded. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis.
NRDC - 71	The Navy must also consider the full effects of its sonar training. It simply assumes that all behavioral impacts are short-term in nature and cannot affect individuals or populations through repeated activity-even though the anticipated takes of its preferred alternative would affect the same populations year after year. While the DEIS's analysis focuses on impacts over 5 years, naval training and testing will undoubtedly continue in the HSTT Study Area for the foreseeable future. At current rates, which is a conservative estimate given increases in training and testing activities over the last decade, the marine mammal populations of the HSTT Study Area will suffer nearly 100 million takes over the next 35 years.	The Navy used the best available science and a comprehensive review of past, present and reasonably foreseeable actions to develop a robust Cumulative Impacts analysis (see Chapter 4, Cumulative Impacts). As required under NEPA, the level and scope of the analysis are commensurate with the potential impacts of the action as reflected in the resource-specific discussions in Chapter 3. The EIS/OEIS considered its activities alongside those of other activities in the region whose impacts are "truly meaningful" to the analysis. The scope of the EIS/OEIS only extends to 2019, at which time, further NEPA analysis will be conducted for the permitting process. At that time, the needs of

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		the Navy's training and testing communities will be re-evaluated.
NRDC - 72	Nor does the Navy consider the potential for acute synergistic effects from sonar training. Although the OEIS discusses the potential for ship strike in the training area (OEIS 4-23 to 25 for marine mammals), it does not consider the greater susceptibility to vessel strike of animals that have been temporarily harassed or disoriented by certain noise sources. The absence of analysis is particularly glaring in light of the Haro Strait incident, in which killer whales and other marine mammals were observed fleeing away from the sonar vessel at high speeds.[60] Neither does the Navy consider the synergistic effects of noise with other stressors in producing or magnifying a stress-response.[61] For these reasons alone, the Navy should have concluded that the cumulative and synergistic impacts from sonar training are Significant and focused its efforts to analyze and develop mitigation measures to avoid those impacts.	Based on the page numbers described, this comment seems to have been made on the Navy's 2008 Atlantic Fleet Active Sonar Training EIS/OEIS for Navy training activities in the Atlantic Ocean, and not the HSTT DEIS/OEIS. Although the Navy acknowledges that acute synergistic effects are not well-studied and can only be accounted for qualitatively, a section for each resource exists that discusses this particular issue. For marine mammals, it is Section 3.4.4 (Summary of Impacts [Combined Impact of All Stressors] on Marine Mammals).
NRDC - 73	The Navy acknowledges that the HSTT Study Area is crowded with human and military activities, many of which introduce noise, chemical pollution, debris, and vessel traffic into the habitat of protected species. OEIS at 4-4 to 16. Yet it inexplicably fails to conclude what the cumulative effects will be for the environment other than saying the impacts will be "significant." NEPA's cumulative impacts analysis must require more than stating the obvious. Given the scope of the proposed action, the deficiencies of the Navy's cumulative impacts assessment represents a critical failure of the DEIS. At a minimum, the Navy must evaluate the potential for cumulative impacts on populations that will occur in and near the HSTT Study Area, clearly define the extent of expected cumulative impacts, and assess the potential for synergistic adverse effects (such as from noise in combination with ship-strikes).	The Navy used the best available science and a comprehensive review of past, present and reasonably foreseeable actions to develop a robust Cumulative Impacts analysis (see Chapter 4, Cumulative Impacts). As required under NEPA, the level and scope of the analysis are commensurate with the potential impacts of the action as reflected in the resource-specific discussions in Chapter 3. The EIS/OEIS considered its activities alongside those of other activities in the region whose impacts are "truly meaningful" to the analysis.
NRDC - 74	The Navy Fails to Properly Analyze Reasonable Alternatives To comply with NEPA, an EIS must "inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment." 40 C.F.R. § 1502.1. The regulation itself describes the requirement as "the heart of the environmental impact statement." [d. at § 1502.14. Courts similarly portray the alternatives requirement as the "linchpin" of the EIS. Monroe County Conservation Council v. Volpe, 472 F.2d 693 (2d Cir. 1972). The agency must therefore "[r]igorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated." 40 C.F.R. § 1502.14(a). The agency must also state how the alternatives considered in the DEIS and decisions based on the DEIS will or will not achieve the requirements of sections 101 and 102(1) of NEPA and other environmental laws and policies. See 40 C.F.R. § 1502.2(d). Consideration of alternatives is required by (and must conform to the independent terms of) both sections lO2(2)(C) and lO2(2)(E) of NEPA. Here, the Navy's alternatives	The alternatives carried forward meet the Navy's purpose and need (Section 1.4, Purpose and Need) to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. The Navy complied with NEPA requirements in the development and consideration of alternatives. This EIS/OEIS analyzes all alternatives in Section 2.5.2 (Alternatives Carried Forward) and explains why the Navy has eliminated other alternatives in Section 2.5.1 (Alternatives Eliminated from Further Consideration). The selection of an alternative by the decision maker will be based on a review of all relevant facts, impact analyses, comments received via the EIS/OEIS public participation process, and the requirements of the Navy in order to fulfill its mission.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	analysis misses the mark. Three alternatives are given in the DEIS: a No Action Alternative (maintaining the current level of activities), Alternative 1 (increasing training and testing activities and force structure changes), and the preferred Alternative 2 (Alternative 1 with range enhancements and more training and testing activities). These alternatives do not provide decision makers with a range of genuine choices. While the purpose of the alternatives analysis is to "consider the likely environmental impacts of the preferred course of action as well as reasonable alternatives," which "facilitates informed decisionmaking by agencies and allows the political process to check those decisions," New Mexico ex rel. Richardson v. BLM, 565 F.3d 683, 703-704 (10th Cir. 2009), the DEIS falls short of this goal. The Navy's alternatives amount to a presentation of only one true course of action: potential training and testing in all areas at all times. A. Failure to Identify Environmental Impact-Based Alternatives The Navy claims it "considers potential environmental impacts" while executing its responsibilities under federal law, including NEPA. DEIS at I-I. But the Navy's alternatives were not selected to "inform decision-makers and the public" of how the Navy could "avoid or minimize adverse impacts or enhance the quality of the human environment." 40 C.F.R. § 1502.1. Instead, as discussed in the DEIS and below, the Navy chose alternatives based on factors unrelated to the proposed action's environmental impacts.	
NRDC - 75	At no point in the OEIS does the Navy discuss how the alternatives pose different environmental choices for the public and decisionmakers. The DEIS fails entirely to comply with NEPA's regulations, requiring the Navy to "present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decisionmaker and the public." 40 C.F.R. § 1502.14. The Navy fails to sharply define the environmental issues applicable to each alternative and include these differences in a comparison of alternatives. There is simply no comparison of the risks and benefits of each alternative site showing what is and is not known and what species and habitats would be most at risk from each alternative	The Alternatives carried forward meet the Navy's purpose and need (see Section 1.4 [Purpose and Need for Proposed Military Readiness Training and Testing Activities]) to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. The Navy complied with NEPA requirements in the development and consideration of alternatives. This EIS/OEIS analyzes all alternatives in Section 2.5.2 (Alternatives Carried Forward) and explains why the Navy has eliminated other alternatives in Section 2.5.1 (Alternatives Eliminated from Further Consideration).
NRDC - 76	The two alternatives that meet the Navy's purpose and needs present no options for a decisionmaker wishing to reduce harms to the environment or for the public to hold decisionmakers accountable for their choices based on environmental impacts. For example, a decisionmaker wishing to choose the alternative that does less harm to sea turtles has nowhere to turn. Similarly, both of the Navy's alternatives result in the exact same impact to marine mammals from training with sonar - over 2.5 million takes per year. Violating NEPA's regulations, there is no presentation of an alternative that details a way forward that "avoid[s] or minimizes] adverse impacts or enhancers] the quality of	The Alternatives carried forward meet the Navy's purpose and need (see Section 1.4 [Purpose and Need for Proposed Military Readiness Training and Testing Activities]) to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. The Navy complied with NEPA requirements in the development and consideration of alternatives. This EIS/OEIS analyzes all alternatives in Section 2.5.2 (Alternatives Carried Forward) and explains why the Navy has eliminated other alternatives in Section 2.5.1 (Alternatives

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	the human environment." /d.	Eliminated from Further Consideration).
NRDC - 77	The Navy Improperly Dismissed Alternatives Necessary to Provide a Well Reasoned Choice of Alternatives Several alternatives were recommended to the Navy during the scoping process that addressed this absence of environmental impact-based alternatives. However, the DEIS improperly dismisses all these suggestions. "While NEPA 'does not require agencies to analyze the environmental consequences of alternatives it has in good faith rejected as too remote, speculative, or impractical or ineffective,' it does require the development of 'information sufficient to permit a reasoned choice of alternatives as far as environmental aspects are concerned. "' New Mexico ex reI. Richardson v. BLM, 565 F.3d 683, 708-709 (10th Cir. 2009) quoting Colorado Envrl. Coalition v. Dombeck, 185 F.3d 1162, 1174 (lath Cir. 1999).	The Alternatives carried forward meet the Navy's purpose and need (see Section 1.4 [Purpose and Need for Proposed Military Readiness Training and Testing Activities]) to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. The Navy complied with NEPA requirements in the development and consideration of alternatives. This EIS/OEIS analyzes all alternatives in Section 2.5.2 (Alternatives Carried Forward) and explains why the Navy has eliminated other alternatives in Section 2.5.1 (Alternatives Eliminated from Further Consideration).
NRDC - 78	Dismissing the suggestions, the Navy fails to show how any of the alternatives are "too remote, speculative, or impractical or ineffective." For instance, while proximity to home ports and complexes might prove to be more convenient and even more cost effective, neither expense nor ease equates to the level of being too remote, speculative, or impractical or ineffective. See DEIS § 2.5.1.1 at 2-59 t060. These factors alone cannot dictate an agency's choice of alternatives to evaluate in an EIS.	The Alternatives carried forward meet the Navy's purpose and need (see Section 1.4 [Purpose and Need for Proposed Military Readiness Training and Testing Activities]) to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. The Navy complied with NEPA requirements in the development and consideration of alternatives. This EIS/OEIS analyzes all alternatives in Section 2.5.2 (Alternatives Carried Forward) and explains why the Navy has eliminated other alternatives in Section 2.5.1 (Alternatives Eliminated from Further Consideration).
NRDC - 79	"The primary purpose of the impact statement is to compel federal agencies to give serious weight to environmental factors in making discretionary choices." 1-291 Why? Ass'n v. Burns, 372 F.Supp. 233,247 (D. Conn. 1974). If an agency is permitted to consider and compare the environmental impacts of its proposed action with only equally convenient alternatives-and permitted to omit from such analysis any alternatives that are less convenient, no matter that they might result in significant environmental benefits-this purpose would be thwarted and the alternatives analysis loses its purpose entirely. An agency must discuss all reasonable alternatives-those that will accomplish the purpose and need of the agency and are practical and feasible-not simply those it finds most expedient. 40 C.F.R. § 1502.14. By improperly disregarding many alternatives, the Navy has failed to discuss all reasonable alternatives.	The Alternatives carried forward meet the Navy's purpose and need (see Section 1.4 [Purpose and Need for Proposed Military Readiness Training and Testing Activities]) to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. The Navy complied with NEPA requirements in the development and consideration of alternatives. This EIS/OEIS analyzes all alternatives in Section 2.5.2 (Alternatives Carried Forward) and explains why the Navy has eliminated other alternatives in Section 2.5.1 (Alternatives Eliminated from Further Consideration).
NRDC - 80	The Navy Must Identify Alternative Sites and Seasonal Restrictions The Navy's analysis is devoid of geographic alternatives and even minor seasonal restrictions. This omission is inappropriate in light of the strong consensus-at NOAA and in the scientific community-that spatial-temporal avoidance of high-value habitat represents the best available means to reduce the impacts of mid-frequency active sonar	As described throughout Chapter 2, geographic and seasonal flexibility is required to support evolving Navy training and testing requirements, which are linked to real world events. As described in Section 5.2.3.1 (Effectiveness Assessment) of the EIS/OEIS, a specific season, time of day, or geographic area must be important to the resource to

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	and certain other types of ocean noise on marine life.[62] 62 - Supra, Note 3. Protected areas should ordinarily be identified during the planning stage based on biological and oceanographic factors, rather than merely on the confirmed presence of marine animals in real time; and, indeed, the Naval Facilities Engineering Command, Atlantic undertook just such an analysis in the Navy's previous EIS for Atlantic Fleet Active Sonar Training. The Navy's detailed planning for certain training and testing exercises, particularly major exercises, such as RIMPAC, JTFEXs, COMPTUEXs, and USWEXs, provide an ideal opportunity to develop reasonable alternatives for the timing and siting of such activities based on biological and oceanographic factors.	determine whether the potential for establishing a mitigation area would be effective in avoiding or reducing a potential impact on a resource. In determining importance, special consideration will be given to those time periods or geographic areas having characteristics such as especially high overall density or percent population use, seasonal bottlenecks for a migration corridor, and identifiable key foraging and reproduction areas. The Navy proposes mitigation measures (a portion of which will include specific mitigation areas) on a case-by-case basis that would apply to all locations where a specified activity occurs. The balance between Procedural Measures and Mitigation Area measures provide a way for the Navy to mitigate potential impacts while maintaining its military readiness objectives. The proposed mitigation measures were developed in coordination with NMFS in order to avoid or reduce a potential impact on a particular resource.
NRDC - 81	Further spatial-temporal alternatives do not require large shifts in location, but rather can be very effective by simply carving out small areas of known biological importance. For instance, the Navy concedes in its mitigation analysis (DEIS at 5-45) the importance of the Humpback Whale National Marine Sanctuary off the coast of the Hawaiian Islands, designating a "cautionary area" that requires higher administrative approval for activities in the area during winter months. Despite this recognition, the Navy fails to identify other areas and develop an alternative based on avoiding a handful of biologically important areas. Instead, all of the alternatives propose yearround, unrestricted use without regard to seasonal variations in marine mammal and fish abundance. This is true despite the well-documented seasonal migrations of numerous endangered species and the identification of biologically important areas. Carefully siting the activities proposed to occur in the range to avoid concentrations of vulnerable and endangered species and high abundances of marine life is the most critical step the Navy can take in reducing the environmental impacts of this project. However, because the Navy has failed to undertake an alternatives analysis that allows it to make an informed siting choice, the DEIS is inadequate and must be revised.	As described throughout Chapter 2, geographic and seasonal flexibility is required to support evolving Navy training and testing requirements, which are linked to real world events. As described in Section 5.2.3.1 (Effectiveness Assessment) of the EIS/OEIS, a specific season, time of day, or geographic area must be important to the resource to determine whether the potential for establishing a mitigation area would be effective in avoiding or reducing a potential impact on a resource. In determining importance, special consideration will be given to those time periods or geographic areas having characteristics such as especially high overall density or percent population use, seasonal bottlenecks for a migration corridor, and identifiable key foraging and reproduction areas. The Navy proposes mitigation measures (a portion of which will include specific mitigation areas) on a case-by-case basis that would apply to all locations where a specified activity occurs. The balance between Procedural Measures and Mitigation Area measures provide a way for the Navy to mitigate potential impacts while maintaining its military readiness objectives. The proposed mitigation measures were developed in coordination with NMFS in order to avoid or reduce a potential impact on a particular resource. Please refer to Section 5.3.4.1.11 (Avoiding Marine Species Habitats) for further discussion of habitat avoidance.
NRDC - 82	Other Reasonable Alternatives The DEIS should also consider other reasonable alternatives which could fulfill the Navy's purpose while reducing harm to marine life and coastal resources. For example:	The Alternatives carried forward meet the Navy's purpose and need (see Section 1.4 [Purpose and Need for Proposed Military Readiness Training and Testing Activities]) to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	(1) The DEIS fails to include a range of mitigation measures among its alternatives. Many such measures have been employed by the U.S. Navy in other contexts, as discussed in Section IV; and there are many others that should be considered. Such measures are reasonable means of reducing harm to marine life and other resources on the proposed range, and their omission from the alternatives analysis renders that discussion inadequate. For instance, while safety zones are no substitute for geographic mitigation (which, as noted above, is the most effective means of reducing impacts on marine mammals), they do provide a form of last-recourse protection for any animals that are spotted near the array. The Navy must analyze safety zone enhancements outside critical points of its training and consider modifications in the safety zone provisions. We have noted several reasons in the past why expanding the safety zone would reduce the risk of near-array exposures: for example, (1) marine mammal groups are often spread out over a wide area, and animals may go undetected within the safety zone even if group members are only spotted outside; and (2) uncertainty remains over the thresholds and distances needed to cause hearing loss in some species. Given the Navy's defacto use of a wider safety zone in past exercises, it should consider how to provide for safety zone enhancements outside critical points of its training. In addition, the Marine Mammal Commission has repeatedly called for modifications in the safety zone provisions to allow sufficient time for animals to move out of the sound field. 63 MMC, Letter from Tim Ragen, Executive Director, Marine Mammal Commission, to P. Michael Payne, Chief, Permits Division, NMFS. Formal comments on MMPA proposed rulemaking, submitted Nov. 13,2008 (2008).(2) While we appreciate the Navy's plan to use range sensors and other passive acoustic platforms in limited instances, such efforts must be expanded. The Navy has failed to set forth an action plan and timeline in its EIS (and as part of its adaptive management under its current incidental take permits) to bring these sensors and platforms on line for purposes of more meaningful mitigation. Passive acoustic monitoring is one of the most effective available means of monitoring marine mammals in the vicinity of MFA sonar exercises and other sources of undersea noise.[64] Under the right conditions, it can significantly improve detectability of certain cryptic or deep-diving species. For example, while beaked whales are theoretically sightable only during the 8% of time that they are on the surface (and even then are unlikely to be spotted visually), some species vocalize over roughly 25% of their deep foraging dives.[65] NMFS, in its rulemakings, has repeatedly noted the mitigation potential of passive acoustic monitoring and the commitment of the Navy to technological development in support of this measure. 74 Fed. Reg. 3895.(3) The Navy's statement of purpose and need contains no language that would justify the limited set of alternatives that the Navy considers (or the alternative it ultimately prefers). Yet it is a fundamental requirement of NEPA that agencies preparing an EIS specify their project's "purpose and need" in terms that do not exclude full consideration of reasonable alternatives. 40 C.F.R. § 1502.13; City of Carmel-by-the-Sea v. United States Dep't of Transp. , 123 F.3d 1142, 1155 (9th Cif. 1997) (citing Citizens Against Burlington, Inc. v. Busey, 938 F.2d	detailed information on the development of alternatives. The Navy complied with NEPA requirements in the development and consideration of alternatives. This EIS/OEIS analyzes all alternatives in Section 2.5.2 (Alternatives Carried Forward) and explains why the Navy has eliminated other alternatives in Section 2.5.1 (Alternatives Eliminated from Further Consideration). The selection of an alternative by the decision-maker will be based on a review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	190, 196 (D.C. Cif. 1991). "The existence of a viable but unexamined alternative renders an· environmental impact statement inadequate," Idaho Conservation League v. Mumma, 956 F.2d 1508, 1519 (9th Cir. 1992), and an EIS errs when it accepts "as a given" parameters that it should have studied and weighed. Simmons v. U.S. Army Corps of Engineers, 120 F.3d 664, 667 (7th Cir. 1997).In sum, the DEIS shortchanges or omits from its analysis reasonable alternatives that might achieve the Navy's core aim of testing and training while minimizing environmental harm. For these reasons, we urge the Navy to revise its DEIS to adequately inform the public of all reasonable alternatives that would reduce adverse impacts to whales, fish, and other resources. 40 C.F.R. § 1502.1.	surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website. The Navy has revised the mitigation zones used during training and testing activities as described in Section 5.3.2 (Mitigation Zone Procedural Measures).
NRDC – 83	The Navy Fails to Analyze the Impacts on Wildlife Viewing Interests and Recreation. Just as it fails to consider the direct, indirect, and cumulative impacts of increased training in the HSTT Study Area on the region's marine mammals and other fish and wildlife, the DEIS does not adequately consider the effects on wildlife viewing and other wildlife-dependent recreational interests. The DEIS makes no mention of the value lost from the harm to marine mammals that attract a number of our organizational members and members of the public to the potentially affected areas of Southern California and Hawaii. Nor does it address the potential economic value lost from decreased tourism (e.g., whale watching, cruise ships, etc.), particularly those areas centered on observing whales and other marine mammals in their natural habitats. One of NEPA's explicit purposes is to "assure esthetically and culturally pleasing surroundings," 42 U.S.C. 433 1(b)(2), and courts have made clear that an agency must adequately consider such recreational impacts in its NEPA analysis. See, e.g., Lujan v. NWF, 497 U.S. 871, 887	As stated in the approach to analysis (see Section 3.0.5 [Overall Approach to Analysis]), indirect impacts result when a direct impact on one resource induces an impact on another resource (referred to as a secondary stressor). If there is no direct impact on a resource, then indirect impacts are not foreseeable. Section 3.9 (Fish) concluded no long-term impacts to fish populations. The analysis in Marine Mammals (Section 3.4) and Socioeconomic Resources (Section 3.11) screened for any impacts on other resources that might create secondary impacts. Because the EIS/OEIS concluded there would be no impacts to fish populations, reduced catch rates and prey base were not addressed for Marine Mammals (Section 3.4) or Socioeconomic Resources (Section 3.11). The biological resources sections (3.4 through 3.9) determined there would be no long-term

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	(1990) ("no doubt that recreational use and aesthetic enjoyment are among the sorts of interests NEPA [was] specifically designed to protect"); LaFlamme v. FERC, 852 F.2d 389, 401 (1988) (because "there were substantial questions raised regarding whether the project may significantly affect recreational use in the project area, and that FERC failed to explain or discuss" these impacts, the court found that "this record reflects a decision which is neither 'fully informed or well-considered,'" and therefore concluded the agency's decision not to prepare an EIS was unreasonable).	impacts to populations, therefore not reaching the level of "harm" as to impact tourism activities.
NRDC - 84	Project Description and Meaningful Public Disclosure Disclosure of the specific activities contemplated by the Navy is essential if the NEPA process is to be a meaningful one. See, e.g., LaFlamme v. F.E.R.C., 852 F.2d 389, 398 (9th Cir. 1988) (noting that NEPA's goal is to facilitate "widespread discussion and consideration of the environmental risks and remedies associated with [a proposed action]"). For meaningful public input, the Navy must describe source levels, frequency ranges, duty cycles, and other technical parameters relevant to determining potential impacts on marine life. The DEIS provides some of this information, but it fails to disclose sufficient information about active sonobuoys, acoustic device countermeasures, training targets, or range sources that would be used during the exercises. And the DEIS gives no indication of platform speed, pulse length, repetition rate, beam widths, or operating depths-that is, most of the data that the Navy used in modeling acoustic impacts.	Information regarding source levels, frequencies, duty cycles, and other technical parameters have been provided in consideration of that which is necessary to conduct the analysis, and in consideration of protection of classified information. For more information on sonar system parameters, see Chapter 2 (Section 2.3.7, Classification of Acoustic and Explosive Sources). For descriptions of specific activities and the sources used for each activity, see Appendix A (Navy Activities Descriptions).
NRDC – 85	The Navy-despite repeated requests-has not released or offered to release CASS/GRAB or any of the other modeling systems or functions it used to develop the biological risk function or calculate acoustic harassment and injury.	The CASS/GRAB program is classified and not available for public release; however, approximate results can be obtained using other mathematical models commonly available to those with the technical expertise to utilize those tools. See the Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis Technical Report and the Determination of Acoustic Effects on Marine Mammals and Sea Turtles Technical Report which can be found at www.hstteis.com, for details on the development of the Navy Acoustic Effects Model and Criteria.
NRDC – 86	In addition, the Navy has also ignored repeated Freedom of Information Act requests regarding information and reports cited in the DEIS. These models, reports, and requests for information must be made available to the public, including the independent scientific community, for public comment to be meaningful under NEPA and the Administrative Procedure Act. 40 C.F.R. §§ 1502.9(a), 1503.1(a) (NEPA); 5 U.S.C. § 706(2)(0) (APA). In addition, guidelines adopted under the Data (or Information) Quality Act also require their disclosure. The Office of Management and Budget's guidelines require agencies to provide a "high degree of transparency" precisely "to facilitate reproducibility of such information by qualified third parties" (67 Fed. Reg. 8452, 8460 (Feb. 22,2002»; and the Defense Department's own data quality guidelines mandate that	No reference has been provided and the Navy is unaware of any Freedom of Information Act requests on this topic that have not been responded to. Navy takes its regulatory responsibilities seriously and when a request is submitted, it is acted upon.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	"influential" scientific material be made reproducible as well. We encourage the Navy to contact us immediately to discuss how to make this critical information available.	
NRDC - 87	Compliance With Other Applicable Laws A number of other statutes and conventions are implicated by the proposed activities. Among those that must be disclosed and addressed during the NEPA process are the following: (l) The Marine Mammal Protection Act ("MMPA"), 16 U.S.C. § 1361 et seq., which requires the Navy to obtain a permit or other authorization from NMFS or the U.S. Fish and Wildlife Service prior to any "take" of marine mammals. The Navy must apply for an incidental take permit under the MMPA, and NRDC will submit comments regarding the Navy's application to NMFS at the appropriate time. (2) The Endangered Species Act, 16 U.S.C. § 1531 et seq., which requires the Navy to enter into formal consultation with NMFS or the U.S. Fish and Wildlife Service, and receive a legally valid Incidental Take Permit, prior to its "take" of any endangered or threatened marine mammals or other species, including fish, sea turtles, and birds, or its "adverse modification" of critical habitat. See, e.g., IS36(a)(2); Romero-Barcelo v. Brown, 643 F.2d 835 (1st Cir. 1981), rev'd on other grounds, Weinberger v. Romero-Careeto, 456 U.S. 304, 313 (1982). Given the scope and significance of the actions and effects it proposes, the Navy must engage in formal consultation with NMFS and the U.S. Fish and Wildlife Service over the numerous endangered and threatened species that will be harmed from its activities. (3) The Coastal Zone Management Act, and in particular its federal consistency requirements, 16 U.S.C. § 1456(c)(1)(A), which mandate that activities that affect the natural resources of the coastal zone-whether they are located "within or outside the coastal zone"-be carried out "in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs." The Navy must fulfill its CZMA commitments along the California and Hawaii coasts. (4) The Magnuson-Stevens Fisheries Conservation and Management Act, 16 U.S.C. § 1801 et seq. ("MSA"), which requires federal agencies to "consult with the Secretary [of Commerce] with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken" that "may adversely affect any essential fish habitat" identified under that Act. 16 U.S.C. §1855 (b)(2). In turn, the MSA defines essential fish habitat as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." 16 U.S.C. § 1802 (10). The HSTT Study Area contains such habitat. As discussed at length above, anti-submarine warfare exercises alone have the significant potential to adversely affect at least the waters, and possibly the substrate, on which fish in these areas depend. Under the MSA, a thorough consultation is required.(5) The Marine Protection, Research and Sanctuaries Act, 33 U.S.C. § 1401 et seq., which requires federal agencies to consult with the Secretary of Commerce if their actions are "likely to destroy, cause the loss of, or injure any sanctuary resource." 16 U.S.C. § 1434(d)(l). Since the Navy's exercises would cause injury and mortality of	The Navy has addressed all of these statutes and conventions. Please see Section 3.0.1 (Regulatory Framework) for a complete list of Federal Statues and Executive Orders addressed in Chapter 3 (Affected Environment and Environmental Consequences) and Chapter 6 (Additional Regulatory Considerations). The Clean Water Act was addressed in Section 3.1 (Sediments and Water Quality) and the Clean Air Act was addressed in Section 3.2 (Air Quality). As part of this process, the Navy has consulted under the Marine Mammal Protection Act, Endangered Species Act, and Magnuson-Stevens Fishery Conservation Management Act. The Proposed Action did not warrant consultation under the Marine Protection, Research and Sanctuaries Act or the Migratory Bird Treaty Act. The Navy has submitted Determinations to California and Hawaii in compliance with the Coastal Zone Management Act. Chapter 6 (Additional Regulatory Considerations) has thoroughly addressed Marine Protected Areas (Section 6.1.2) under Executive Order 13158.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	species, consultation is clearly required if sonar use takes place either within or in the vicinity of the sanctuary or otherwise affects its resources. Since sonar may impact sanctuary resources even when operated outside its bounds, the Navy should indicate how close it presently operates, or foreseeably plans to operate, to such sanctuary and consult with the Secretary of Commerce as required. In addition, the Sanctuaries Act is intended to "prevent or strictly limit the dumping into ocean waters of any material that would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities" (33 U.S.C. § 1401 (b», and prohibits all persons, including Federal agencies, from dumping materials into ocean waters, except as authorized by the Environmental Protection Agency. 33 U.S.C. §§ 1411,1412(a). The Navy has not indicated its intent to seek a permit under the statute.(6) The Migratory Bird Treaty Act, 16 U.S.C. § 703 et seq. ("MBTA"), which makes it illegal for any person, including any agency of the Federal government, "by any means or in any manner, to pursue, hunt, take, capture, [or] kill" any migratory birds except as permitted by regulation. 16 U.S.C. § 703. After the District Court for the D.C. Circuit held that naval training exercises that incidentally take migratory birds without a permit violate the MBTA, (see Center for Biological Diversity v. Pirie, 191 F. Supp. 2ei 161 (D. D.C. 2002) (later vacated as moot», Congress exempted some military readiness activities from the MBTA but also placed a duty on the Defense Department to minimize harms to seabirds. Under the new law, the Secretary of Defense, "shall, in consultation with the Secretary of the Interior, identify measures-- (1) to minimize and mitigate, to the extent practicable, any adverse impacts of authorized military readiness activities on affected species of migratory birds; and (2) to monitor the impacts of such military readiness activities on affected species of migratory birds." Pub.L. 107-314, § 315 (Dec. 2,2002). As the Navy acknowledges, many migratory birds occur within the HSTT Study Area. The Navy must therefore consult with the Secretary of the Interior regarding measures to minimize and monitor the effects of the proposed range on migratory birds, as required.(7) Executive Order 13158, which sets forth protections for marine protected areas ("MPAs") nationwide. The Executive Order defines MPAs broadly to include "any area of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." E.G. 13158 (May 26,2000). It then requires that "[e]ach Federal agency whose actions affect the natural or cultural resources that are protected by an MPA shall identify such actions," and that, "[t]o the extent permitted by law and to the maximum extent practicable, each Federal agency, in taking such actions, shall avoid harm to the natural and cultural resources that are protected by an MPA." Jd. The Navy must therefore consider and, to the maximum extent practicable, must avoid harm to the resources of all federally- and state-designated marine protected areas. The proposed activities also implicate the Clean Air Act and Clean Water Act as well as other statutes protecting the public health. The Navy must comply with these and other laws.	

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
NRDC - 88	Conflicts with Federal, State and Local Land-Use Planning NEPA requires agencies to assess possible conflicts that their projects might have with the objectives of federal, regional, state, and local land-use plans, policies, and controls. 40 C.F.R. § 1502.16(c). The Navy's training and testing activities may affect resources in the coastal zone and within other state and local jurisdictions, in conflict with the purpose and intent of those areas. The consistency of Navy operations with these land use policies must receive more thorough consideration.	The Navy has prepared Coastal Zone Management Act consistency determinations to ensure consistency with the enforceable policies of the applicable Coastal Zone Management Programs. Additionally, the Draft EIS/OEIS was submitted to each state adjacent to the Study Area for comment.
NRDC - 89	Appendix B – Impacts of Sonar	The issues addressed in this appendix were responded to directly within the NRDC comments above.
NRDC - 90	Appendix C – CRITIQUE OF THE NAVY'S ACOUSTICS ANALYSIS CRITIQUE OF THE RISK ASSESSMENT MODEL EMPLOYED TO CALCULATE TAKES IN THE HAWAII RANGE COMPLEX SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT David E. Bain, Ph.D. Abstract Rather than using a fixed received level threshold for whether a take is likely to occur from exposure to mid-frequency sonar, the Navy proposed a method for incorporating individual variation. Risk is predicted as a function of three parameters: 1) a basement value below which takes are unlikely to occur; 2) the level at which 50% of individuals would be taken; and 3) a sharpness parameter intended to reflect the range of individual variation. This paper reviews whether the parameters employed are based on the best available science, the implications of uncertainty in the values, and biases and limitations in the model. Data were incorrectly interpreted when calculating parameter values, resulting in a model that underestimates takes.	The analytical methodology used in this EIS/OEIS was developed in close coordination with NMFS for the Hawaii Range Complex EIS/OEIS finalized in 2009. Past actions also included rulemaking by NMFS and issuance of a five year Letter of Authorization under the Marine Mammal Protection Act using the methodology presented in that previous EIS/OEIS. The "Appendix C – Critique" presented in these most recent comments is almost a verbatim repeat of the same critique presented in 2008 and so the following responses are also necessarily repetitive of the responses provided previously. As noted previously, the analysis presented in the HSTT EIS/OEIS represents the best available and most applicable science with regard to analysis of effects to marine mammals from sound sources. While recognizing there is incomplete and unavailable information with regard to behavioral impacts on marine mammals (see Section 3.4.3, Environmental Consequences), the response function curve extends to 120 dB sound pressure level specifically to encompass uncertainty and the potential for behavioral reactions in marine mammal species that may be affected by sounds perceived at levels just above ambient.
NRDC - 91	Errors included failure to recognize the difference between the mathematical basement plugged into the model, and the biological basement value, where the likelihood of observed and predicted takes becomes non-negligible; using the level where the probability of take was near 100% for the level where the probability of take was 50%; and extrapolating values derived from laboratory experiments that were conducted on trained animals to wild animals without regard for the implications of training; and ignoring other available data, resulting in a further underestimation of takes.	NMFS, as a cooperating agency and in its role as the MMPA regulator, reviewed all available applicable data and determined there were specific data from three data sets that should be used to develop the criteria. NMFS then applied the response function to predict exposures that resulted in exposures that NMFS may classify as harassment. NMFS developed two risk curves based on the Feller adaptive risk function, one for odontocetes and pinnipeds and one for mysticetes, with input parameters of B = 120dB, K = 45, 99 percent point = 195 dB, 50 percent point = 165 dB.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
NRDC - 92	In addition, uncertainty, whether due to inter-specific variation or parameter values based on data with broad confidence intervals, results in the model being biased to underestimate takes.	The commenter provides no specifics on why the takes would be underestimated. There is much conservativeness (overestimation) built into the modeling process (refer to Finneran and Jenkins [2012]). Additionally, NMFS, as a cooperating agency and in its role as the MMPA regulator, reviewed all available applicable data and determined there were specific data from three data sets that should be used to develop the criteria. NMFS then applied the risk function to predict exposures that resulted in exposures that NMFS may classify as harassment. NMFS developed two risk curves based on the Feller adaptive risk function, one for odontocetes and pinnipeds and one for mysticetes, with input parameters of B = 120dB, K = 45, 99 percent point = 195 dB, 50 percent point = 165 dB.
NRDC - 93	The model also has limitations. For example, it does not take into account social factors, and this is likely to result in the model underestimating takes. This analysis has important management implications.	The commenter was concerned that if one animal is "taken" and leaves an area then the whole pod would likely follow. The model does not operate on the basis of an individual animal, does account for average group size, and quantifies the exposures NMFS may classify as takes based on the summation of fractional marine mammal densities. Because the model output does not consider the many mitigation measures that the Navy utilizes when it is using mid-frequency active sonar, to include mid-frequency active sonar power down and power off requirements should mammals be spotted within certain distances of the ship, if anything, it overestimates the amount of takes.
NRDC - 94	First, not only do takes occur at far greater distances than predicted by the Navy's risk model, the fact that larger areas are exposed to a given received level with increasing distance from the source further multiplies the number of takes. This implies takes of specific individuals will be of greater duration and be repeated more often, resulting in unexpectedly large cumulative effects. Second, corrections need to be made for bias, and corrections will need to be larger for species for which there are no data than for species for which there are poor data.	Modeling accounts for exposures NMFS may classify as takes at distances up to 180 kilometers as described in the Final EIS/OEIS Section 3.4.3 (Environmental consequences) and the Determination of Acoustic Effects on Marine Mammals and Sea Turtles for the Hawaii-Southern California Training and Testing EIS/OEIS technical report. These clearly demonstrate the modeling was conducted over a wide range of bathymetry, sound velocity profiles, and bottom classes. Using these sound propagation characteristics, modeling resulted in less than 1 percent of the exposures that NMFS may classify as a take occurring between 120 dB and 140 dB. Risk function data sets and the parameters, such as the basement values, were chosen to account for uncertainties and for species for which there was less or no data regarding hearing thresholds. The area encompassed by this sound propagation, as determined by NMFS for exposures that may constitute harassment, avoids a bias toward underestimation because the response function parameters were designed with this in mind.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
NRDC - 95	Third, the greater range at which takes would occur requires more careful consideration of habitat-specific risks and fundamentally different approaches to mitigation. The value of the model is that it provides a focus for future research on the effects of noise on marine mammals. In particular, the sensitivity analysis indicates the primary need for data is determining response probabilities of a wide range of species when exposed to received levels near the level at which 50% of individuals respond.	Section 5.3.4 (Mitigation Measures Considered but Eliminated) of the Final EIS/OEIS evaluates alternative or additional mitigations, specifically, as they relate to potential mitigation approaches. The examples of the fundamentally different approaches noted in the comment were addressed in this section of the Final EIS/OEIS. In addition, NMFS has identified general goals of mitigation measures. These goals include avoidance of death or injury, a reduction in the number of marine mammals exposed to received levels when these are expected to result in takes, a reduction in the number of times marine mammals are exposed when these are expected to result in takes, a reduction in the intensity of exposures that are expected to result in takes, and a reduction in adverse effects to marine mammal habitat. As discussed below, NMFS and Navy have identified mitigation measures that are practicable and reasonably effective. For example, the safety zones reduce the likelihood of physiological harm, the number of marine mammals exposed, and the intensity of those exposures. The Navy has determined that mitigation measures will likely prevent animals from being exposed to the loudest sonar sounds or explosive effects that could potentially result in temporary threshold shift or permanent threshold shift and more intense behavioral reactions (Final EIS/OEIS, Section 5.3, Mitigation Assessment). Mitigation measures that are practicable involve those that reduce direct physiological effects within the temporary threshold shift and permanent threshold shift thresholds.
NRDC - 96	The Navy distinguishes two types of takes: Level A, in which there is immediate injury or death; and Level B, in which there is no immediate injury, but cumulative exposure may lead to harm at the population level. However, in certain contexts, Level B harassment may lead to Level A takes through indirect mechanisms. The population effects of Level A takes on populations are relatively easy to assess, as individuals that are killed are obviously removed from the population, and those that are injured are more likely to die whenever the population is next exposed to stress.	This comment is a complete mischaracterization of the analysis presented in the EIS/OEIS. Navy does not anticipate any mortality from its activities. Though the model estimates the potential for mortality based on very conservative criteria, with the implementation of proven mitigation and decades of historical information from conducting training and testing in the study area, the likelihood of mortality is near zero and would not impact populations. Additionally, there is no evidence that the type of injuries that could potentially occur (fully recoverable or limited permanent threshold shift) have or will result in follow on mortality.
NRDC - 97	Temporary Threshold Shifts in captive marine mammals are commonly used as an index of physical harm (e.g., Nachtigall et al. 2003, Finneran et al. 2002 and 2005, Kastak et al. 2005). Limiting experimental noise exposure to levels that cause temporary effects alleviates ethical concerns about deliberately causing permanent injury. However, repeated exposure to noise that causes temporary threshold shifts can lead to	The vast majority of these level B takes are short term behavioral responses to relatively short–term activities. The population level impacts are fully discussed in the EIS/OEIS; see Sections 3.0 and 3.4 for the overall discussion, and Sections 3.0.5.7.1 and 3.4.3 for specifics.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	permanent hearing loss. In fact, chronic exposure to levels of noise too low to cause temporary threshold shifts can cause permanent hearing loss.	
NRDC - 98	Changes in behavior resulting from noise exposure could result in indirect injury in the wild. A variety of mechanisms for Level B harassment to potentially lead to Level A takes have been identified.	In prior rulemakings, NMFS established that exposures resulting in Level A and B harassment cannot be considered to overlap, otherwise the regulatory distinction between the two criteria would be lost and the required quantification of takes would be ambiguous. To facilitate the regulatory process, the Final EIS/OEIS maintained a clear and distinct division between Level A and Level B Harassment as required by NMFS.
NRDC - 99	Captive cetaceans Studies of captive marine mammals provide an excellent setting for identifying direct effects of sound. E.g., one of the datasets employed by the Navy consists of studies relating short-term exposure of bottlenose dolphins and belugas to high levels of noise to Temporary Threshold Shifts. The Navy (Dept. Navy 2008b, p 3-7) noted aggressive behavior toward the test apparatus, suggesting stress was another consequence of the test (see also Romano et al. 2004). Such effects would be unconditional results of noise exposure. However, extrapolation of the level at which aggression was observed to the level at which behaviorally mediated effects might occur in the wild is problematic, as this depends on how well trained the subjects were. For example, the Navy has been a leader in training dolphins and other marine mammals to cooperate with husbandry procedures. Tasks like taking blood, stomach lavage, endoscopic examination, collection of feces, urine, milk, semen and skin samples, etc. once required removing individuals from the water and using several people to restrain them. With training, painful and uncomfortable procedures can be accomplished without restraint and with a reduction in stress that has significantly extended lifespans of captive marine mammals (Bain 1988).	The Navy and NMFS relied upon best available science to derive the behavioral response function. The data used were based on one captive animal study and two studies that involved observations of wild animals exposed to sonar or sonar-like signals.
NRDC - 100	12. Right whales exposed to alerting devices consistently responded when received levels were above 135 dB re 1 µPa. Due to the small sample size (six individuals), it is unclear whether this is close to the 50% risk, the 100% risk level, or both. These data do not allow identification of B, as lower exposure levels were not tested. In mysticetes exposed to a variety of sounds associated with the oil industry, typically 50% exhibited responses at 120 dB re 1 µPa. Thus right whales may be similar to killer whales.	Results of the research by Nowacek et al. (2004) indicated that right whales reacted to multiple "alert stimuli" which were developed specifically to elicit a response. These stimuli had a limited similarity to Navy sonar systems. In addition, Nowacek et al. was one of three primary references used to derive the risk function curve which accounts for effects down to 120 dB sound pressure level. Navy disagrees that there is any science indicating that "mysticetes exposed to a variety of sounds associated with the oil industry, typically 50% exhibited responses at 120 dB re 1 µPa." If in reference to Malme et al. (1983, 1984) as cited elsewhere in the critique, then those studies in fact indicated that for migrating whales, a 50-percent probability of response occurred at 170 dB for a continuous, low frequency sound source.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
NRDC – 101	See Table 1: Bain Appendix H Datasets not considered The Navy incorrectly concludes that additional datasets are unavailable. In addition to the other killer whale datasets mentioned above, data illustrating the use of acoustic harassment and acoustic deterrent devices on harbor porpoises illustrate exclusion from foraging habitat (Laake et al. 1997, 1998 and 1999, Olesiuk et al. 2002). Data are also available showing exclusion of killer whales from foraging habitat (Morton and Symonds 2002), although additional analysis would be required to assess received levels involved. The devices which excluded both killer whales and harbor porpoises had a source level of 195 dB re 1 ~a, a fundamental frequency of 10kHz, and were pulsed repeatedly for a period of about 2.5 seconds, followed by a period of silence of similar duration, before being repeated. Devices used only with harbor porpoises had a source level of 120-145 dB re 1 Pa, fundamental frequency of 10 kHz, a duration on the order of 300 msec, and were repeated every few seconds. Harbor porpoises, which the Navy treats as having a B+K value of 120 dB re µPa (with A large enough to yield a step function) in the AFAST DEIS (Dept. Navy 2008a), 45 dB lower than the average value used in the HRC SDEIS, may be representative: of how the majority of cetacean species, which are shy around vessels and hence poorly known, would respond to mid-frequency sonar. Even if harbor porpoises were given equal weight with the three species used to calculate B+K, including them in the average would put the average value at 154 dB re 1 µPa instead of 165 dB re 1 µPa.	The data sources these comments present as requiring such consideration involve contexts that are neither applicable to the proposed actions nor the sound exposures resulting from those actions. For instance, the comments' citation to Lasseau et al. involve disturbance to a small pod of dolphins exposed to 8,500 whale-watching opportunities annually. This is nothing like the type or frequency of action that is proposed by the Navy for the HSTT Study Area. Navy training involving the use of active sonar typically occurs in situations where the ships are located miles apart, the sound is intermittent, and the training does not involve surrounding the marine mammals at close proximity. Furthermore, suggestions that affect from acoustic harassment devices and acoustic deterrent devices, which are relatively continuous, high frequency sound sources (unlike mid-frequency active sonar) and are specifically designed to exclude marine mammals from habitat, are also fundamentally different from the use of mid-frequency active sonar. Finally, reactions to airguns used in seismic research or other activities associated with the oil industry are also not applicable to mid-frequency active sonar, since the sound or noise source, its frequency, source level, and manner of use is fundamentally different.
NRDC – 102	14. An important property of the model is that the biologically observed basement value is different than the mathematical basement value. The Navy proposes using 120 dB re 1 µPa as the basement value. They indicate the selection of this value is because it was commonly found in noise exposure studies. 15. For example, many looked at changes in migration routes resulting from noise exposure, and found that 50% of migrating whales changed course to remain outside the 120 dB re 1 µPa contour (Malme et al. 1983, 1984). These results might be interpreted in several ways. They could be seen as minor changes in behavior, resulting in a slight increase in energy expenditure. Under this interpretation, they would not qualify as changes in a significant behavior, and are irrelevant to setting the basement value. They could be interpreted as interfering with migration, even though the whales did not stop and turn around, and hence 120 dB would make an appropriate B+K value rather than B value. Third, the change in course could have been accompanied by a stress response, in which case the received level at which the course change was initiated rather than the highest level received (120 dB re 1 µPa) could be taken as the biological basement value.	These comments are factually inaccurate. The single citation provided for the repeated assertion that 50 percent of marine mammals will react to 120 db re 1uPa is Malme et al. (1983, 1984). Malme et al. (1983, 1984) in fact indicated that for migrating whales, a 50-percent probability of response occurred at 170 dB for a continuous, low frequency sound source that is very different from mid-frequency active sonar. Additionally, based on recent work at the Atlantic Undersea Test and Evaluation Center and SOCAL (Southall et al. 2007 and Tyack et al. 2011), with the exception of beaked whales there is no evidence to suggest the 120 dB basement value is incorrect, and for beaked whales a 140 dB receive level step function criteria was chosen.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
NRDC - 103	See Table 2: Bain Appendix Take numbers are based on Alternative 3 in the Hawaii Range Complex SDEIS (Dept. Navy 2008b), which in turn is based on the No Action Alternative, Table 3.3.1-1. Where the number of takes approaches the size of the population, the actual number of takes will be smaller than shown in the table. However, individuals will be taken multiple times and the duration of takes will be longer than if the calculated number of takes were small. Presumably, longer and more frequent takes of individuals will have more impact on the population than takes due to single exposures. See Table 3: Bain Appendix H Table 3. Sensitivity analysis based on a model with spherical spreading for 2 km followed by cylindrical spreading.	The vast majority of these level B takes are short term behavioral responses to relatively short term activities. The population level impacts are fully discussed in the EIS/OEIS. See Sections 3.0 and 3.4 for the overall discussion, and Sections 3.0.5.7.1 and 3.4.3 for specifics.
Ocean Conservation Research-01 (Written)	Please include the following comments into the record for both the HSTT DEIS and the AFTT DEIS. In preparing, this critique we have had the opportunity to review the comments from our colleagues at the Natural Resources Defense Council (NRDC) to both the HSTT and AFFT DEIS's. We find them thorough, thoughtful, comprehensive, and complete. Rather than overlap their efforts, let it stand that we fully endorse their work on these reviews. We always appreciate the opportunity to review and comment on proposed activities of the US Navy, although we find that the concurrent issuance and simultaneous closure of the public comment period for the Hawaii-Southern California Testing and Training (HSTT) and the Atlantic Fleet Training and Testing (AFTT) DEIS places a significant and we believe unreasonable burden on the resources of those of us who have made it our work to review, comment, and inform the public about how their tax dollars are spent.	The Navy has complied with all NEPA notification requirements under 40 C.F.R. § 1506. NEPA regulations require that agencies not allow less than 45 days for comments on a Draft EIS/OEIS. Please note that public comments are very important to the NEPA process. The Navy included an extra 15 days for review of this document for an extended comment period of 60 days total.
OCR-02	As always we have concerns about the impacts of the proposed activities, and in the case of both of the HSTT and AFTT DEIS we are particularly concerned, given that the estimated take numbers are so extremely high. In reviewing these documents we found that the numbers were high because the drafters of the documents dug deeply into the literature and presented their estimations based on both more thorough as well as more current peer reviewed literature. This is a breath of fresh air from our previous experiences in reviewing US Navy DEIS documents wherein the peer-reviewed papers substantiating the positions in the documents were either outdated, based on questionable premises, and/or the assumptions made about impacts were short-sighted or woefully inadequate. We congratulated this new candor in the HSTT- DEIS to our community on its original release, figuring that the Navy N-45 Environmental Preparedness Group was coming to terms with the fact that mitigating for bad public opinion was more costly than "'doing the right thing." This was particularly in light of the recent US Navy Public Relations sobriquet of "A force for good."	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of the EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy implements practical, effective, and safe mitigations in the context of impacts to the proposed activity.
OCR-03	That being said, upon deeper review of the documents our concerns are redoubled, because while there is more overall candor in the document, the assumptions that	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	destroying so much marine life for the expediency of the perceived Navy mission is completely unacceptable. While it may be arguable in the regulatory setting of the Marine Mammal Protection Act that "Level B" behavioral adaptations to proposed activities would be disruptive but recoverable, there is absolutely no justification for biological damage indicated in a "Level A" harassment. Even short-term "recoverable" assaults such as temporary threshold shift (TTS) are barbaric. Asking the National Marine Fisheries Service or the Marine Mammal Commission to issue "Incidental Harassment Authorizations" or "Take Permits" for "Level A" harassment is the apex of institutional hubris. If someone were to apply to the Department of Health and Human Services for a permit to yell in someone else's ear, or spill spent ordinance in their salad they would be watched cautiously and put on some "security risk list." So why is the US Navy encouraged to apply for permission to damage animals? It is patently unethical to damage an animal unless you are going to eat it, or it is going to eat you.	Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. All mitigation measures are designed to reduce or avoid potential impacts to marine resources, taking into account national security interests, the best available science, and regulatory requirements (including the MMPA and ESA). Additional information on the development of mitigation measures can be found in Section 5.2.2, (Overview of Mitigation Approach). Furthermore, the Navy has invested a significant amount of funding and support for marine mammal research.
OCR-04	We understand the need for a robust military to defend our shores and guard against unlawful international activities on the high seas. We also understand that we do not want to send our military personnel into harm's way without assuring their utmost safety. But the US military- particularly the Navy - is the most powerful fighting force on the planet, unparalleled by even the combined forces of the next eight global military powers - many of which are current allies. Of course it is always the desire for a military force to be "invincible." But invincibility should always be framed in the context of the scale of the threats, in the the costs to society, and increasingly in terms of the cost to our global environment. It should also be weighed in terms of the effectiveness and costs of the alternatives. Because in addition to the hefty costs of over-blown military invincibility, the risk is that it easily becomes a rationale for the military action to become the "action of choice," overshadowing less costly alternatives for conflict resolution such as diplomacy, or social and economic pressures. If there remains the chance that our military personnel will suffer or die in an action, there then remains a high incentive to engage in diplomacy or socio-political actions. If our military can just "pound our perceived threats into oblivion" it will then fall upon our own citizens to attempt to stop the carnage. This is a very ineffective strategy for democratic engagement because we have repeatedly seen that in the heat of perceived conflict the voices of our citizens fade behind the roar of war. I need not point any further than our reckless engagement with Iraq in 2002 based of false assumptions with the huge collateral costs to our economy and the destabilization of global security as an example. While we are not military strategists, nor are we privy to the long-term political objectives of our government, we are as citizens qualified to add our philosophical voice to this discussion. This is particularly in light of the fact that we find the assumptions used to justify the continuous expansion of US Navy warfare training ranges throughout US sovereign waters so egregious, short sighted, and reckless as to almost not warrant any further comment, except to say the since the decommissioning of the US Training Range in Vieques, Puerto Rico, that the	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. The discussion of interaction with commercial fisheries is included in the description of the baseline as an essential component used to inform a complete discussion on the status and threats to species. The Navy activities are compared against this baseline.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	US Nave has been making the entire US Sovereign waters a "Warfare Training Range." The HSTT-DEIS and AFTT-DEIS are further evidence of this relentless expansion and begs philosophical feedback because aside from the scientific candor in estimated take levels, there is an assumption that this is "OK." One of the arguments used in the DEIS to justify the high take levels is the comparison implied throughout the entire "Affected Environment" Sections 3 as well as in the executive summaries that commercial fisheries interactions through entanglements and by-catch exact much higher impacts on marine mammals, fish, invertebrates, and turtles than the proposed military actions as to render the military actions insignificant. This is a hollow argument; while the take numbers may indicate that the military actions are the "lesser of two evils," it does not justify any of the deliberate carnage of marine life by the Navy. The determinations of "acceptable" take numbers are predicated on the assumption that given the various population densities of the subject animals, that an "incidental, but not intentional, taking by citizens while engaging in that activity within that region of small numbers of marine mammals of a species or population stock [is allowed] if the Secretary ... finds that the total of such taking during each five-year (or less) period concerned will have a negligible impact on such species or stock."[3] This regulatory framework defined in the Marine Mammal Protection Act (MMPA) was modified to accommodate "military readiness activity [with] a determination of "least practicable adverse impact on such species or stock."	
OCR-05	This accommodation is not an exemption or release from the MMPA, rather it is an opportunity to evaluate the proposed actions in the context of "personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity."[5] This clause provides for deeper consideration of the environmental costs of the action with the safety and effectiveness of the desired outcomes in mind. It is through this that the US Navy's "Force for Good" could really shine, because the US Navy through its resources and funded studies of ocean physics, chemistry, marine habitat and biology has developed a broad palate to examine the potential impacts of their actions. This is an opportunity that is not being taken the HSTT and AFTT OBIS's. While the evaluations reveal a new candor, the proposed alternatives don't express responsiveness to the estimated impacts. Nor do they reflect anthropogenic impacts that we know about, that are increasingly becoming evident, but are just recently entering into of the literature.	The Alternatives carried forward meet the Navy's purpose and need (see Section 1.4 [Purpose and Need for Proposed Military Readiness Training and Testing Activities]) to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. The Navy complied with NEPA requirements in the development and consideration of alternatives. This EIS/OEIS analyzes the chosen alternatives in Section 2.5.2 (Alternatives Carried Forward) and explains why the Navy has eliminated other alternatives in Section 2.5.1 (Alternatives Eliminated from Further Consideration). The selection of an alternative by the decision-maker will be based on a review of all relevant facts, impact analyses, comments received via the EIS/OEIS public participation process, and the requirements of the Navy in order to fulfill its mission. The EIS/OEIS uses best available science as described in Section 3.0.5 (Overall Approach to Analysis).
OCR-06	For example: while the synergistic and cumulative impacts of human activities are beginning to make way into the Environmental Impact Statement discussions, so far	The Navy used the best available science and a comprehensive review of past, present and reasonably foreseeable actions to develop

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	there is no metric examining the intermediate and long term health effects induced by our ever increasing agonistic activities on marine life. It is quite clear that we are compromising marine habitats through chemical pollution. Animals at the top trophic levels are becoming toxic to the point that a stranded whale or dolphin runs the possibility of being an Environmental Protection Agency-rated "toxic waste site," and food animals once considered 'delectable' are no longer safe for human consumption. A similar concern lies in the impacts of noise pollution. Even when the impacts are not mortal or "permanent" we are inducing noise-related stress on marine animals[6] that most probably compromises their ability to survive and proliferate. Much of this is pointed out in the Sections 3 "Affected Environment" and particularly in the Sections 3.4 Marine Mammal sections where the more recent papers on behavioral impacts of noise exposures are sited. It is clear from the more recent work that behavioral impacts occur at much lower levels and at greater distances than what is used as the threshold for MMPA "Level B" exposure.	a robust Cumulative Impacts analysis (Chapter 4).
OCR-07	It is clear that we are compromising their habitat, increasing stress levels, displacing them from preferred feeding, social, and breeding areas, and compromising their ability to communicate, navigate, proliferate, and ultimately survive by the short-sighted priorities of our military-industrial and commercial economy. In this context we should not be doing a comparative analysis on whether fishing, shipping, or Naval warfare training has a greater impact on marine habitat, rather we need to examine how the additional disruptions further compromise an already stressed environment.	The discussion of general threats to resources is included in the description of the baseline as an essential component used to inform a complete discussion on the status and threats to species. The Navy activities are compared against this baseline.
OCR-08	If more "biological bandwidth" is required to assure our national security and health of our marine food supply, the Navy is in the best place to promote less impactful marine technologies, and enforce regulations that decrease unlawful commercial and industrial impacts on the habitat. Throughout my 20 year experience of reviewing and critiquing US Navy and other agency Draft Environmental Impact Statements I have taken the allotted public comment period to comb through the proposals, examining the assumptions, deconstructing the models, and evaluating the supporting documentation. Typically I have offered comments on the shortcomings, obfuscations, deceptions, and programmatic deceits set into the agencies' responses to their NEPA mandated requirements to explore the environmental impacts of their proposed actions.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of the EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy implements, to the maximum extent practicable, mitigation measures during its training and testing activities.
OCR-09	This case is different, largely due to the comprehensive and thorough examination of the literature in the two DEIS. While I find it annoying that these were let out concurrently I do appreciate the "candor" of the drafts. What I find extremely troubling is that with all of the facts, models, and assumptions presented in the documents that the Navy is not paying heed to what they have concluded: that millions of marine mammals and countless fish and marine invertebrates will be maimed, poisoned, or killed by the proposed actions. They have not considered that over the intermediate to long term the	The HSTT EIS/OEIS analyses and conclusions are based on best available science and do not support your comment. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of the EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation,

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	practices of the US Navy proposed in the HSTT and AFTT DEIS's will contribute significantly to the collapse of marine ecosystems. And they have not conceded that these environmental compromises will have a significantly deeper negative impact on global security. In our review of the HSTT and AFTT DEIS we find profound evidence that the economic and environmental costs are excessive, particularly in a time when both the US economy and the ocean environment are under deep duress. We advise that in both the Hawaii Southern California Training and Testing and the Atlantic Fleet Training and Testing areas that the "No Action" alternative be selected.	and Monitoring) of the EIS/OEIS, the Navy implements, to the maximum extent practicable, mitigation measures during its training and testing activities. Though the intensity of training and testing will increase, the events are of relatively short duration. Based on the analysis of potential impacts and associated mitigation measures, the Navy does not anticipate long-term, population level impacts to marine animals. The Navy used the best available and most applicable science to analyze potential environmental impacts to every resource. The Navy is studying the long-term population effects of sonar as stated in Section 5.5 (Monitoring and Reporting). Additionally, Navy has been conducting these types of training activities for decades and there is no evidence to support this comment.
Save the Whales-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals. Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of the Draft EIS/OEIS. The Navy is proposing to implement several mitigation measures within pre-defined habitat areas in the Study Area. For the purposes of this document, the Navy will refer to these areas as “mitigation areas.” As described throughout this section, these recommended mitigation areas may be based off endangered species critical habitats, endangered species reproductive areas, or bottom features. The size and location of certain habitat areas, such as the critical habitats, is subject to change over time; however, the Navy’s effectiveness and operational assessments and resulting mitigation recommendations are entirely dependent on the mitigation area defined in this document. Therefore, it is important to note that the Navy is recommending implementing mitigation measures only within each area as described in this document. Applying these mitigations to additional or expanded areas could potentially result in an unacceptable impact on readiness. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Save the Whales-02	I understand that for safety & security purposes ship hulls need to be tested for strength. However, believe if we can send men to the moon & can have humans orbit our planet on a space station, we can find a way to test ships without causing harm to the ocean-life we've not yet exterminated. I'm from a NASA town & grew up in a NASA family so I know our government has the know-how. Perhaps funding could be diverted from the testing to find out why monkeys fling their poop. Don't laugh, this is listed as a current legitimate budget expense of our government. We can't keep killing off these amazing creatures in our	The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
Sierra Club (Bigger)-01 (Written)	INTRODUCTION Thank you for the opportunity to comment on this very comprehensive document. We also appreciate the efforts of the Navy to engage the public in review of this document, including the hosting of public open house public meetings at various locations throughout the affected region. We recognize and appreciate the contributions of our armed services personnel, including the U.S. Navy, in providing for the security of our homeland under increasingly complex conditions. That includes the difficult task of seeking to balance the duties of providing such security while also fulfilling their responsibilities as environmental stewards. As citizens of the United States, we value our freedom and security. We also value our relationships with whales, dolphins, sea turtles, sea birds, and other creatures with which we share the Planet. They are more than just "natural resources." Strong, adequate, measures are necessary to avoid or minimize risks the Navy's training and testing activities pose to marine species and their habitats, as they also face increasing stresses in coming years from climate change impacts -- including rises in sea levels, and increases in sea temperatures and ocean acidification-- and from the cumulative impacts of increased uses of coastal waters for wind energy projects, oil and gas exploration, and other human activities.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Sierra Club (Bigger)-02	GENERAL COMMENTS We are quite concerned over the potential toll the planned Testing and Training activities described in this DEIS could exact on marine mammals, sea turtles, other species and their habitats. Unfortunately, we do not consider the mitigation measures described in this DEIS to be sufficiently strong or adequate.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. Through consultation and the permitting process with NMFS and USFWS, the Navy refined the mitigation measures, which are now presented in Chapter 5 of this Final EIS/OEIS.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
Sierra Club (Bigger)-03	In addition to our own study of this document, we have reviewed and endorsed the comments on this DEIS submitted by the National Resources Defense Council (NRDC). We agree with their conclusion that this DEIS must be revised as necessary to comply with NEPA requirements, including development of alternatives that incorporate spatial and temporal mitigation measures. The DEIS shows in considerable detail that either Alternative I and Alternative 2 (the Preferred Alternative) would constitute very large increases in the, scope, scale, and impacts of activities compared to the baseline levels of the No Action Alternative. In particular the DEIS projects large increases in "takes" under the provisions of the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA). Ultimately, the National Marine Fisheries Service will need to establish take limits through authorization letters in compliance with the MMPA and the ESA. As the DEIS notes, NMFS may require additional mitigation measures as conditions for issuing an MMPA (and, presumably, ESA) letter of authorization: "In order to make the findings necessary to issue an MMPA Letter of Authorization, it may be necessary for NMFS to require additional mitigation measures or monitoring beyond those contained in this Draft EIS/OEIS. These could include measures considered, but eliminated in this EIS/OEIS, or as yet undeveloped measures. The public will have an opportunity to provide information to NMFS through the MMPA process, both during the comment period following NMFS' notice of receipt of the application for a letter of authorization, and during the comment period following publication of the proposed rule. NMFS may propose additional mitigation measures or monitoring in the proposed rule." (ES-12) While this quote suggests that NMFS might require more stringent measures than contained in this DEIS, we concur with NRDC that the DEIS itself should identify such measures as alternatives to be considered.	The Alternatives carried forward meet the Navy's purpose and need (see Section 1.4 [Purpose and Need for Proposed Military Readiness Training and Testing Activities]) to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. The Navy complied with NEPA requirements in the development and consideration of alternatives. This EIS/OEIS analyzes all alternatives in Section 2.5.2 (Alternatives Carried Forward) and explains why the Navy has eliminated other alternatives in Section 2.5.1 (Alternatives Eliminated from Further Consideration). The selection of an alternative by the decision-maker will be based on a review of all relevant facts, impact analyses, comments received via the EIS/OEIS public participation process, and the requirements of the Navy in order to fulfill its mission.
Sierra Club (Bigger)-04	2. Inadequacy of Visual Detection as a Mitigation Measure Use of lookouts and other visual detection methods as mitigation measures may be necessary, but are not sufficient in the case of numerous species whose presence is difficult to detect visually. For example, under either Alternative 1 or Alternative 2, the Hawaiian stock of Cuvier' s beaked whale is projected to receive 52,110 Behavioral exposures out of a total of 112,752 for all Hawaiian stock species. This equates to 46%, almost half, of the total. The study area abundance for this species is 15,242, so these impacts are very significant as a percentage of the total population. The Occurrence in the Study Area is described as "Year-round occurrence but difficult to detect due to diving behavior "6 The Dwarf sperm whale accounts for 20,569 out of a total of 30,292 TTS exposures -- 67% of the total. It accounts for 60 out of 63 PTS exposures- 95% of the total. The study area abundance for this species is 17,519, so these impacts are also very significant as a percentage of the total population. It appears that the population, or at least a portion of the population, will be subject to multiple exposures at levels affecting their auditory functions. The Occurrence in the Study Area is described as "Stranding numbers	The Navy acknowledges the limitations of visual shipboard monitoring and uses aerial monitoring and passive acoustic monitoring for multi-faceted monitoring where practical. The EIS/OEIS, Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring), presents the U.S. Navy's mitigation measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events. In general, there are usually more ships and more observers present on Navy ships, and additional aerial assets engaged in exercise events than used during trackline detection during a survey, thereby increasing the potential to detect marine mammals during a Navy activity. Section 3.4.3.1.8.4 (Model Assumptions and Limitations) in the Final EIS/OEIS provides a more robust discussion on marine mammal sightability and the inclusion of implementing mitigation measures to reduce the effects of sound exposures on marine mammals. Section 3.4.3.2 (Analysis of Effects on Marine Mammals) has been revised to account for the Navy's mitigation

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	suggest this species is more common than infrequent sightings during survey (Barlow 2006) indicated." This suggests that even trained scientists seeking to assess population sizes have difficult spotting this species visually. Cuvier's beaked whale and the Dwarf sperm whale are both "cryptic" species difficult to spot" because they are not very active at the surface and do not have a conspicuous blow)."7 It is clear that the use of lookouts or other visual detection methods are not sufficient for the populations most affected by Training activities in the Hawaiian Area Complex. As disturbingly high as these exposures are, they are likely understated since they do not include exposures from Testing or other activities. We have not had sufficient time to perform the required calculations, which require compiling exposure data from two, and possibly more, separate tables scattered throughout the DEIS. Nor should reviewers such as us- or, ultimately, NMFS -- have to perform such additional steps in order to get useful information out of the huge amounts of fragmented data contained in this DEIS. The revised, reissued, version of this DEIS must contain tables showing total impacts per species from all sources as well as ratios of exposures to total population sizes. Such tables would be necessary for determining what levels of take would be acceptable under the MMPA or ESA, and would direct decision makers to the areas requiring additional or more effective mitigation measures.	measures and marine mammal behavioral responses to sound in the water to more accurately reflect the predicted potential effects on marine mammals. In addition, for species-specific take requests permitted under MMPA for activities covered by the HSTT EIS/OEIS, please see the complete Letter of Authorization at the NMFS website: http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications
Sierra Club (Bigger)-05	3. Concerns over impacts to Gray whale populations in SOCAL The DEIS shows high estimated exposures for the Gray whale population, including considerable instances of PTT relative to the population size. As stated in the DEIS, the "Population migrates through SOCAL, with the occurrence in SOCAL described as "Transient during seasonal migrations. "8 According to the DEIS, the Gray whale population is estimated at I 8,813. Combined Training and Testing exposures under the No Action Alternative are estimated to be 1,077 Behavioral, 1,401 ITS, and 0 PTS. Those impacts relative to the population size are 6%, 7%, and 0% respectively. Combined Training and Testing exposures under Alternative 1, are 3,816 Behavioral 7,358 TTS, and 25 PTS. Those impacts relative to the population size are 21%, 39%, and 0.1% respectively. The increases relative to the No Action Alternative are 359% for Behavioral and 525% for ITS. Combined Training and Testing exposures under Alternative 2, are 3,911 Behavioral 7,645 TTS, and 25 PTS. Those impacts relative to the population size are 21%, 41%, and 0.1% respectively. The increases relative to the No Action Alternative are 363% for Behavioral and 546% for TTS. Clearly, use of a temporal closure for at least key portions of the SOCAL area appears warranted for reduction of impacts to the Gray whale population transiting the SOCAL.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Sierra Club National Marine Action	Aloha, my name is Dave Raney, and I am Team Leader of the Sierra Club's National Marine Action Team. The Sierra Club is soliciting comments from our affected Chapters and will submit written comments on this DEIS, and the Atlantic Fleet Training and	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
Team-01 (Written)	Testing DEIS. This evening I will make a few preliminary comments. First, we recognize and appreciate the contributions of our armed services personnel, including the U.S. Navy, in providing for the security of our homeland under increasingly complex conditions. That includes the difficult task of seeking to balance the duties of providing such security while also fulfilling their responsibilities as environmental stewards. We value our freedom and security. As Pacific Islanders in particular, we also value our relationships with whales, dolphins, sea turtles, sea birds, and other creatures with which we share the Planet. They are more than just "natural resources" and we ask your help in protecting them from risks your training and testing activities may pose, as they also face increasing stresses in coming years from climate change impacts -- including rises in sea levels, and increases in sea temperatures and ocean acidification. You have invited our help in improving this DEIS. Here are two suggestions: 1. Use coastal and marine spatial planning tools, as promoted by the National Ocean Policy, to address the conflicts this DEIS attempts to address. NOAA and the Navy have a broad array of applicable tools, including a geographic information system data base showing the densities of marine mammal and sea turtle species found in specific areas. Avoiding areas of high population densities through the use of spatial planning, or zones, such as the National Marine Fisheries service proposed monk seal critical habitat, would be much more effective than the heavy reliance the DEIS currently places on the use of lookouts and limited area mitigation zones.	(Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.3 (Simulated Training and Testing) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments." Coastal and marine spatial planning is a tool under development by the National Ocean Council (NCO) which includes all federal agencies and is co-chaired by the CEQ Chair and Director of Office, Science, Technology and Policy. CMSP is a team effort by the NOC and its staff in coordination with all the NOC members. Navy continues working with the NOC Staff and other members to implement the National Ocean Policy in accordance with Executive Order 13547. Additional information on the status of the National Ocean Policy can be obtained at http://www.whitehouse.gov/administration/eop/oceans/policy. The DoD has been and will continue to be actively involved in the National Ocean Policy process. The mitigation measures listed in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS are the result of the consultation with NMFS and USFWS. The Navy proposes to implement both area-specific mitigations and activity-specific mitigations. For a discussion of area-specific mitigations, please see Section 5.3.3 (Mitigation Areas) of the Draft and Final EIS/OEIS. To supplement the Navy's proposed Mitigation Areas, activity-specific procedural mitigation measures (see Section 5.3.1, Lookout Procedural Measures and Section 5.3.2,

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		Mitigation Zone Procedural Measures) will apply year round at each activity location. The balance between Procedural Measures and Mitigation Area measures provide a way for the Navy to mitigate potential impacts while maintaining its military readiness objectives. Refer to Chapter 4 (Cumulative Impacts) for a discussion of the additive effects of all projects in the Study Area.
Sierra Club National Marine Action Team-02	2. Abandon the SINKEX program of sinking obsolete ships in our waters. We note that each of the three alternatives includes the possible sinking of up to six ship hulks in the Hawai'i Range Complex through use of the SINKEX project. We urge the Navy to abandon the wasteful and environmentally threatening practice of sinking ships that still contain remnant amounts of PCBs even after meeting what we consider to be inadequate cleanup standards required by the EPA. This DEIS rules out several potential mitigation measures because they would make a training practice "unrealistic." The use of SINKEX involves sinking a large, unarmed, stationary vessel incapable of attempting evasive maneuvers or employing electronic countermeasures. This fails the requirement for realism, just as shooting a grazing cow would not adequately prepare one for duck hunting. SINKEX has provided a small percentage of trainees the experience of watching live weapons send very large ships to the bottom of the ocean. That experience passes with time, while the ship that was sunk permanently joins what has become the underwater equivalent of an elephant's graveyard on our seabed. There are more than a dozen such ships sunk within the Hawai'i Range Complex, most of them due north of the island of Kaua'i. Surely this is not an acceptable environmental legacy for the Navy, and we urge that you abandon the use of SINKEX from this time forward.	The SINKEX is an essential component of the suite of training activities to ensure that Sailors and Marines are ready to deploy in real world operations. The Navy must comply with the Office of the Chief of Naval Operations (OPNAV) Instruction 1541.5, which limits SINKEXs to those required to satisfy specific requirements for ship survivability or weapons lethality evaluation (required by Title 10, Section 2366 for major system or munitions programs), major joint or multi-national exercises, or the evaluation of new multi-unit tactics or tactics and weapons combination. Environmental preparation of SINKEX vessels is in accordance with EPA permits and additional guidance. As stated in Section 1.4.2 (Fleet Readiness Training Plan), the Fleet Readiness Training Plan outlines the training activities required for military readiness that prepares Navy personnel for any conflict or operation. The Navy's building-block approach to training is cyclical and qualifies its personnel to perform their assigned missions. The value of a SINKEX goes beyond engaging a maneuvering target and the lessons learned are passed to other members of the fleet.
Sirius Institute and Planet Puna (Oral)	Okay. Well, thank you for letting me speak here. I hope my input can have some value. Star Newland and I, through the Sirius Institute and Planet Puna, have been studying mostly the effects of birth and general birth and water birth on the constitution of humans. And one of the major experts in underwater birth and birth in general is a French medical doctor named Dr. Michel Odent. And he points out that nearly all cultures have messed around with the birth imprint or the birthing process. For example, some cultures will express the mother's colostrum and throw it away to make sure that the baby never has it in spite of the fact it's the most helpful thing it could get right at birth. Other cultures would put sand, salt, bread, sugar, rice, anything other than milk as the first taste for an infant. So we have planet-wide messed up the process of birth. Recently -- well, not recently but over the last decades, they've been using more and more synthetic Oxytocin, Pitocin, and it's causing great fetal distress, but it also messes up the bonding and the suckling between the mother and infant. So we are rapidly losing the ability to give birth properly. The punchline of this is when you do this to an infant, since the type of life they have is dependent on their birth imprint, you end up -- if you interfere with birth in a major way like we've been doing, you end up with people that have missed connecting with their mothers, with the Earth, and they are great warriors,	Thank you for participating in the NEPA process.

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
	and they are traumatized. They're enraged, and they're ready to kill at some point because we have messed up their birth imprint. So we have fallen into this, and that might be one of the major reasons why we have such a warlike planet. So fortunately the Navy has agreed to partner with Star Newland and the Sirius Institute for domestic harmony, and so we're here to talk to them about that. And we hope that the Navy can start this process that one could imagine, for example, Navy wives giving birth in the water with the service dolphins that the Navy already has. One can imagine the service dolphins helping the returning veterans with their traumas and post-traumatic stress disorders and so on. And this could lead to a much more harmonious planet, which is consonant with the Navy goals right now, that they will pursue humanitarian efforts to avoid or reduce conflict before they will choose to attack and to do other things like that. So we're very proud that the Navy wants to do that, and we're hoping they'll continue, and we're here to help in any way to reverse this trend on the planet. Thanks.	
Surfrider Foundation (Labedz) (Oral)	Hi, I'm Gordon LaBedz. I'm here representing The Surfrider Foundation, and you're taking notes. In 2006 the Surfrider Foundation, the Kauai Chapter, sued the Navy over RIMPAC. And the law that we used with NEPA, National Environmental Protection Act, and the judge agreed with us that RIMPAC needed an environmental impact statement. And the Navy appealed, and the appeal judge agreed with us, too. And our view towards this EIS is that this does not work. A blanket, We want to do whatever we want to do for the next five years as far as testing and training in one booklet, is just not in the spirit of the National Environmental Protection Act that each bad thing that the Navy does needs to be looked at separately. And a blanket umbrella EIS it appears to us is illegal. And that's the most important thing that needs to be commented on this draft EIS, and we are talking to our attorneys. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of the EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. The EIS/OEIS is prepared by the Department of the Navy in compliance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality, the Department of the Navy procedures for implementing NEPA, and Executive Order 12114 (Environmental Effects Abroad of Major Department of Defense Actions). The selection of an alternative by the decision-maker will be based on a review of all relevant facts, impact analyses, comments received via the EIS/OEIS public participation process, and the requirements of the Navy in order to fulfill its mission.
Surfrider Foundation (Sardez) (Written)	The weakest part of the document is the 'justification" for the NOAA Marine Fisheries "take" permit to harm and kill endangered marine mammals. There is simply no science whatsoever to justify the numbers. Killing endangered species, arguably, is one of the worst things the Navy does besides burning fuel and polluting the ocean and yet there is no justification, nor science for NOAA to make any educated decision. Years ago, the Navy would not hire consultants and did whatever they want. Now they hire consultants and continue the same destructive behavior without mitigations.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have

Table E.3-3: Responses to Comments from Organizations (continued)

Commenter	Comment	Navy Response
		been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4 contains comments from private individuals received during the public comment period and the Navy's response. Responses to these comments were prepared and reviewed for scientific and technical accuracy and completeness. Comments appear as they were submitted and have not been altered with the exception that expletives, addresses, and phone numbers have been removed, as necessary.

Table E.3-4: Responses to Comments from Private Individuals

Commenter	Comment	Navy Response
Anonymous (Hilo-Written)	Remove outline around the monument as the way it is currently represented it appears that the Navy does not conduct training activities within that area which is not true.	Thank you for your comment. The Navy agrees that this outline has created confusion. The figures depicting the Study Area have been revised in the Final EIS/OEIS to remove this outline. One exception is Figure 6.1-2, in which the point of the figure is to identify the monument.
Anonymous (Hilo-Written)	There have been consistent and significant long-term studies which show conclusive evidence that acoustic disturbances result in brain hemmrage, internal injury, breaking of resonance chambers, rapid ascent from dives, etc. in many critically endangered cetaceans. From speaking with officials tonight, my only impression of the EIS is its impossible to quantify the real impact in these pelagic species despite the fact the Navy "isn't seeing many problems." Although these trainings serve a benefit to National Defense their location, timing, and true impact must be more closely examined.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from acoustic sources were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Abrahams (Electronic)	Dear Dept. Of the Navy, I am writing to ask you to please not use high frequency sonar in our oceans. The damage it does to marine animals is horribly inhumane. While I do understand the need to test, continuing with the high frequency soar testing makes our nation to bad to the rest of the world. We need to find a more humane way to do testing. Thank you, Leslie Abrahams	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Actipis (Electronic)	I'm extremely concerned about the impact this might have on sea creatures. I think we can protect national security AND endangered marine animals. Please consider the steps recommended by the Humane Society of the US and other groups: * avoiding the most harmful activities in areas used as calving grounds or migratory corridors * avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; * using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. Through consultation and permitting with NMFS and USFWS, the Navy refined the mitigation measures, which are now presented in Chapter 5 of this Final EIS/OEIS.
Adams (Electronic)	Please protect all of the marine mammals from explosives and sonar along the East Coast» and California/Hawaii».	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Agnello (Electronic)	I am completely against this useless display of disregard to wildlife. I think you can see how many people are against it, so please go back to square one and think of another way to do this without harming innocent creatures. Please,please, please don't do this – these creatures can't speak for themselves!	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Ahern (Electronic)	Please reconsider your plans for training exercises that will harm, maim or kill dolphins, whales and other marine life off the coasts of California and Hawaii.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Akaka (Oral-Hilo)	That's fine. 'Ano 'ai ke aloha. My name is Moanikeala Akaka. I'm with the Aloha Aina Education Center. I really didn't have any prepared statement. However, over 20 years	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	ago, the first suit that was done related to the sonar and the whales came from Hilo, came from this island, and so this has been going on for a number of years, maybe 15, 20 years. And, you know, I see that we keep going 'round and 'round about this whole issue related to, you know, the sonar. You know, it's not just the fact that it's not known the kind of damage that the sonar can do to our mammals and our sea life and the whales, the turtles, the dolphins. You have beachings that have happened, that have happened in areas where there has been sonar trials going on, and there is a great deal of concern. You know, these creatures have inhabited these oceans for millions of years, and yet we end up intruding on their territory, and with the sonar you end up hurting them. There's a situation where whales, when they're in the vicinity, they end up going up fast and end up getting the bends. There's a great deal of concern, but the U.S. Navy doesn't seem to be concerned about these creatures that there aren't very many of them left. There are only, you know, two countries in the world that -- you know, and that is shameful -- that even hunt whales. You know, there's a great deal of concern about the more and more military industrial complex that's evolving in our islands. You know, bad enough that we have areas left over from the Second World War, say in Waikoloa, where they say it will take -- at $10 million a year, it will take 60 years to remove the munitions that they have left over at Waikoloa. It will take 60 years at $10 million a year to remove these munitions. We have over in Oahu, even off this coastline, munitions that have been dumped since the Second World War. You know, the U.S. Military seems to have no regard for the trash, the lethal, toxic trash. Even on our shores we have munitions that float up on one of our only white sand beaches, Hapuna Beach, and, you know, there seems to be no concern. Over in Waianae, you have debris, military debris that's still there, leaking probably, leaking into the ocean, getting into the fish life, and then we eat the fish. You know, it's -- you know, we're sick and tired of being the dumping ground for America's military industrial complex. They don't want you in Japan. They don't want you in Guam. In Okinawa they say the Osprey helicopters are too dangerous. You know, the U.S. Military -- whether it be the Navy, the Army, or the Marines, keep dumping on these islands. And we're sick and tired of this kind of abuse. Mahalo.	Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Alalem (Oral-Kauai)	Aloha, my name is James Alalem. Under the International Laws of Occupation, more particularly Article 43 of the 1907 Hague Convention, The occupying government must establish a system of direct administration of the laws of the country that it's occupying. In other words, the United States government is an illegally occupying government in the Hawaiian Islands since its unprovoked intrusions by the troops on August 13, 1898, was mandated to administer the Hawaiian Kingdom Law over the territory and not its own until they withdraw. This is not a mere descriptive assumption by the occupying government, but rather it's the law of occupation. Under the International Laws of Occupation a title of sovereignty of occupied territory does not pass to the occupying powers. And if that occupying territory to be a neutral, the occupying powers is limited by	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	the laws of war. In other words, we are military occupied from 1893. It was never solved. So with that I leave it to you guys to know that we want back our country that you guys stole from us. Thank you.	
Alalem (Written-Kauai)	U.S. violates international law. You should be ashamed of yourself. Ignoring the Kingdom of Hawaii. The people and culture you help destroy! What more do you want? You don't need to put on a show, do you think we are that dumb and stupid? Hawaiian Kingdom is military occupation. You going to do what you want anyway.	Thank you for participating in the NEPA process.
Albertini (Oral-Hilo)	This is a fraud. The greatest invasive species that I know of in Hawaii is the United States military. MS. AKAKA: Hear, hear. MR. ALBERTINI: And the history of Hawaii was the U.S. Navy was directly involved in the overthrow of Hawaii in 1893 on behalf of corporate interest, which was sugar then. And today the U.S. Navy and its Navy SEALs and special operations teams are involved on behalf of corporate interest today, overthrowing governments all around the world on behalf of oil interests and others. So the whole idea of the U.S. Navy protecting the environment is a fraud just like the whole sense of defending democracy, freedom and democracy. It's a fraud. And it's time we really take you to account on this kind of thing. You're the greatest polluter on the face of the Earth, the U.S. Military, and in Hawaii that's the case. Pearl Harbor alone, what is it? Seven hundred and some odd sites are polluted sites in Pearl Harbor. It used to be the fish-breeding capital of the world. Today it's a polluted cesspool from the U.S. Military, including nuclear waste from the submarines at Pearl Harbor. The Navy Sea Systems Command used to put out the data, and I remember doing the research. There were five million gallons discharged as of 1973, and when we started publicizing that, they started withholding the data. The U.S. Navy continues to bomb at Pohakuloa along with all the other military branches, and it's a contaminated area with depleted uranium and other things up there. So stop the fraud on us. Stop dividing the community by this type of thing, and I would say I agree with the Grim Reaper. It's time for the Navy to go. AUDIENCE MEMBER: Time for the Navy to go. AUDIENCE MEMBER: Thank you, Jim Albertini.	Thank you for participating in the NEPA process.
Allen-01 (Electronic)	I just want to comment, without bias, but a clear and present sense of urgency, that the sounding tests that will be carried out to better map the seafloor and subterranean channels, will most likely and at a high degree of probability, be in the same locations, where many of the high order mammals will be hunting and eating, spawning, etcetera. My hope is that the US Naval operations, especially the pacific and southern California fleet will form a partnership with independent, unbiased sources, regarding the survival, of an already heavily impacted irradiated undersea environment, logic should prevail, the link to the story below cites the effects of new high pulse sounding gear and the dolphin deaths speak for themselves.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Allen-02	Timing is everything, let us not ignore the extreme stress that the entire ocean food chain is under right now, the events at fukushima have yet to be measured in such a wide scale, but I think further stressing an already battered food chain, is going to be the nail in the coffin, so to speak, for the majority of sensitive mammals. If not killing them, it will destroy their sense of direction, I urge the highest caution in this matter, if we start to see dolphins washing ashore in California right after the sounding tests, we will know who to point the finger at, just like in Peru. I only hope for the highest transparency and for the Navy to bring in the consultation of unbiased marine protection agencies to assess ways in which the Navy can have the least environmental impact. Thank you, sincerely Nathan Allen http://inhabitat.com/615-dead-dolphins-discovered-on-peruvian-coast-oil-exploration-thought-to-be-responsible/615-dead-dolphins-found-along-peruvian-coast-ocra-peru-2/	The Navy used the best available science and a comprehensive review of past, present and reasonably foreseeable actions to develop a robust Cumulative Impacts analysis. See Chapter 4 of the EIS/OEIS.
Almy (Electronic)	Dear Sir or Madam: I write out of concern about the effects of SONAR on marine mammals. Please avoid causing death or interfering with these animals' biologically important behaviors by changing the timing and/or location of these activities. By avoiding areas of high use and high importance to these animals, and by employing technologies such as acoustic monitoring to detect marine mammals' presence, the Navy could proceed with its operations without causing undue harm to these species. Sincerely yours, Jessica Almy	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Alward (Electronic)	It saddens me beyond belief to think of how horrific a death the sea mammals must endure under the sonar and explosive noise. Please minimize the collateral damage to these vulnerable creatures. No sea creatures, no seas, and without seas, we will no longer survive. This is the first generation of people who can legitimately worry if their children's children will have a future on this planet.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ames-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ames-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. Through consultation and permitting with NMFS and USFWS, the Navy refined the mitigation measures, which are now presented in Chapter 5 of this Final EIS/OEIS.
Amornkul-01 (Electronic)	Dear US Navy, As a former Hawaii resident, I have seen what happens with well-intentioned military testing off pristine coastal shores in Kauai and Kahoolawe. I grew up in Maryland, and I now live in California. As a Buddhist physician who has worked and lived all over the world doing International HIV prevention in Africa and polio eradication in Nepal/India, I plead that this proposal be reconsidered. All beings on this earth are inter-related, and if we damage/harm another, we hurt ourselves. Humans, with our highly evolved brains, have the responsibility of foresite and thinking through the global consequences (not just financial or political) and repercussions of our actions and decisions.	Thank you for participating in the NEPA process.
Amornkul-02	Please reconsider the initiative. Please consider E-138dditional steps to reduce the harmful impact to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Please re-think the plans and incorporate additional protective measures to preserve the marine biodiversity – particularly in Hawaii where 80% of the US’s endemic biodiversity is found. Thank you for your consideration. P.N. Amornkul, MD, MPH	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. As described in Chapter 5 (Standard Operating Procedures,

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Mitigation, and Monitoring) of the EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. Through consultation and permitting with NMFS and USFWS, the Navy refined the mitigation measures, which are now presented in Chapter 5 of this Final EIS/OEIS.
D. Anderson (Oral-Oahu)	My name is Diane Anderson. Do you want my address? I live on the North Shore of Oahu, and I arrived here today with my mind pretty much already set up with really, really concerns about where our species, our human species is going to draw the line to impact the marine world, mammals in particular. And I just find that it just seems in our world escalating and escalating and escalating, and I believe our human species can do better, much better. So I do not support active -- when I read the numbers of the impact that the Navy is predicting, I am horrified, just horrified. That's not very much to say, except for that I'm here in person to say it. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
R. Anderson (Written)	I think the public would welcome a situation in which truly independent observers could be placed upon the Navy ships during the most critical times. They would not be government employees or scientists on the Navy payroll. They would be highly qualified experts from independent university marine programs and from credible environmental organizations. The arguments I have heard against this are need for security clearances and lack of bunk space or various inconveniences. However I think this is doable if the Navy would agree to it.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Please see Section 5.3.4.1.15 (Conducting Visual Observations Using Third-Party Observers) for a complete discussion of the viability of independent observers.
Anderson-Pomeroy (Electronic)	I live in the San Juan islands off the coast of Washington state. The lives of Orcas, Minkes, Gray and Humpback whales are intertwined with the lives of the islanders economically, educationally, and spiritually. As a proud daughter of a retired Navy Chief, I understand and respect the Navy's need to conduct various exercices to protect our country. But I also have the utmost confidence in the Navy's ability to develop technologies that protect the marine life that our citizens depend on. Those that serve show everyday their excellent capabilities to take the long view, to do what's right especially if it is difficult. The exercises currently conducted by the Navy cause horrible pain and suffering in intelligent species. The death of L112, the female Orca, was definitely caused by those exercises. I know the Navy does not want to harm these creatures intentionally. Please show those whom you serve and protect that you intend	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	to work toward a humane solution. Thank you.	
Anthony-01 (Electronic)	I would like to comment on the testing that will completely change the course of mother nature and this earth. We are inseparably tied to every animal in the ocean. We need them thriving and healthy with how much we already do to hurt them. As the Navy please do the admiral thing and stop any testing that will hurt our fellow mammals. It is not worth it in The end. Who knows if the funding for your testing will even be worth the consequence in the future. Do not mess with life!	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Anthony-02 (Electronic)	Read below	Thank you for participating in the NEPA process.
Archibald (Electronic)	Stop the killing of 1,800 whales and dolphins and the deafening of 15,900 more by ceasing the operation of the Navy's underwater sound system in the Hawaiian Islands, the California and Atlantic Coasts, and the Gulf of Mexico.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Argentierti (Electronic)	To Whom it may concern, There is much we don't know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return because of education and protection. We have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing. Please consider the voice of the public..we wish to support all that you do. We appreciate your dedication to our safety. Most sincerely, Lynne Argentieri	Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Arias (Electronic)	Please consider that there is no rewind button on your testing equipment -- once the damage is done, there is no going back. If you seriously want to develop these weapons in order to protect the people of this country and its allies, then you might want to think about what it means for our children and their children to live in a world damaged beyond repair by people with all the right intentions but none of the real courage to protect all of its creatures. Please do the right thing -- even though it won't make billions of dollars for some companies who invest their money but none of their own lives...	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Arita (Electronic)	The U.S. Navy is completely inconsiderate and asinine. They should know that we have already had several important sea animals die from the oil spill and more etc. Now they wanna do super explosions with what little life is even [expletive deleted] left in the ocean? I hate our army. I hate the people who don't give a damn about any other living creatures we SHARE this planet with. If I was in charge, i'd make my own prison to put idiots like that, away for life. This is another reason why i hate the american army. Got damn rednecks controlling everything, little rich kids don't know [expletive deleted].	The Navy used the best available science and a comprehensive review of past, present and reasonably foreseeable actions to develop a robust Cumulative Impacts analysis. See Chapter 4 of the EIS/OEIS. Thank you for participating in the NEPA process.
Arkin (Electronic)	Please consider protecting. ALL living creatures, not just the human race. Please do not conduct these tests as the cost to sealife is too high. We are all God's creatures.	Thank you for participating in the NEPA process.
Armao (Electronic)	if navy sonar is harming dolphins whales and other marine mammals then someone is not doing their job. it is not good enough to develop sonar that detects enemies if you are then killing life in the oceans. this is a nightmare and sonar should not be tested and used if that is the end result. theses animals live in the seas it's not like they can go	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	somewhere else. the navy and sonar developers must take responsibiliy for this. there will be nothing left to protect and keep safe if we extinguish life in the name of security. i for one would rather be less safe and keep the dolphins and whales around and healthy.	Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Arms (Electronic)	How can we call ourselves a civilized nation when we are killing animals- not for the needs of our people? This is completely irresponsible behavior of the government. Keeping the planet ALIVE should be the main goal.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Asam (Written)	Opposed	Thank you for participating in the NEPA process.
Ashkenazy (Oral-Kauai)	First, I'd like to thank you for being here. I'm really glad that you're visiting all the Hawaiian Islands to get public input, and I'm very happy to you know that you go to San Diego as well. But I don't think this is enough. I think that the entire Pacific Coast needs to be covered because people in California, Oregon, and Washington, they all need to give their input into this very urgent situation. And I'd also like to say that really an EIS wouldn't be necessary if it were not for this endless push of weapons testing, weapons production for endless wars. This is pure insanity. In fact, this is not for the defense of the country. This is for the benefit of the war contractors; Raytheon, General Electric, Lockheed Martin to name a few. This is so wrong. These people are making huge profits with war. Now, I remember, Commander, I saw you in the newspaper where Raikaohi (ph) was blessing you and telling everyone that a balance had to be struck between culture and the military. Well, let me tell you about the balance. I have a relative at Jeju Island in South Korea, and she is seeing the results of the testing of the Aegis missile that has gone on here. And I'm going to read you some of the things that she wrote me. She said, Well, the testing of the Aegis missile is resulting in an Aegis missile base forcibly shoved down the throats of the brave people of Jeju as if the U.S. Military doesn't already have enough bases in Korea. Remember, we have a thousands bases worldwide. Why do we need another base on this beautiful island? I mean, I find it amazing that the military always picks the most beautiful places to set up housekeeping.	Because of the footprint of the proposed activities, the Navy feels the public meeting locations are appropriate for this project. In addition to the meeting venues, the public can download and review the document, and make comments to it, on the website, which is available throughout the world.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	But anyway, as I said, it's about money and the rape of people to get it. Shame on anyone supporting PMRF which cannot possibly justify the jobs that it provides for the people of Kauai. The money which supports PMRF could provide so many more jobs, many more jobs for a peaceful economy such as education, health, environmental progress, alternative energy, housing, public welfare, and the list goes on. Shame, shame, shame.	
Atack-01 (Electronic)	How can you sleep at night knowing you're contributing to the death of our oceans? You do realize that no matter where on the planet you live, when the ocean dies, we all die.	Thank you for participating in the NEPA process.
Atack-02	In the year 2012 how can you think this is ok? How can you put at risk so many creatures of the ocean? Not only cetaceans will be affected by this, but you are going to disrupt the entire balance of the ocean! Our planet cannot exist on any level without our ocean. I beg you to stop this!	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Atkins-01 (Electronic)	It is known that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. I ask the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Please re-think plans and incorporate additional protective measures.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Atkins	It is known that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. I ask the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Please re-think plans and incorporate additional protective measures.	Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Attwell (Electronic)	If you must do this kind of testing, please implement additional protective measures to minimize harm to our precious sea creatures. No amount of national defense is worth the harm, suffering, and destruction it causes to these creatures. Our own future depends on the health of our oceans. Protect our ocean life, and you protect us. This too must be part of the mission of the U.S. Navy.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. Through consultation and permitting with NMFS and USFWS, the Navy refined the mitigation measures, which are now presented in Chapter 5 of this Final EIS/OEIS.
Atwood (Electronic)	Navy: " Sonar, Blasts Way Harmful Than We Thought" "1.6K WHALES, DOLPHINS COULD FACE INJURY, HEARING LOSS IN YEAR (NEWSER) – The Navy's use of sonar and explosives could deal damage to some 1,600 marine mammals near California and Hawaii every year—a figure far higher than once believed. The whales and dolphins are at risk of hearing loss and other injuries, the AP reports. What's more, the explosives could accidentally kill up to 200 animals. An earlier study assessing the risk between 2009 and 2013 predicted that just 100 creatures could be hurt or killed. The new research is part of an environmental impact statement that considers the Navy's plans between 2014 and 2019." You know it's not only harmful, but deadly. This quote was from the US Navy, posted 5/11/12. So, why would you continue to do this? Are you here to protect lives or destroy them? I am a constituent, and a tax paying US citizen, and I do NOT want my hard earned tax $ going to the destruction of such precious species. Thank you for your consideration to protect, rather than harm and destroy. Sincerely, Shelly Atwood, MD	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Augustine (Electronic)	As a citizen of the United States I strongly, strongly object to the Navy's plan to conduct high-intensity sonar testing anywhere near marine mammals. I do not want you to protect me at the expense of killing wildlife that we are all responsible for and which I cherish. Such testing has been documented in the past to cause significant loss of marine life and cause thousands others to become deaf. The environmental impacts of your actions are simply too great. Please stop and desist.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Aum (Electronic)	I hereby state my objection to any sonar testing that would damage whales, dolphins or any other sea creature sensitive to such testing. Please DO NOT DO THIS!!! Is there another way to test without harming the environment and the sea life? Is there another location? Please listen to the collective voice of the conscience, of the public, our future and common sense of not destroying species that could become endangered. Thank you	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Austin (Electronic)	It is my understanding that the sound tests the Navy is considering can be very harmful to marine animals. The Navy is full of so many smart and innovative people my hope is that there is another way to conduct research and development. I know sacrifices must sometimes be made for security, but I fear this action is premature since there should be other alternatives available. Thank you for considering my comment. Karina Austin	Sonar is the best means of locating small objects in the water. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Avery (Electronic)	Please stop killing off whales. This world is rough enough and we need them, the oceans need them. Find a better way!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
M. Avila (Electronic)	As a resident of Hawaii, I can think of no greater responsibility than to be stewards of our great life giving ocean. I must plead with the Government and Naval forces: PLEASE! For the sake of ALL sea creatures, reconsider and change the plans you have for testing in our oceans; in Hawaiian and Californian Pacific waters and Atlantic waters as well.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
P. Avila	We are saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. We look forward to hearing from you with your views on the above, if you have any queries please do not hesitate to contact us, yours, Paula	[Use whatever AFTT settles on for their comment #217. Find the other 20+ comments in HSTT using the phrase "There is also the issue of sound channels in the ocean…" and apply this response to those as well. I think we are keeping the response sentence that says we're not hurting anything, but add that that applies to stocks and populations.]
Ayers-bell (Electronic)	This is in regard to the Navy plans to do practice in the oceans near California and Hawaii using live explosives and high intensity sonar, that will cause extensive and potentially harmful and possibly deadly effects on marine life in those areas. I understand the need for practice, but there must be some way to eliminate or reduce the amount of damage to the unsuspecting wildlife, to make dry runs or some other option. Please reconsider the damage to the already compromised creatures of the oceans. Thank you!	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. The Navy used the best available science and a comprehensive review of past, present and reasonably foreseeable actions to develop a robust Cumulative Impacts analysis. See Chapter 4 of the EIS/OEIS.
Backinoff (Written)	I am very concerned about the impact of sound and weapon testing on marine mammals and other sea life as well as humans. In the research I have done, I have seen documentation that some of the experts that claim that whales and dolphins are safe in relation to sonar testing are working under government grants in so they are biased by their funding sources. I am strongly for decreasing military expenditures and reallocating those funds to programs that will improve conditions for peaceful communication. Most people just want a safe home with food to eat and that is much less expensive then high tech weaponry and protective equipment.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding bias in the Navy's analysis, in conducting the analysis of impacts to marine mammals, the Navy uses hundreds of peer-reviewed scientific research studies.
Baker (Electronic)	This project, that will adversely affect the hearing of whales and dolphins, is unconscionable. Please think of another way to accomplish what you want to do to map the seas. There is no need to sacrifice precious marine life. Your present plans are not acceptable. Please reconsider the consequences of your actions now before it's too late. Thank you!	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Balagan	Opposed	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
(Written)		
Baldwin (Electronic)	We are the most powerful nation in the world. We should be able to run tests in a manner that does NOT harm marine life...you need to find another way to do this. It's not ok...and our military has more compassion than that!!!	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Ballou (Electronic)	Please balance all needs when making your decisions. Marine Life can not comment.	Thank you for participating in the NEPA process.
Bambrough (Electronic)	Please don't proceed with the testing that will injure whales and dolphins! They don't have voices to speak out against this kind of testing....so i pray that my voice might help make a difference for their survival. Marine mammals are amazing and endangered too much already. Please consider the welfare of all animals and choose another way that won't cause marine mammals their lives. Sincerely, stephanie bambrough	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Baratta (Electronic)	Dear Navy Staff, I recently became aware of your plans for sonar exercises on both the east and west coasts that will have significant negative health impacts on marine mammals. I implore you to reconsider these plans and avoid the most harmful activities in marine areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. I am well aware that Navy leadership has taken forward-thinking steps to reduce military impact on the atmosphere and increase energy security and I hope you will consider aggressive protection steps in minimizing harm to marine mammal populations, some of which are endangered. Thank you very much for your	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	consideration.	significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Barker (Electronic)	Dear sirs, Thank you for providing this method to comment on the underwater sonar program. I support the United States military and the United States Navy as the daughter of a former Air Force enlistee, a friend to several enlisted men and officers in various branches of the service, and a resident of a Coast Guard town. I have volunteered for various causes that support our military and their families. I support having a ready military that is well trained. All this said, I oppose the sonar program as there are still scientists and environmentalists who argue that sonar can disrupt whale feeding patterns, and in extreme cases can kill whales by causing them to beach themselves. I understands that scientists don't fully understand how sonar affects whales, but implore you to consider delaying this program while more scientific study is conducted. While you will encounter many individuals and comments that are inflammatory, reason and unbiased scientific study are the only true methods to discerning the correct path. Respectfully yours, Katie Barker	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
D. Barlow (Electronic)	Whales are some of the oldest, most intelligent creatures alive on earth. Only about a century ago, they were hunted nearly to extinction, and many populations are just now making a comeback while other populations struggle to do so. However, just as these whale populations are beginning to recover from the previous harm caused by humans, the Navy threatens to harm or kill thousands more through their sound testing. Whales us sound for navigation, communication, feeding, and for the selection of a mate. The frequency and intensity of the sound deployed by the Navy deafens the whales. Without the use of sound, whales are unable to survive, and a deaf whale is a dead whale. Whales are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. I have personally seen the pain and suffering that whales are capable of experiencing through encounters I have had with humpback whales entangled in nets. The Navy is fully aware of the harm and damage that they will be causing. They have calculated the estimated number of deaths, and I know the amount of suffering that the whales will endure. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing. Sincerely, Dawn Barlow	
S. Barlow (Electronic)	To the Navy officials: I am writing to express my strong opposition to the Navy's acoustic/sonor testing in Hawaii and California along the migration routes of dolphins and whales. I understand that these tests are killing or gravely injuring these whales and dolphins. I recognize that testing is necessary for our national security and I'm glad you are doing that. But surely you can find places to do the testing in areas that do not damage these creatures. I would appreciate a response. regards, Sean Barlow, Brooklyn, New York	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Barnard (Electronic)	Dear Navy Officials: I definitely think we should protect our country and I thank you very much for that. Every American is proud of our Navy and we all appreciate the fact that you keep us safe. I also know you are smart enough to find a way to protect our country without killing and/or endangering our whales and other marine life off the coast of California. Marine life is one of this country's greatest natural resources. Please be considerate and protect these animals while you're protecting Americans. Sincerely, Sue Ellen Barnard, DVM Franklin, Tennessee	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Sonar is the best means of locating small objects in the water. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
Barnum (Electronic)	There is much we don't know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return because of education and protection. We have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I strongly disapprove of Navy sound testing.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Barry (Electronic)	You live in a beautiful place - why practice war there? The sea creatures have been there far longer than we have and deserve our respect. Please stop killing them!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Barton (Electronic)	I am deeply concerned over the sonar testing proposed off the east coast. The cost to marine mammals resulting from such testing is unthinkable, especially since there are other alternatives which would avoid this catastrophic massacre and permanent impairment to such a large number fellow inhabitants - all feeling, thinking creatures. This is unbearable. Don't let this happen, please!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Basmajian (Electronic)	Dear Sir or Madam, Please do not allow sound testing that will harm the whales as they migrate! We must think of the consequences of our actions. Thank you! Don Basmajian	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Bates (Electronic)	This is one of the most unnecessary and barbaric excercizes!! You have been doing this for years now... you KNOW what it does! You also know the results of your actions, obviously with you estimate of the Dolphin mass murder. PLEASE STOP THIS NOW!!! It is almost as ignorant as the people who round up dolphins so young men can "become Men" right of passage by slaughtering rounded up and captive dolphins!! What is it with you men that you feel the need to slaugher something in order to feel powerful? I find this sooo sad and heartbreaking for you all! Why are you perpetuating this to our younger generations? Let it stop w2ith You guys here and now!! Please this only adds more violence and damage to every living thing/person/soul on this planet!! We have done this for centuries! Maybe we should try something different for a change?! Help the Earth and all beings, things, souls to evolve beyond Murder, Mayhem and Fear! Especially when you already KNOW what it is going to do!!! PLEASE DO NOT DO THIS! Hawaii is a very Sacred place, PLEASE treat it with respect, Love and Consciousness!!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Bator (Written)	Aloha! The U.S. Navy is just going through the 'process' of the National Environmental Policy Act of 1969. I understand that my comments in this final Environmental Impact Statement/Overseas Environmental Impact Statement will not have any affect on the purpose of the U.S. Navy to implement the Hawaii-Southern California Training and Testing EIS/OEIS Project. However, I will make an effort to endeavor: The environmental effects associated with the HSTT EIS/OEIS Project will be insurmountable. The use of active sonar and explosives under the Pacific Ocean will have extremely harmful effects on the wildlife. It is 2012, simulated military training is possible, to accomplish the U.S. navy's mission to maintain, train, and equip combat-ready U.S. naval forces capable of deterring aggression and maintain freedom of the seas without destroying the sea life.	Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, “Today’s simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments.”
Baugh (Electronic)	Why do some humans think the human race is separate from nature and therefore superior to it? We will thrive and survive when we learn to live together without harm to any life. Please reconsider the plans to do the testing that surely will affect the sea life. Thank you for attention.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Baxter (Electronic)	I think it is sad that you will be testing in the waters off of California and Hawaii and potentially killing and causing hearing loss to so many marine animals. I am truly opposed and hope that this testing will be stopped.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Beard (Electronic)	Please stop the naval testing that will hurt marine life, specifically marine mammals such as whales and dolphins. The ocean noise is very harmful to the ecosystem, especially for marine mammals who use sonics to hunt, comunicate, and mate. Thank you. Sincerely, Sky	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Benjamin (Electronic)	I am conservative American and support our Arned Forces and those that galantly serve in each of our armed forces, especially the Navy. Protecting our nation and our troops is essential and vigilance is mandatory. However, I believe it is our responsibility to do all we can to avoid unncessary and avoidable damage to wildlife and our surroundings in the natural order of life, we need to do everything we can to protect animals and our fellow humans while not sacrificing the above. In upcoming military naval excersises in our oceans, especially those involving sonar and explosives, we MUST take prudent steps to avoid damaging and/or killing marine mammals like whales and porpoises. Using technology at our fingertips we need to avoid populated marine areas in testing and di everything we can to protect these helpless animals who become unnecessary collateral damage. Sonar must be used with consideration for the best outcomes for the planet and for our future. Please take immediate steps to avoid the deafening of thousands of whales and other collateral damage that can be avoided. It is our charge and responsibility as Americans. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Benke (Electronic)	Please protect marine mammals from explosives and sonar along the East Coast and California/Hawaii. We know that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. Please consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Regarding the 2003 Washington State stranding event referred to in the comment, although mid-frequency active sonar was used by the Navy, the distribution of harbor porpoise strandings by location and with respect to time surrounding the event do not support the suggestion that mid-frequency active sonar was a cause of harbor

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. I am calling on the U.S. Navy to re-think its plans and to incorporate additional protective measures. Thank you.	porpoise strandings. Rather, a lack of evidence of any acoustic trauma within the harbor porpoises, and the identification of probable causes of stranding or death in several animals, supports the conclusion that harbor porpoise strandings were unrelated to Navy sonar activities. Regarding the 2005 North Carolina stranding event, NMFS was unable to determine any causative role that sonar may have played in the stranding event. All of the species involved in this stranding event are known to occasionally strand in this region. Although the cause of the stranding could not be determined, several whales had preexisting conditions that could have contributed to the stranding. Cause of death for many of the whales was likely due to the physiological stresses associated with being stranded. A consistent suite of injuries across species, which was consistent with prior strandings where sonar exposure is expected to be a causative mechanism, was not observed. For a complete analysis of these and other stranding events, please see the Marine Mammal Stranding Report, found on the HSTTEIS.com website at: http://hstteis.com/Portals/0/hstteis/SupportingTechnicalDocs/ Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Bennett (Electronic)	Stop. Think. Killing marine life to test weapons? The Navy's job is to protect America, not kill it's animals. Many if not most Americans love, enjoy and would want to protect our animals as well as out citizens. If we are murdering animals to test weapons we are ignorant useless dwellers on this planet. Destruction is not protecting. This world belongs to every animal and human on it. America belongs to every citizen in it. I would hate to read that the US Navy disgraced our country by murdering marine mammals just to test some weapon. We are better than that.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
Benzel (Electronic)	I am very much against the use of explosives and high intensity sonar when it harms whales, dolphins and other sea creatures, killing many of them. I'm all for security but "training exercises" can certainly be done without creating a war on wildlife. I am also ashamed that my tax dollars are funding this sort of thing, which we know has done terrible harm and death to sea creatures over the years. The price is too high in my opinion.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Berberich (Electronic)	I spoke with many people at the meeting and after doing so I just don't feel explosive testing is necessary. Computer simulation can be just as realistic and is unharmful. Don't brush it off and say it's not as realistic. Technology is fantastic and can absolutly make it as realisitic as the real thing. Also that way the rest of the human population won't hate the Navy and be constantly fighting them.	Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the EIS/OEIS, today's simulation technology does not permit effective training and testing.
S. Berg (Electronic)	Please DO NOT carry on with the proposed Naval Training and Testing EIS/OEIS that will inevitably kill and maim marine wildlife!!! It is incredibly baffling that all of our military training exercises have to include torturing and killing mammals on land and in the sea and I find it repugnant, unnecessary and evil. Our nation has become one that does not respect the sanctity of life -- whether animal or human -- and I am always thoroughly DUSGUSTED to hear about activities that promote this violence. STOP, STOP, STOP these sick and twisted projected procedures! Thank you.	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
M. Berg (Electronic)	I understand the need for the Navy. However , we, as the human race have a responsibility to protect and keep our planets marine mammals safe from harm, and we should most certainly not should not bring them death. I believe as human beings we are intelligent enough to conduct tests without harming these amazing animals. I also believe that those in charge of this project will be humane enough to find another way. Swim with these amazing creatures. They will share a feeling of peace with you that render you unable to even consider harming them or their environment.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Betourne-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements.	As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis.
Betourne-02 (Electronic)	The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive.	The increase in harassment levels is due to several contributing factors that make it inappropriate to compare takes from the 2008 SOCAL EIS/OEIS: • An increase in training and testing activities and the inclusion of more activities and sources, such as pierside sonar testing, to meet emerging requirements • The 2008 EIS/OEIS included very little of the existing testing that is now included in this EIS/OEIS, much of which was covered under other environmental analyses. • This EIS/OEIS now includes a number of previously unanalyzed sound sources • Combined geographical areas (inclusion of both SOCAL and Silver Strand Training Complexes, and areas not previously analyzed such as San Diego Bay) • Included activities conducted along a transit corridor between

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		SOCAL and Hawaii that account for additional potential harassments • Updated marine mammal density information that reflects current species abundance • New acoustic effects model that provides a more accurate prediction of animal movement and therefore, potential exposures • New acoustic threshold criteria based on the best available science that is more protective of marine mammals, extends the ranges to effects of sound sources, and results in higher numbers of predicted level A takes.
Betourne-03 (Electronic)	What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries.	As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. Through consultation and permitting with NMFS and USFWS, the Navy refined the mitigation measures, which are now presented in Chapter 5 of this Final EIS/OEIS.
Betourne-04 (Electronic)	I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. Through consultation and permitting with NMFS and USFWS, the Navy refined the mitigation measures, which are now presented in Chapter 5 of this Final EIS/OEIS.
Bettwy (Electronic)	Dear Sir/Madame representing the U.S. Navy: Please consider steps to reduce the harmful impacts to marine mammals in your testing methods. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Please re-think the current plans for testing and incorporate additional protective measures. Surely the Navy can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. Thank you, Dana Bettwy Irvine, California	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Bhatt (Electronic)	This is making me sick to my stomach. Dolphins and whales are such intelligent and gentle creatures known for saving human beings on multiple occasions. Please please please please please do not put them through this torture. There is no explanation that can make this okay. We (The United States of America) are better than this. Thank you for your time.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Bianco Johnston (Electronic)	DO NOT HARM MARINE LIFE	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Bickel (Electronic)	I am emailing you as a very concerned citizen of the united States. I would like to please ask you to refrain from planned sonar and explosive testing that the Navy is planning to proceed with. This is such a huge danger to the oceans mammals and survivial of multiple types of endangered species. We must protect our oceans and these animals, to sustain our earth for the future of our own children and our planets survival. Please reconsider executing your plans. Sincerely Jenni Bickel	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Bielby (Electronic)	I am deeply concerned for our ocean sea life with the Navy's proposal with their testing which will deafen 1600 cetaceans and kill 200 marine mammals. If we continue to destroy our oceans in the name of protecting us who are we actually protecting ? THINK PEACE	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Blackorby (Electronic)	This is unthinkable and unforgivable. There must be a better way. PLEASE don't do this to our precious ocean friends.	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
Bleiweiss-01 (Electronic)	Please, please, for the mercy of the living creatures who reside in the ocean STOP THE UNDERWATER SONAR/SOUND TESTING. The US military is without question, the strongest, most advanced military on our great blue planet. It is now time for our great military to make its future technical advances in humane ways. As a future resident of Hawaii, I speak out for the whales and dolphins who cannot be heard but who CAN HEAR YOU. They are suffering greatly from the effects of underwater sonar. Dolphins and whales use sonar not only to navigate, but to communicate with each other. Our sonar testing, much louder than their own voices, drowns out their own calls, destroys their hearing, and can lead to loss of life. Please, please be conscious of how sonar testing affects them and cease this practice.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Bleiweiss-02	We can use our technical prowess to create lab environments to test our equipment. Thank you sincerely for your consideration.	Sonar is the best means of locating small objects in the water at present. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
Bleiweiss-03	Can you imagine the incredible headache sonar testing must cause to whales and dolphins? It is on the magnitude of TORTURE to these magnificent creatures. PLEASE	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	STOP THE SONAR TESTING. Thank you.	analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Blystone (Electronic)	Please do not test along the ocean waters and kill our marine lives. That is invasion on their home and they deserve to love a long healthy life without having to worry about what humans are going to do. We do enough to animals already without doing this test. You should test out in the DESERT!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Bohonik-01 (Electronic)	I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Please support the responsible sharing of our oceans for protection of our wildlife and our planet.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Bohonik-02	Thank you for the opportunity to comment. Thank you, too, for the work you do to	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	safeguard the USA as well as the shores of other countries, and the safe passage of vessels the world over. God bless your fine efforts.	
Bolinger (Electronic)	Please stop killing our marine life while performing this testing! The public is outraged at this, as am I. Thank you	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Booker (Electronic)	Find another way. The cost is too high. The oceans and its abundant life are essential to the health of the whole planet.	Thank you for participating in the NEPA process.
Boros (Electronic)	I am writing to protest your sonar testing which will kill and injure countless marine animals. While I believe in taking steps to maintain our national security I know there must be alternative methods that don't harm the animals and sea life that live in the ocean. We must learn to share the planet with other living beings, not take everything for ourselves. Please consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Bostock	STOP Killing OUR WHALES AND DOLPHINS!!!!	The Navy shares your concern for marine life. All of the reasonably

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
(Electronic)		foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Bourland (Electronic)	Please do not harm whales and dolphins with sonar. They are beautiful intelligent creatures who deserve our respect and our protection.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Bowen (Electronic)	I question the value of ANY underwater explosives testing. I don't believe that the navy or the country is facing any submarine or surface vessel threats which would effectively be countered by in-water explosions. Certainly any need for such devices could be adequately served by existing WW 2 era technology and simulation training. I applaud, however, that the US Navy is submitting to this public scrutiny, which has been lacking in the case of high-impact echo-sounding by oil exploration firms. I would advocate an international assessment of ALL sonic pollution in the oceans.	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Boyd (Written)	I feel showing dolphin playing near the ship during testing could establish a connection to us all. I dolphin show no effects at point blank range during full up testing nor do they run away. Please show more dolphin.	Thank you for participating in the NEPA process.
Boydstun (Electronic)	In conducting your training exercises along the California coast and Hawaii I urge you to minimize the impact these activities have upon the marine life. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Boyse (Electronic)	It is not acceptable to endanger marine mammals by conducting training exercises using explosives and sonar in their habitats.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Bradish (Electronic)	Please, please stop thinking of ways to kill and instead, start thinking of ways to protect our planet, the human race, and all the other creatures we are so fortunate to share this beautiful world with. We humans have a responsibility to to protect and nurture all the	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	other nonhuman persons, yes persons, like whales and dolphins (among others) who will be adversely affected by Naval testing stretching from Hawaii to California. The proposed testing is incredibly selfish and short sighted, actually unthinkable. How dare we?	development of alternatives.
Bradley (Electronic)	please consider the damage to the cetaceans, dolphins and whales, with the sound experiments. This would be terrible to kill or damage these animals. Very bad planning. It is time to heal the planet not to add to the destruction. Thank you, Jean Bradley	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Bradshaw (Electronic)	please don't allow this.	Thank you for participating in the NEPA process.
Brandeis (Written)	My question to the Navy: Since the Navy conducts public outreach on all Hawaiian Islands and San Diego, then the Navy should conduct similar outreach on the entire Pacific Coast, from CA through Washington, to enable Americans affected by weapons development in the Pacific to give their input.	The decision on where to host public meetings is based on a variety of factors, including range of the Study Area and public interest in the project. Based on these factors, the Navy determined that meetings in Southern California and Hawaii were the most efficient and effective at providing and receiving relevant information from the public. Studies currently being conducted for activities in the Pacific Northwest do include public meetings in Washington, Oregon, and Northern California.
Braniff (Electronic)	We cannot further endanger the whale population for any reason. The level of intelligence of these giant mammals is unknown to us, but their future existence depends on the intelligence and compassion of human beings. Please do not create any situation that will harm their future. They need our help to survive. Thank you for listening, Martha E. Braniff	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Brenkman (Electronic)	My late stepfather, Paul Stevens, was a Naval Oceanographer, and he taught at the Naval Academy in Monterey, CA. He was extremely concerned about the impact of projects such as this, as he understood the balance of nature and the possible damage to creatures who would be affected by such research. I respectfully plead that you suspend all plans to implement these studies. It is my belief that this would be cruel and torturous treatment. I thank you for your consideration, on behalf of myself and my late stepfather.	Thank you for participating in the NEPA process.
Brewster (Electronic)	I think this is wrong and should not happen!	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Brickell Vaughn (Electronic)	I am very concerned that a branch of the military of my country is seriously considering this kind of destructive, large scale testing. That so many intelligent, sensitive marine mammals would suffer incalculable suffering and loss strikes me as prohibitive. How can we be a proud people while conducting such reprehensible behavior? I fully understand that testing of various technologies needs to be done. Yet I see no reason this kind of data collection has to be done with such breathtaking disregard for our fellow living, breathing, feeling fellow creatures. As a nation, we have evolved in many ways. When we go to war, we now actually go to some great lengths to avoid "colateral damage". Civilian deaths are no longer seen as an acceptable & necessary by products of war. So too should we graduate to clearer thinking when it comes to creatures we share this planet with. Dolphins & Whales are not "just fish", they are our kindred. Not so very different from us, they think, they plan, they feel, they love, they live in family groups that support and care for one another. Are we so base a creature that this does not move us to seek out their protection? How can we think of ourselves as beings of conscience, yet allow ourselves to participate in a program that will blindly rip into our fellow creatures. Are we so blood thirstily self-centered? We certainly can devise testing protocols that insure the continued safety and well being of these animals, while allowing us to collect the information we need. Would our currently proposed testing have to be scaled back? Perhaps. Would our current plans need to be modified & revised? Certainly. Would it cost more money than we had anticipated? You bet. Would it be simple & easy? Not likely. But COULD it be done? Of that, there is no doubt! I want to look at myself in the mirror every morning and be able to stand tall. I want my Son to be proud of the things I have stood for. I imagine you do too. But I won't achieve these things if I stand by and say nothing while plans are made which would inflict grevious harm on innocent animals for no good reason. And to my way of thinking, being inconvienenced, having to go back to the drawing board to create a more humane plan, and being forced to become creative and come up with a new budgetary structure are not good enough reasons to allow ourselves to sidestep doing what is right and what is justifiable. Our current plans treat our companion creatures as if they were "things" with no feeling-that warrant no thought on our part. "Things" we can just discount. Nothing could be further from the truth. And if we don't start acknowledging this, we stain ourselves with filth. The filth that comes with the manically egocentric attitude that we can do whatever we want without regard to how it affects the planet's other "citizens". Personally, I would much rather try to grow & become "more" in my lifetime. The broader view, the bigger picture, the more inclusive approach is what leads us to become better human beings. And whatever that may cost-it is what we are called to do. Thank you for your time. Please think deeply about this. Sincerely Yours, Denise Brickell Vaughan	Currently, sonar is the best technology available that can help keep Sailors safe from mines and hostile submarines. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Bridges (Electronic)	The price is too high. Please do not make this lethal mistake. I understand the need to protect our country but feel that innocent lives should not be taken to achieve this end. Please make me proud to support the Navy, as I always have been. PUT A STOP TO	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	THESE PLANS!	
Briglio (Electronic)	I want to say that the Navy (and everyone) MUST consider how it's actions affect the biological systems of other living creatures. The fact is that when one system is affected, it affects ALL systems, including humans. You cannot harm these intelligent mammals. You should be protecting them. There is always a way to compromise so that BOTH sides get what they need. Please don't hurt these amazing animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Brooks-01 (Electronic	I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Brooks-02	The animals have a right to live without the interference and interaction of human beings. Us, as people of the human race, wouldn't want this sonar testing to interfere with our lives.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
J. Brown (Electronic)	The U.S. Navy is proposing to conduct training exercises in the rich marine environment off the coast of California and Hawaii. I am calling on the U.S. Navy to re-think its plans and to incorporate additional protective measures for marine wildlife. These exercises would involve the use of live explosives and high-intensity sonar. According to its own Environmental Impact Statements, the Navy estimates that the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. I understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. We know that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. Please protect marine mammals from explosives and sonar in California and Hawaii by considering steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
K. Brown-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive.	Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
K. Brown-02	What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Kelly Brown-01 (Electronic)	Please don't destroy anymore marine wildlife using sonar testing. Too many animals have already perished.	Thank you for participating in the NEPA process.
R. Brown (Electronic)	All animals deserve to live on this planet and be safe from destruction of another species. Please do the right thing and make the necessary changes to protect whales and other sea animals. Thank you,	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Bruckner-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Bruckner-02	What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. Through consultation and permitting with NMFS and USFWS, the Navy refined the mitigation measures, which are now presented in Chapter 5 of this Final EIS/OEIS.
Brudigam-seim-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Brudigam-seim-02	What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird’s beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, “generally approach only 5” is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide “a crude estimate” of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, “(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching.” When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60’. Also like marine mammal observers, Navy Lookouts are

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Buckley (Electronic)	Please consider steps to reduce the harmful impacts of sonar on marine mammals such as avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Bueler-Pina (Electronic)	Please consider these protective measures to help the protect our precious marine life. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Burley (Oral-Kauai)	Hi, my name is Stu Burley, and I live in Lawai Valley, and I am a resident of Kauai for 55 years now. When I came over I helped to open up the Pacific Missile Range Facility, and from there I started working as a civilian for PMRF, and finally after 46 years of being involved with every operation that took place, no matter what it was, I had a fantastic career. Now I'd like to speak a little bit about sonar. I remember when the underwater range first operated in 1968. The oldest ship in the United States Navy was the first ship on the range, U.S.S. Fletcher. And it came on the range, and it put one little torpedo in the water, and underwater warfare started at that time. This EIS/OEIS, is a long time coming. It's great. It's something that should have happened some time ago. Now, when people ask about sonar, one thing, and I'd like to just identify the missile range here. First of all, there's a lot of submarines that do the work on the range. You will not hear a submarine sonar. They do not transmit mainly because in time of war if they transmitted they would be found immediately. And it takes surface ships, when they come on range, and they transmit, they are told at the pre-sail briefs that they should go into half power instead of full power because if they went full power, their sonar would ricochet off the island of Kauai or the island of Niihau. Therefore, the sonar signals that are in the water here are less than what you would hear in the open ocean. Now, for range safety, let me make a comment about range safety. PMRF is very environmentally, the word I want is conscious. I've seen it sometimes that if there's a helicopter in the area and it happens to spot a pod of whales, that is reported. The exercise stops and then moves to another location where that pod of whales no longer exists. They take care of the ocean. They take care of what's here around the island. They also give a lot of employment. Before I retired I took a poll of how many companies on Kauai actually get paid for doing	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	something at PMRF, and the number came up with 270 companies. Thank you.	
Burley (Written)	Real-time training is very essential to all sailors in order to maintain their efficiency as a war fighter, a defender of our great nation, and the reason we have a free republic. Training in simulators is good but does not fill the warfighter experience at sea contingencies. The Navy has always been very environmentally conscious of endangered species. Range safety is always involved when training operations are scheduled.	Thank you for participating in the NEPA process.
Burns (Electronic)	As a shareholder I believe that the negative impact that the training and testing in the ocean around Hawaii and California during the next five years on animals defeats the purpose of having an EIS. According to your document the exercises could cause 1,600 marine mammals to suffer from hearing loss or other injury from its use of sonar and explosives each year for the next five years. The report also projects that 200 marine mammals will die each year. This is such a devastating and harmful impact to the marine life and an alternate on land testing facility should be utilized. There were millions of frogs used for biology dissection at one time but because of technology we now have better alternatives. Consider the IMPACTS in your EIS. You may not see the direct impact and the animals can not complain to you directly but is their pain, suffering and possibly death worth it?	See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. The Navy historically has recorded few to no mortalities caused from sonar or explosives. The estimated number of marine mammals sonar testing could affect is based on a scientific model, and it is only an estimate. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts.
Butler (Electronic)	With all the research DARPA does, I sincerely believe that the Navy needs to work on a better solution than using sonar that damages more of our mammal marine life. It has taken 40 years for the humpback whale to make a comeback from near extinction to ONLY reach the designation of "endangered" species. There is research on the damage to dolphins and whales hearing and the disorientation leading to death and serious injury of mammal marine life due to the SONAR used by the Navy - in the U.S. and the U.K. Stranding, beachings, confusion and fear cause whales to stop feeding and subsequently die. The UK military has research from 2007 that clearly indicates there are issues with sonar in causing death to whales and that in 2011 additional research conducted by a team of international scientists has confirmed the earlier research. We have some of the best scientists in the world working on these issues and still, this issue continues to plague us in finding a better solution. The NAVY should re-evaluate it's plans, establish a timeline and a plan for alternatives, expedite research on better tools than SONAR, and start to more fully balance the military need in the context of damage to the ocean environment. It is unconscionable that the U.S. Navy would expand the damage to the marine environment by simplistically justifying it's actions by creating fear in the public. It requires leadership to take a more thorough and thoughtful approach. I respectfully submit, having been a public servant, that there are always alternatives that can be examined, and in this case, should be considered to mitigate the loss of marine mammal life.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Butner-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Butner-02	What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly,

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Butz (Electronic)	Dear Sir/Madam, I am writing in support of your careful consideration about proposed testing that may adversely impact migrating whales in the coastal waters. I am a concerned citizen, and simply want to register my request that you weigh the various needs for research and defense related activities along with a keen sense of stewardship in managing the larger environment and ecosystem that your activities may impact. Thank you for your consideration, Tom Butz, phD	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Byers (Electronic)	Please take all reasonable measures to ensure your impact on marine wildlife is minimized by exploring less dense areas and employing some of the recommendations provided by those concerned about the threats to whales and dolphins.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Caffrey (Electronic)	I am deeply concerned about the harm that most likely will be caused to marine mammals during the Navy's sonar training and testing. Please apply your environmental report findings, and avoid your sonar testing in areas where whales, porpoises and dolphins are especially vulnerable: in calving grounds, migratory corridors and seasonal-use feeding areas. Your military testing can go forth, and with a small amount of awareness and planning, thousands of marine mammals can continue to live in their natural habitat. Thank you for protecting part of our country's rich natural resources. We stand to learn much more about sonar from these amazing creatures when they are protected, and can share the coastline with us.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Cagley-01 (Electronic)	Dear Officials, I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Cagley-02	What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to bring this to your attention. Sincerely, Jonah Cagley	not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Callan (Electronic)	Please reconsider your use of warfare on mother nature. There are permanent catastrophic consequences to your actions and while you may feel it is necessary, consider that you may be wrong. Your actions will murder and permanently disable innocent members of this planet and while it is clear that that is of little importance to you, it is to many other people. I hope your conscious gets a hold of your decisions and you make the right one.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Callis (Electronic)	Please adjust your training exercises to protect marine mammals from explosives and sonar.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Calton (Electronic)	I do not consent to have my tax money used for this. When SERVICE members say they SERVE...what does that mean? It means they SERVE US. I am a veteran and I approve this message.	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Camino (Electronic)	The estimates of the number of marine mammals that could be deafened and/or killed is unacceptable. Despite it being a worst-case estimate, the numbers are far higher than in the past, and I question the longterm benefit. We continue to destroy habitat and animal life and justify it as necessary for national defense, but at some point, the cost is too high. What will be left for those we've protected? I believe we've reached that point and ask that this testing be scaled back to reduce the negative impact on marine life as much as possible.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Capozzelli (Written)	I have read that the Navy is moving full speed ahead with plans for sonar and explosives training that threaten to deafen, injure, and even kill countless whales, dolphins and other marine mammals. Starting in 2014, the Navy will harass, injure, or kill marine mammals more than 33 million times in both the Atlantic and Pacific Oceans during five years of testing and training with sonar and explosives. Those alarming numbers come from the Navy itself. I am writing to ask your help because I am deeply concerned at the Navy's estimates of the far-reaching harm that will be inflicted on marine mammals during proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard, and the Gulf States from 2014 to 2019, as stated in your Draft Environmental Impact Statements. The sheer scope of the Navy's proposed training and testing activities is staggering, potentially assaulting entire populations of marine wildlife off the East Coast, Southern California, Hawaii and the Gulf states. Navy ships will flood millions of square miles of ocean with high-intensity sonar, which is known to cause disorientation, hearing loss, stranding and death in whales. In addition, the Navy will be detonating high-powered explosives with the potential to fatally injure	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	the lungs and other organs of marine mammals. The projected damage to whales and dolphins is staggering, with 33 million instances of "take" over five years, a vast increase over existing estimates of harm for the same regions. I am shocked by the level of carnage reflected in these numbers: over 5 million instances of temporary hearing loss; 16,000 instances of permanent hearing loss; almost 9,000 lung injuries; and over 1,800 deaths. The analysis fails to present and analyze reasonable alternatives that would significantly reduce the unprecedented level of harm to marine life. The mitigation scheme that the Navy principally relies upon, centered on the ability of lookouts to detect whales and dolphins, will not result in an appreciable decrease in marine mammal injuries. Federal courts have found this same scheme inadequate and ineffective for good reason: it is largely useless in conditions (common at sea) that impair visual surveillance, it is unsuitable for detecting cryptic and deep-diving species that spend little time at the surface and, even if it were fully effective at detecting whales and dolphins, would only protect species from the most serious injuries. The waters around Hawaii and Southern California, including critical habitat for endangered blue and humpback whales, would be among the hardest hit. The Navy predicts that more than 1,000 marine mammals would be killed in this area alone. And the threat to even one North Atlantic right whale may be one too many, as fewer than 400 of these survivors now hover on the brink of extinction. I urgently and respectfully call on the Navy to identify and set aside areas of high marine mammal density acknowledged to be the most effective means of reducing marine mammal injury. The Navy should and must take common sense precautions -- like keeping training out of key whale habitat -- before launching this sonic assault. Such precautions will not compromise the nation's military readiness. I urgently and respectfully ask the Navy to enact tough safeguards for marine mammals before it conducts the next five years of training exercises. If the Navy wishes to be seen as an effective steward of the ocean environment, it must take steps to significantly reduce the level of harm that training and testing activities will inflict on marine life. Thank you for the opportunity to comment and for your help on behalf of marine life.	Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Carberry-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate,	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	communicate and survive.	with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Carberry-02	What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4)

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Carchesio (Electronic)	Please consider steps to reduce the harmful impacts of these exercises to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
A. Cardenas-01 (Electronic)	PLEASE. If it is possible to attain your goals without the negative impact on live creatures - Why wouldn't you do it? We all have to share this earth. Animals are our gifts and our responsibility. We must behave humanely if we are ever going to evolve as human beings. Please, Deborah Cardenas	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
A. Cardenas-02	we see..and we base our life in the sense of sight. they hear..and base their life on the sense of hearing. Imagine if there was no light to see because someone decided to test the velocity of light through air..only to gain more knowledge and be more prepared to win a war..Please stop this, as you will harm every single living being that depends on hearing to survive, which are most of the animals in the ocean.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
M. Cardenas (Electronic)	I am appalled over the decision to use both sonar and explosives inside our precious oceans. The ocean is sacred and home to a life as vibrant and necessary as the dry land we live on. I am sickened over the idea of pollution and death being forced upon these innocent creatures and precious waters. The ocean is not our playground; it is not our property to abuse or mistreat. It is a home and a cooling center for the earth. These exercises are extremely selfish. I am demanding you find another way to train. For hundreds of years people walked on this earth thinking only of themselves. As a result poisons were pumped into the air, land and yes oceans. In our present life we cannot afford to be so ignorant and unenlightened. We have to put the concerns and welfare of ALL elements - people, animals, natural resources - to the forefront in any decision.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	American is not ignorant. We know better. Do not show a lack of compassion or disregard for this beautiful planet and the gifts our oceans bring to us every single day. Do NOT.	Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Carey (Electronic)	I ask for use of explosives in the ocean to be stopped in order to protect dolphins, whales and other creatures from being injured or killed.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
R. Carley (Oral-Hilo)	Aloha. My name is Ru, and I live in Honaunau, West Hawaii. I come here as a voice for those who cannot be here tonight, and that includes thousands of people who live in and near Kailua-Kona, Captain Cook, Kealakekua, Honaunau, and Hawaii. I come as a voice for the creatures in the ocean who cannot defend themselves against this plan. I tried to read the Draft EIS, but how does one go through 838 pages in two days? My understanding of the draft means that the Navy wishes to step up testing on land and in the sea around our islands and off the coast of Southern California. I am not alone when I say no to this plan. What the Navy proposes is basically a death sentence to countless beings in and around Hawaiian waters. According to one of the Navy's Draft Environmental Impact Statements, the sonar sound field around this transmitting ship will be 180 decibels up to one mile away and 150 to 160 decibels up to 100 miles. This means that many marine mammals will be exposed to low-frequency sonar levels capable of causing stranding and lung hemorrhaging over large areas of the ocean. I am not alone when I say no to this plan. Hawaii's tourism depends on the sea. Many boats bring hundreds of people a day from	The Navy shares your desire to preserve marine life. The Navy believes that the proposed training will not pose a risk to marine mammals, fish, and other wildlife given that these same activities have been conducted for many years in this Study Area and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Navy training or testing on land is not included in this EIS/OEIS. The Navy is not aware of any documented cases of sonar harming people.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	Honokohau Harbor out to spend times with dolphins and catch glimpses of humpback whales, pilot whales, false killer whales, turtles, manta rays, sharks and more. The lure of the dolphin stretches all around the globe, and groups spend vast sums of money here in the islands because of their desire to be around dolphins. It should be noted that back in the '90s when sonar testing was present off Kona, people went into the water and developed nerve damage shortly thereafter. Marine mammals are no different if not more sensitive. Everybody knows, including the Navy, that sonar is deadly. I am not alone when I say no to this plan. The National Marine Fisheries Act granted the endangered Hawaiian monk seals and humpback whales protection. By granting the Navy permission to play war games and low-frequency sound testing in Hawaiian waters or anywhere puts marine life in danger. The Navy's plan has the potential to harm and even kill the already low numbers of monk seals. I am not alone when I say no to this plan. I understand --Equally important, low-frequency sonar levels also affect fish, and business and family fishermen could be affected. This in turn translates to reduced state and federal taxes. I understand that the Navy wants to test new equipment, new weapons, new ways of killing for the defense of this nation, but don't we already have enough fire power to destroy the world many times over? I am not alone when I say no to this plan. Thank you. Aloha kakou.	
R. Carley (Electronic)	The Navy's proposal of increased activity in the eastern Pacific (i.e., Hawaii and California) will be disastrous for marine life, especially for the dolphins and whales. Cetaeceans are dying from sonar blasting, and it seems the Navy couldn't care less. What about Hawaii tourism which relies on healthy oceans? Can you imagine what will happen to tourism when whales and dolphins start washing up on our shores? Thousands of people come to the islands to visit with these creatures. You will be destroying, not helping anything. You need to stop this idea dead in its tracks! Try applying your immense resources and energy to something healthy and productive for the beings on the planet from now on.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Carlson (Electronic)	I am strongly against the use of the sound testing that endangers dolphins , whales and other sea life. I am writing to ask you to remember the Navy has projected that it will make deaf 1600 whales and dolphins and kill 200 EACH YEAR IN A 7-YEAR PROGRAM in training exercises.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Carpenter (Electronic)	I am writing to ask the Navy to consider steps to reduce the harmful impacts to marine mammals during planned exercises that involve the use of live explosives and high-intensity sonar. I learned these planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. This is horrible!! Whales have stranded and died after major military sonar exercises. If the Navy could avoid the most harmful activities in areas used as calving grounds or migratory corridors; avoid seasonal high-use feeding areas; create a larger "safety zone" around the exercises; and use aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed, it could save their lives. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Please do the right thing. Save all lives!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate.
Carr-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Carr-02	What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. As described in Chapter 5 (Standard Operating Procedures,

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However,

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Carroll (Electronic)	I live in San Diego. I'm a supporter of the Navy. I also understand the need to test systems. But when it comes to this testing, I think we need to look long and hard about the benefits versus the disaster it spells for marine life. Our science has shown us, (and is showing us more everyday) that these are intelligent, curious and at times loving animals. Whales have been shown to display affection to humans who've helped them out of bad situations, like being caught up in fishing line. Should we use our heads when making decisions like this? Of course. But I would contend this decision also needs some input from the heart and when that comes into play the conclusion is obvious. DO NOT CONDUCT THIS TERRIBLY HARMFUL TESTING! Thank You.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Carter (Electronic)	I am writing to ask you to protect marine mammals during your sonar exercises on the East Coast and in Hawaii, and anywhere else such exercises are conducted. I am asking you to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	that whales, dolphins, and porpoises might be harmed or killed.	actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Castillo (Electronic)	Hello and thank you for your time, I'm very concerned about this sound testing that is going to take place. I'm trying to understand why this is necessary? Isn't there any other way? We cannot destroy these beautiful creatures that have ever right to be here, just as we do. Dolphins, whales, sea life.. I do appreciate your duty's and how difficult your jobs are, but please can you find another way to do this particular job? I beg you PLEASE DON'T Kill these incredible creatures!Our poor planet is already in such a state! We must pull together now and find alternative ways to help everyone and every living thing! I do thank you for allowing the public to comment, and please feel free to email any information about this topic, how can we fix this ? Please don't kill them! Please!! Signed, Nalini Castillo a concerned human	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. As described in Chapter 5 of the EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. Through consultation and permitting with NMFS and USFWS, the Navy refined the mitigation measures, which are now presented in Chapter 5 of this Final EIS/OEIS.
Catania (Oral-Kauai)	Aloha, Brothers and Sisters. So far the people that have been speaking up have been speaking out against militarism and destroying our beautiful Pacific. First of all, I would like to say that the reason why they're having these meetings here is to secure public support for their scam of controlling the Pacific as their own lake. They see China as their big competitor. It came out in the paper today that the head of the Navy was talking about that. As far as I'm concerned, my concern is that a working class person, every	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	penny is being spent on war should now go to the needs of the people; jobs, housing and education like the schools over here. Now, let's get straight. Okay. The people are suffering. Enough money on war and war preparations. In fact, there's a global worldwide movement against war and militarism and corporate greed. The only people that are really benefacting out of this whole thing is the contractors and people that make missiles and bombs like General Electric. We've got to stop killing people that did nothing to us. We've got to give the land back to the Hawaiians, and we've got to start taking care of the needs of the working class.	
Cavanagh-01 (Electronic)	Raymond C. Cavanagh Vienna VA 22181 July 10, 2012 Comments and Questions about Navy's HSST DEIS/OEIS of May 2012 -- Emphasis is on MMPA and ESA acoustic impact of sonars/projectors and explosives on marine mammals. 1. General Comments 1.1 The sections applying to acoustic impacts are very much like those of previous EISs (viz., USWTR, HRC, SOCAL, etc.). 1.1.1 This is disappointing - given the years that have passed in which the accuracy and readability could have been improved. Errors and misinformation and redundancy abound. More below. 1.1.2 The number of pages devoted to the subject is staggering. [I count about 200 for Vol I alone. This is not to mention the repeated attention to individual species (how many bio-histories do we need?) Why not relegate all of this to appendices or reference papers?] 1.1.3 A modest amount of editing by experts on sonars and explosives and acoustics would to it. The cost would be minimal.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Cavanagh-02	1.1.3.1 A technical editor could help - to reduce the page count to 1/4 of what it is now. But the technical editor's edited text would have to be edited once more by the authors. 1.2 Precision vs accuracy is not explained. This is a perennial problem, as noted by MMC and many others. NMFS' abundance estimates for a single species and a small area to 6 significant figures? What about TL estimates like 67.23 dB? SPLs like the now infamous 169.3 dB? Such reporting misleads the reader - Is accuracy suggested by these inexplicable levels of detail? Better to either fix the number of significant figures or repeat a caveat often in the text about how precision almost never implies accuracy. 1.3 If the goal of the subject sections was to induce sleep in the reader, confuse the reader, gloss over the important points, and hide the main messages, then the goal was more than met. 1.3.1 As a good example, consult the Executive Summary. None of the important issues is given any attention (e.g., what are the take counts, by species and source and action?). 1.4 Even for a veteran of acoustic risk assessments, terminology can be a mystery. 1.4.1 What is a 'Stressor?' A cause of stress? But what is 'stress?' No definition is given for this very often-used term in the text. Why confuse the issue with	The Navy has used the best available science in the development of this EIS/OEIS. The text has been reviewed and revised throughout the document's development by professional technical editors and scientists for accuracy. Levels of precision are used as provided by source documents, which are largely peer-reviewed scientific studies. The level of detail in the document is a result of refining the document to satisfy the needs of both the public and scientists, as well as meet legal sufficiency standards of NEPA. As noted in Section 3.0.5 (Overall Approach to Analysis), "the term stressor is broadly used in this document to refer to an agent, condition, or other stimulus that causes stress to an organism or alters physical, socioeconomic, or cultural resources." The term 'exposure' is used in a number of different contexts within the document. When used in the context of a sound or energy exposure that exceeds the PTS or TTS criteria, then the predicted effect (or exposure) is similar to the MMPA term 'take.' In terms of Endangered Species Act (ESA) listed animals, NMFS also

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	jargon that is not defined? Are full moons or teenagers partying in the surf or very low wind-speeds stressors? (We searched for 'stressor' in the pdf document, but found no defintion) 1.4.2 What is an 'exposure?' Please define. It looks like an exposure is the same as a take. After all, won't the take permit (LOA) be based on the number of exposures listed in the text? (Again, we searched the pdf document but found no definition of exposure.) 1.4.2.1 In a previous NMFS' document, an 'exposure' was defined in two different sections as (a) a sound level above 120 dB or (b) as any sound that the animal could hear!	used the term exposure to mean exposure to any level of sound, energy, or stressor, which pursuant to ESA constitutes a "may affect". Due to the ambiguity, in the term "exposure", Navy has attempted to be clearer in the FEIS by referring to the numbers of animals estimated to be exposed to the various criteria as predicted effects.
Cavanagh-03	Likewise, NMFS has claimed that as regulator it can make the judgment (even years and years before the action) of whether an exposure is to be counted as a take (for a permit) or not. We have never seen such a determination in a formal take permit request. 1.4.3 Where is 'restart time?' This has been a critical NMFS' pronouncement in many risk assessments. No mention is made here. The importance is that NMFS counts takes of an animal at most once over a restart time. NMFS prescribed restart times have been documented as '24 hours' or 'duration of the exercise' – whichever is smaller. 1.4.3.1 A review of the SURTASS-LFA FEIS will show that the restart time was of order 10 days -- so that no animal could be taken more than once in that period. The consequences are huge! 1.4.3.2 Restart time gets its name from the logic that the whole take assessment is restarted after that time has elapsed. There is no memory of any previous conditions or 'exposures.' Usually, the take counts for 3 restart times equal 3 times the take counts for 1 restart time. 1.5 Basic and important acoustic quantities are almost never defined correctly, or explained, or defined at all. Some examples follow. 1.5.1 Source Level (SL) for a sonar or projector is complicated and not understood by many. 1.5.1.1 A good example is for SURTASS-LFA in which NMFS and Navy supported a 215 dB (re 1 μPa re 1 m) SL. For compliance and sonar applications, this is 10s of dBs too low for the actual, standard and traditional source level. This misunderstanding by NMFS and Navy is astounding. 1.5.2 There seems to be no understanding of the definitions of SPL, Intensity Level, EFDL, SEL, peak pressure, max SPL, and many more. 1.5.2.1 SEL is not an energy metric; it is new to underwater sound, having its derivation from in-air acoustics. It does not allow for near-field effects, and is independent of medium (same in air as in water). Likewise for SPL as power metric. In air, from whence it came, the units are 1 μPa and assumes a 1 second normalization for pulse length. In current use, by bio-acousticians, the metric for SEL is like that for EFDL (1 μPa2-s). This is very confusing. Why not use EFDL? 1.5.2.2 For a transient signal, SPL has to have many parameters specified to give it any meaning. Many good examples of errors resulting from such lack of definition and confusion about the metric can be provided upon request. The NMFS-Navy Dose Function for sonars provides a great example of confusion about SPL. 1.6 We stop here- but many many more examples can be given as requested.	As described in Chapter 5 of the EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. Through consultation and permitting with NMFS and USFWS, the Navy refined the mitigation measures, which are now presented in Chapter 5 of this Final EIS/OEIS.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Cavanagh-04	Raymond C. Cavanagh Vienna VA 22181 July 10, 2012 Comments and Questions about Navy's HSST DEIS/OEIS of May 2012 (Part Two) -- Emphasis is on MMPA and ESA acoustic impact of sonars/projectors and explosives on marine mammals. 2 More Specific Comments and Questions --Sonar Level B (behavioral)Take Counts for an LOA 2.1 Ten's of thousands of 'exposures' (Level B behavioral 'takes') for Sonars?. How can this be? We argue that this is orders of magnitude greater than it should be. 2.1.1 Application of the NMFS' prescribed dose-response functions (DRF) is the problem here. The input RL metric to the DRF must have been miscalculated during the risk assessment. It is supposed to be the 'mean of the mean SPLs 'and not the 'mean of the peak SPLs. ' This is per the SHOUP analysis which led to the infamous 169.3 dB estimate of the 0.5 probability of harassment, as input to the DRF. If the 'mean of the mean SPLs' was used as the RL for the DRF for the HTTS actions, the take counts would be dramatically reduced. We roughly estimate 100 Level B behavioral takes over the year, all of which could be mitigated. Sonar operating modes could reduce this even more. In fact, behavioral takes should almost always be fewer than TTS takes. 2.1.2 The NMFS' DRF form is attributed to Feller Vol 1. (It is a GREAT book and I keep it under my pillow for inspiration). No one has yet found the form in Feller since its use in 1999 for a SURTASS-LFA EIS. NMFS could not find it either - so they said the 'Feller-adapted function.' This has zero basis, and another obfuscation. Can anyone find the citation? (I have an answer, but Feller is not the sole source.) By the way, the formula given in the text 2.1.2 1 The use of the Nowacek et al playback results in construction of the NMFS' DRF is hard to defend. The animal was a mysticete and the alarm signal that caused a reaction was an FM slide from 500 Hz to 4500 Hz over a minute. That signal is not at all similar to s sonar signal - as claimed by Nowacek and NMFS (in writing). NMFS has massaged the result by saying it projected signals within the frequency band of a tactical sonar, or misquoted the bandwidth of the signal ('above 1 kHz). In addition, the signal lasted much longer than any sonar signal. These data distorted greatly the DRF shape and parameters. 2.1.3 For a typical HTTS hull-mounted sonar action, the expected number of takes (as usual, over time and space) does not at all depend on grouping of the animals. Nor does it depend on spatial distribution of the animals, given a non-specific sonar track (also as usual). To say that a take estimate applies to a 'population' of animals and not to a single specific animal (as per NMFS) is contrary to the statistical bases for take counts. 2.2 Level A takes by sonars This is not possible. Collision is more likely. Theories about embolisms, bends, brain trauma etc. as impacts or causes of strandings have never been treated seriously . Any response? 3	There are several contributing factors that make it inappropriate to compare takes from previous studies: • An increase in training and testing activities and the inclusion of more activities and sources to meet emerging requirements. • Combined geographical areas (areas not previously analyzed) • Updated marine mammal density information • New acoustic effects model • New acoustic threshold criteria extended the ranges to effects of sound sources and result in higher numbers of predicted level A takes. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded few to no mortalities from sonar or explosives. Any model used to predict marine mammal mortality and takes is only an estimate. The Navy has used the best available science in the development of this EIS/OEIS.
Cavanagh-05	More Specific Comments and Questions --Explosive Take Counts for an LOA 3.1 Precedent is not respected here. The SEAWOLF and CHURCHIL EISs use a different threshold for harassment - specifically the peak 1/3 octave band RL vs the average of the 1/3 octave band RLs.. To say that this is more 'conservative' is not a valid reason for using it. It was approved in the EISs mentioned, and reviewed by many scientists. 3.2	The Navy has used the best available science in the development of this EIS/OEIS.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	We doubt that the impact estimates involving the Goertner modified positive impulse could be accurate. Very few persons in the world know how this works. Impulse is not the same as positive impulse!! Impulse must be zero. The depth dependence rule is incorrect. 3.3 As we have argued with NMFS, peak pressure is not a reasonable metric for impact on animals. It does not reflect the physics of what happens when an animal (or human) approaches the surface of the water. See the AIR FORCE's JASSM and EGTTR EISs for more on this. NMFS spent a lot of time on it. 3.4 'Peak pressure' requires a careful definition for explosives. SPL is not applicable. Peak pressure cannot be measured and most be modeled. 3.5 To infer impact to animals in air from impact in water is controversial - for peak pressure or SEL. Some adhere to the concept that peak pressure itself (independent of the water or air medium) is the metric to use to estimate injury, etc. (See Ketten, Chapman, Craig, and others). Others argue that power or energy (which depend on impedance) are the appropriate metrics. What is the view from the EIS - do we need to apply dual thresholds including peak pressure (independent of impedance). These dual thresholds are key to this EIS.	
Cerio (Electronic)	Please rethink planned training exercises that use live explosives and high-intensity sonar. The impact on wildlife would be significantly damaging. I would rather these exercises stop altogether but another option is to take steps including avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Chalmers (Electronic)	Please don't do any underwater testing in the oceans. Everything that lives there should have a peaceful life. You will be destroying marine mammals that can not escape the repercussions from testing bombs and other experiments.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Chambers-01 (Electronic)	The plans that you currently have and the horrific impact it will have on marine wildlife is simply unacceptable. Considerations should be made and taken very seriously to alter these plans as to avoid the devastating impact your actions will have.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Chambers-02	By disrupting marine life you ultimately disrupt tourism and therefore the economy in the area. Sick/injured/dead marine life and marine mammals = bad tourism and economy for the area. There are much larger implications here. I plead with you to reconsider.	Section 3.11 (Socioeconomic Resources) has addressed impacts to fishing and tourism activities. Socioeconomic Resources screened for impacts on other resources that might create secondary impacts. The biological resources sections (3.4-3.9) determined there would be no long-term impacts to populations, therefore not reaching the level of "harm" as to impact tourism activities.
Chan (Electronic)	Please do not harm marine life. Don't you see the kind effects it'll do, particularly in the long term? Aren't there other ways? Even if the other methods are not cost efficient or convenient, the harm it'll do to your pockets will benefit in the long term, for everyone, including your association, we're all living in the same place, same earth. Affecting marine life apart from being morally wrong and causing extinction, it in turn, would cause fishermen, and anyone in the field which depends on the ocean and the life in it, to fall. You all are trying to make a living, and so are they. Sooner or later it's going to come back to you anyway. Wake up, and don't go along with this, think of the effects. Hear all	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	the comments flooding the mail system, and listen to them.	whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Chandler (Electronic)	Please do not harm our dolphins and whales.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Chaney (Electronic)	Dear Navy Sonar Testing Participants, I want you to stop sonar testing within the Pacific Region. From reading the NOAA stranding report, there is ample evidence that continuing or expanding this pracitce has the potential to harm an unknown number of marine mammals. Let's not have a repeat performance of the whaling era, albeit through this remote means of death to cetaceans. In reality, the number of stranded animals noted in the report are likely a small percentage of the number of animals killed through the use of oceanic sonar. Please discontinue the use of sonar practice, and keep our cetaceans preserved for future generations. Sincerely, Nancy L. Chaney	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Chapman (Electronic)	We understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Cherivtch (Electronic)	We, the American people, are saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. We look forward to hearing from you with your views on the above.	at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Cheshelski (Electronic)	The Sonar testing you are doing in the ocean is killing whales,dolphins,and God knows what else. This has been proven, the Navy has been aware of it for sometime now, yet you continue. My daughter of 12 years old was watching Animal Planet, unaware of what she was about to see, I also had become interested in the program at this point. This program was filmed in the Ocean where they were recording sounds of the Orcas and other whales, unaware of your testing the crew that was recording was completely caught off guard by the events to follow. The beautiful sounds of the whales communicating were shattered by a horrible sound, followed by complete panic coming from every direction. The sounds/shreaks coming from these precious animals were indescribable, terror and screams of being tortured alive is about as close as I can get to describe. Alot like the screams coming from 100's of dolphins being speared with metal rods to die a slow painful death in Taiji Japan. I watched the cove by mistake and I will tell you that is a sound I have never forgotten. Please stop this Sonar testing, there are so many inhumane acts of violence, tortures, killings of animals/ people around the world, please don't be the reason for the deaths of these beautiful animals. I must add one thing. The people recording these Orcas, the looks on their faces, the tears welling up in their eyes, the sadness and hopeless look along with complete shock, knowing there was nothing they could do to help these poor animals was about all I could handle. My eyes also started to burn and I shut the T.V. off with disbelief of what I was seeing. Please, please step down on this testing, it is not worth it. I know you will do what it is that you have decided already, and I can only hope that our Navy Defense has already decided to abort Sonar Testing. We are the United States of America, and we just have to stand for something good in today's world. Honor, Respect, some sort of kindness. Thank you for giving us "we the people" an opportunity to comment on your Sonar Testing, I pray that you will make the right decision for humanity reasons. Sincerely, Cali Cheshelski Calimesa, California	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Chinchelli (Electronic)	Please don't do it! There is no need for it.	Thank you for participating in the NEPA process.
Chitrik (Electronic)	Why are you wanting or planning to conduct testing on the last remains of ocean natural habitat left on the east and west coast. We know that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. We are saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. Thanks Hanna Chitrik hychitrik@yahoo.com	testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Cho (Electronic)	It is unethical to harm other animals unless absolutely necessary. We have ways of collecting information and defending ourselves that do not necessitate harming so many innocent lives. In fact, when we try to enhance our own lives at the expense of others', we usually end up compromising our own security. Aquatic ecology is especially vulnerable these days; we need to be especially circumspect in this area. Please cancel the training. Thank you,	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Christian (Electronic)	Dear Navy, it is not in our national interest to conduct high power sonar and explosives testing in the waters around Hawaii or anywhere at all. The needless death and harm inflicted on marine life outweighs what little benefit will be achieved. I know you guys like to blow [expletive deleted] up. I wish I could play with the toys you guys get to use and most REAL men (and a lot of women) enjoy the thrill of really big fireworks, but killing thousands and dolphins and whales just isn't worth the price... Thank you for your attention ;o)	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Cicchino (Electronic)	Hello. I am an avid scuba diver and diving instructor who appreciates the variety of LIFE OUR ocean holds and in doing so, RESPECT the life contained in it. I, Renee M. Cicchino, a tax paying citizen of the United States of America DO NOT grant the US Navy permission to conduct any test which is harmful or causes death in ANY MARINE or migratory animal/mammal in the waters in which I dive! I am requesting that the US Navy finds another way to test sound/sonar than to do so in the waters that hold life - life that I and thousands of other divers, pay to experience every time we go diving. With all of the resources at the US Navy's disposal, why must you continue to test in such a barbaric way. Since there is a killing quota, the NAVY acknowledges the danger to marine life. Why not find alternative ways to test??? Computer technology, 3-D simulation something other than to harm and/or kill life that is VITAL to US as a species. Be greater than that US NAVY!!! Be BETTER than Japan, China, Norway - Show the WORLD, there are alternatives than to rape and pillage the ocean. BE A LEADER! Please. Sincerely, Renee M. Cicchino	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Cina (Electronic)	Please stop the explosions you are hurting the Dolphins and Whales!!!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Clare-Newman (Electronic)	While I am all for the navy doing the work it needs to in order to keep our country safe, I am concerned about marine life and the eco-systems in which we live in peace and in war. Please do what you can to reduce the impact on dolphins, whale and other sea life, finding alternate ways to do the testing necessary. Please continue to think outside the	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	box! Thank-you.	decade.
G. Clark (Electronic)	I understand the need for protecting our country, but another way can be found to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. Please reconsider.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
H. Clark (Electronic)	Please stop the Sonar testing. It is hurting the Sea Mammals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Cloutier (Electronic)	This testimony is to express my concerns for underwater sonar testing. You are well aware of the impact of sonar testing to marine mammals. In particular, observations you have already made in previous testing and exercises: 1) Sonar caused panic reactions leading to strandings followed by death 2) Sonar caused decompression sickness (the bends) followed by death 3) The bends caused by sonar even in the absence of panic I	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	would like to add that there are always unintended consequences that even intelligent people like you overlook, such as cultural and spiritual. You are well advised to give that proper consideration.	maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Cole (Electronic)	Why can't this testing be done out in deeper waters, instead of along the coasts?	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
Comito (Electronic)	Please do not test and cause harm to the area dolphins and whales. They have no way to speak for themselves so I am speaking for them.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
H. Concoff (Electronic)	There is much we don't know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return because of education and protection. We have no right to knowingly permanently injure these living creatures	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing.	Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
R. Concoff (Electronic)	Please stop this kind of testing. It is detrimental to whales and other marine mammals which it is our duty to protect. Thank you.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Coniglio (Electronic)	This is beyond cruel and MUST STOP !!!	Thank you for participating in the NEPA process.
Conrad (Electronic)	re: the use of high frequency underwater sound for testing in Hawaii, the California and Atlantic Coasts, and the Gulf of Mexico. Stop this testing NOW - it will deafen many whales and dolphins and kill more of them. Just horrid and cruel!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Corey	I have just finished reading much of the EIS/OEIS report. I am especially concerned on the impacts of the Navy's explosive and sonar testing in the Pacific areas addressed in	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
(Electronic)	the report. I want to firmly protest the negative impacts this proposed testing will have on the whales, dolphin and other mammals in this area. The thought that any amount of these species being harmed, in such as way as to drive them from their habitat of the coastal areas there, that are their feeding and mating grounds is unacceptable. Even worse to see it is quantified and acceptable to cause deafness, tissue damage and general suffering, or whatever pain and discomfort these tests cause is beyond just unacceptable into the highly objectionable range. How can the military of the United States depend on, design and plan to implement a project to save human life by increasing our security when it is dependent on the loss of other life that are not our enemies and cohabitate peacefully beside us? This is a flawed argument with a bias against other species even to their death and displacement. I believe that the mammals and all creatures of this earth have the unquestionable right to live freely without harassment, suffering or pain inflicted on them by any of our human activities. We do not possess this right to do so and any action that harms another and so grievously with forethought is immoral, ignorant and totally without merit. I therefore state my objection to this testing, to the premise this testing rests on and any future execution of this plan. I firmly resolve to do what i can, within the power i have as a citizen of this land to stop, object, publicize, promote dissent, inform, and disperse this information and its disastrous consequences to all parties within my circle of influence with the intention of collectively working to thwart, stop and beseech the United States of America Navy, its generals, our congress and our President to remove any authorization to proceed with such a plan. In short, please reassess- its egregious and i would be ashamed for any agency of my country to be engaging in these horrendous practices under the banner of protection of our rights, liberty and lives. We are not the only ones living here. Sincerely, C. Corey	Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Costa (Electronic)	please do not conduct these tests. thousands of animals will be tortured, deafened, and other thousands will die.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Courbis-01 (Written)	As a member of the public and an expert in marine mammal science, I respectfully submit the following comments on the Navy's Hawaii-Southern California Training and Testing Activities Draft Environmental Impact Statement/Overseas Environmental Impact Statement for your consideration. To begin with, I have concerns that the draft EIS/OEIS does not fully consider the scientific documentation of strandings of marine mammals that may be associated with the types of activities proposed by the Navy. For example, the work of Wang and & Yang (2006) indicating pygmy killer whales stranded in Taiwan as a result of active sonar & seismic operations is dismissed as "not supported by the data available" on page 3.4-45. In addition, there is no mention of the concurrent unusual melon-headed whale activity in Hanalei Bay, Kaua'i and Sasanhaya Bay, Rota, Northern Mariana Islands in 2004. These "strandings" are both included in the report "Marine Mammal Strandings Associated with U.S. Navy Sonar Activities" (April 2012) associated with the Atlantic Fleet Training and Testing EIS (http://aftteis.com/Portals/4/aftteis/Supporting%20Technical%20Documents/Marine%20Mammal_Stranding_Report_v02.pdf). The Atlantic Navy report describes five stranding events associated with U.S. Navy sonar activities and five stranding events speculated to be linked to U.S. Navy sonar activities. I suggest that the Hawaii-Southern California EIS/OEIS include details of the Hanalei Bay incident and that it acknowledge the heightened risk for certain species documented to strand during Naval activities. In addition to melon-headed whales, beaked whales are considered to be especially vulnerable to injury and death associated with Navy sonar (five beaked whale stranding events with potential links to Navy sonar activity are described in the Atlantic EIS cited above). Although such strandings of beaked whales associated with Naval exercises have not been seen in Hawai'i, the science indicates that animals affected by Navy sonar in Hawai'i may not be easily detectable (Faerber and Baird 2010). Overall, my recommendation is that the Navy expand its description of potential impacts to include a more thorough treatment of historical stranding information as done in the Atlantic EIS and acknowledge that species such as melon-headed whales and beaked whales have higher risks for injury and death. Potentially, a variable regarding higher risk should be incorporated into the model for calculating take of these species. Although not described in detail, five stranding events identified as including U.S. Navy exercises as a contributing cause are listed on page 3.4-113. This and other stranding events illustrate the need for mitigation plans for live and dead strandings. Although I am aware that the Navy has participated in carcass removal and necropsy in past strandings in Hawai'i, I encourage the Navy to develop a more formal mitigation plan as part of the EIS/OEIS. I understand that a regional stranding implementation plan is being developed collaboratively between the Navy and NOAA. I encourage the Navy (and NOAA) to seek input from the State of Hawai'i and the Pacific territories and to incorporate cultural considerations into protocols.	The Navy shares your desire to preserve marine life. The Navy believes that the proposed training and testing will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at NMFS Office of Protected Resources website. For a complete analysis of stranding events, please see the Marine Mammal Stranding Report, found on the HSTTEIS.com website at: http://hstteis.com/Portals/0/hstteis/SupportingTechnicalDocs/ An integrated monitoring plan for the activities in the HSTT Study Area is also planned as presented in Section 5.5.1.1 (Integrated Comprehensive Monitoring Program) of the Final EIS/OEIS. The Navy will continue to implement the monitoring and research programs where training and testing has been occurring to determine if there are determinable impacts as a result of those activities and will do so in the HSTT Study Area associated with future training and testing occurring there. The Navy will continue to be a leader in funding of research to better understand the potential impacts of Navy training and testing activities and to operate with the least possible impacts while meeting training and testing requirements.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	This does not require the Navy to take formal responsibility for causing any marine mammal stranding, but it would make the Navy a formal partner in the activities necessary to deal with stranded animals. This should include monetary support for removal of animals and appropriate necropsy and sampling. It is to the Navy's benefit to have full necropsy and sampling done on stranded animals to reduce speculation that the Navy is responsible for deaths that have not been properly investigated. Funding for such necropsy work has gone down significantly in recent years.	
Courbis-02	The EIS appears to dismiss some of the science associated with mid-frequency sonar effects on marine mammals. On page 3.4-95 it states "As a result, no marine mammals addressed in this analysis are given differential treatment due to the possibility for acoustically mediated bubble growth." Regardless of the mechanism, it is clear that certain species, like the beaked and melon-headed whales, can be affected by mid-frequency sonar. Bemaldo de Quiros et al. (2012b) found that deep diving marine mammals have a higher risk of decompression; that risk should be considered in determining levels of take. Further, the protocols designed by Bernaldo de Quiros et al. (2012a, 2012b) should be included in official necropsy protocols.	The Navy used the best available science to develop its analysis and appropriate mitigation measures. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures must be estimated scientifically using complex modeling, but it is only an estimate, not a prediction. This estimate needs to encompass the capacity of what could occur to ensure Navy's permits are not exceeded. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. The U.S. Navy has conducted active sonar training and testing activities for decades in the sea space depicted in the Study Area with no documented proof of injuries to marine mammals. Though the intensity of training and testing will increase, the events are of relatively short duration and therefore the Navy does not anticipate long-term population level impacts.
Courbis-03	The Navy acknowledges on page 3.4-92 that long-beaked dolphins have been directly killed by Navy activity in an incident involving explosives. This illustrates the importance of mitigation zones. Some odontocetes are more cryptic and surface less often than long-beaked dolphins. As such, I recommend that the Navy not reduce any of the mitigation zones used in the previous EIS/OEIS. Smaller mitigation zones, as proposed in the draft EIS/OEIS, will only increase risk to marine mammals. Even if animals are not at risk for direct injury by the sound, it is clear that behavioral responses of marine mammals can be contributing factors to injury and death, suggesting that mitigation zones should be conservatively large to account for behavior-induced injury.	The mitigation measures listed in the Chapter 5 of the DEIS/OEIS are the result of the consultation with NMFS and USFWS. Mitigation under MMPA will be coordinated through the Letters of Authorization from NMFS. Mitigation under ESA will be coordinated through the ESA consultation between the Navy and NMFS and USFWS.
Courbis-04	Page 3.4-97 states that "Hearing loss resulting from auditory fatigue could effectively reduce the distance over which animals can communicate, detect biologically relevant sounds such as predators, and echolocate (for odontocetes). The costs to marine mammals with temporary threshold shift, or even some degree of permanent threshold shift have not been studied." There are some studies of threshold shift in cetaceans (e.g. Mooney et al. 2009, Nachtigall et al. 2004). These studies examine things like TTS frequencies and behavioral effects of sonar. Studies also describe odontocete immune response to sonar pings and seismic water guns (Romano et al. 2004). I did not do an exhaustive search of the literature, but further information about TTS and PTS should be	. The discussion in the EIS relies on years of rulemaking, previous Navy NEPA documents analyzing the same actions, and extensive research cited throughout 3.4.3.1. Specific to the latest development of the criteria including TTS and PTS, please see Finneran and Jenkins (2012), which is cited throughout Section 3.4.3 and is available for review at the HSTT EIS/OEIS website.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	reported in the EIS as a quick search indicates some is available.	
Courbis-05	The EIS/OEIS states on page 3.4-93 "The potential for auditory trauma in marine mammals exposed to impulsive sources (e.g., explosions) is inferred from tests of submerged terrestrial mammals exposed to underwater explosions (Richmond et al. 1973; Yelverton et al. 1973; Ketten et al. 1993)." Terrestrial mammals do not have the same hearing physiology and mechanisms as marine mammals, though some ear structures are conserved among the mammals. I am not clear on how terrestrial data can be translated to marine mammal potential for auditory trauma. A clearer explanation of this link would be helpful to assess whether this comparison is appropriate. Darlene Ketten has published a number of articles on cetacean hearing physiology, and Cranford et al. (2008) reported on sound transmission and reception in Cuvier' s beaked whales using CT scan information, which could be cited in this section.	. The development of conservative criteria and thresholds for marine mammal impact analysis has a long history of considering research from terrestrial animals including humans. There is no additive useful information provided by Cranford et al (2008) that is required by the analysis or otherwise assists in understanding of impacts to marine mammals or beaked whales in particular. Section 3.4.3.1 of the EIS provides a synopsis of the information required and provides citations for those interested in looking into the history of the development of environmental impact analyses as related to marine mammals hearing. It is suggested that the commenter start with the cited Southall et al (2007) reference as a baseline overview for understanding the history and use of terrestrial mammal hearing to assist in developing marine mammal hearing impact thresholds.
Courbis-06	Because the Navy's model of biologically significant population consequences of Navy activities included abundance estimates, the Navy EIS/OEIS choses to combine what are now considered separate populations of marine mammals among the Hawaiian Islands for the analysis. This is biologically inappropriate and does not account for the lack of dispersal among island regions. Because populations of many odontocete species are now scientifically documented to be local and island-associated, an analysis of impact by population is necessary to assess affects to these populations. If this assessment cannot be conducted now because of the need to use abundance estimates in the model, I have suggestions. One, the fact that these populations are separate should be acknowledged and described, with a full literature review, in the EIS/OEIS. Two, the letter of authorization and EIS/OEIS should include language that reflects a commitment to do new calculations as abundance estimates become available. With the new Guidelines for Marine Mammal Stock Assessments becoming finalized soon and the new research that is becoming available regularly, abundance estimates for many of these stocks should likely be available before the next reauthorization, so I encourage quick turn around on updating impact estimates as these data become available.	The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures must be estimated scientifically using complex modeling, but it is only an estimate, not a prediction. This estimate needs to encompass the capacity of what could occur to ensure Navy's permits are not exceeded. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States. Active sonar is currently the most effective way to locate submerged enemy submarines before they are close enough to sink U.S. ships. To successfully defend against submarines and other underwater threats, such as mines, Sailors must train realistically with the latest

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		technology, including both passive and active sonar.
Courbis-07	Another aspect of local populations is that displacement of these populations could be permanent or long-term. Other members of the species may not be able to repopulate an area where animals are displaced. Alternatively, movement of local populations out of the area may not be possible if marine mammals have behaviorally adapted to the area. Some high-risk species like melonheaded whales and Blainsville's and Cuvier's beaked whales show evidence of local populations near the Island of Hawai'i (Aschettino et al. 2011, Baird et al. 2011, McSweeney et al. 2007). The increased risks associated with local, island-associated populations should be described in the EIS/OEIS and potentially taken into account in the modeling.	The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures must be estimated scientifically using complex modeling, but it is only an estimate, not a prediction. This estimate needs to encompass the capacity of what could occur to ensure Navy's permits are not exceeded. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States. Active sonar is currently the most effective way to locate submerged enemy submarines before they are close enough to sink U.S. ships. To successfully defend against submarines and other underwater threats, such as mines, Sailors must train realistically with the latest technology, including both passive and active sonar.
Courbis-08	The Navy should identify known "hot spots" for species and preferentially avoid hot spots for Endangered, Threatened, and Candidate marine mammals unless there is a National Security issue. There is already some mitigation of that nature in place for humpback whales. There is extensive research on monk seal and false killer whale movements (e.g. Baird et al. 2012) that should be considered in the EIS/OEIS as areas to avoid Navy activity if possible.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The Navy has used the best available science in the development of this EIS/OEIS.
Courbis-09	On page 3.4-107, the EIS states "Humpback whales showed a trend from negative to positive reactions with vessels during the study period. The author concluded that the whales had habituated to the human activities over time." I urge the Navy to not use terms like "negative" and "positive" because they suggest that there is a "positive" way to harass marine mammals. Even marine mammals engaged in approach are not necessarily experiencing a "positive" interaction. For example, calves of dolphins fed by humans in Shark Bay Australia have up to twice as much calf mortality than unprovisioned dolphins in the area (Mann et al. 2000). Although one could argue the dolphins "choose" to interact with humans and to take handouts, it is not actually in their best interest biologically because it distracts them from protecting and rearing their calves. This is a "positive" interaction with negative consequences. It is also important to remember the difference between habituation and tolerance. Some animals may not have anywhere else to go and therefore, tolerate disturbance. The draft EIS/OEIS states on page 5-24 "The Navy will cease transmissions when a marine mammal is sighted within 200 yd. (183 m). The exercise will re-commence if one of the following conditions are met: the animal is thought to have exited the mitigation zone and the mitigation zone has been clear from any additional sightings for a pre-established amount of time; the vessel has transited more than a pre-established distance beyond the location of the last sighting; or if the ship concludes that dolphins are deliberately closing in on the ship to ride the vessel's bow wave." Although the EIS/OEIS indicates that bow-riding animals would be out of the main transmission axis of active sonar, bow-riding behavior can cease at any time and approaching animals could be in danger of sonar affects. Again, it is important to remember that because an animal "chooses" to approach the vessel does not mean the animal is unaffected by sonar-animals do not always make the best choices for their own health and safety.	Bow riding dolphins may quickly move out of the sound path if they break from bow riding because of the speed of the ship. If dolphins move into the sound path and remain in the mitigation zone, then mitigation procedures would apply and sonar would be powered or shut down as appropriate.
Courbis-10	I support the continued implementation of Marine Species Awareness Training and use of lookouts. I suggest that mitigation measures could also include passive acoustic monitoring to help detect cryptic and long-diving marine mammals. The EIS/OEIS mentions that marine mammals are sometimes detected this way, but does not include passive acoustic detection in protocols for mitigation, with the exception of increased vigilance by lookouts. Passive acoustic detection and localization of marine mammals has come a long way in the last few years. The Journal of the Acoustical Society of	Passive acoustic monitoring is already and will continue to be implemented with several activities. Information on mitigation measures can be found in Chapter 5 of the DEIS and FEIS.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	America will be publishing a special issue on methods for marine mammal passive acoustics later this year. We encourage the Navy to continue to get the latest information to inform mitigation that includes passive acoustic monitoring and detection. Acoustic monitoring has also been done for several years off Hawai'i's coasts through the University of Hawai'i. We encourage the Navy to continue to support these efforts and use this information to learn more about "hot spots" of cetacean activity near the Hawaiian Islands and incorporate this information into updates of the letter of authorization and to develop better means of detecting and localizing cetaceans near testing and training exercises.	
Courbis-11	The Navy's main mitigation measures include visual detection within a radius of the activity and cessation of the activity until the marine mammal has not been seen for 30 min. This may not cover the beaked whales and sperm whales well, as these species can be under the water for more than an hour at a time without appearing at the surface. I suggest movement to a new area or at least an hour without seeing these species before restarting activities. I also encourage as much wait time as possible for cryptic species that are difficult to see, such as pygmy and dwarf sperm whales.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Courbis-12	On page 3.4-57, the draft EIS/OEIS states "There are no significant species-specific threats to spinner dolphins in the Study area." The species-specific threats associated with swimming with spinner dolphins in Hawaiian bays are well documented (e.g. Courbis 2007, Courbis and Timmel 2009, Danil et al. 2005, Timmel et al. 2008), and NOAA published a Federal Register notice of intent to propose rulemaking to protect spinner dolphins from human interactions in Hawai'i (National Marine Fisheries Service 2005). With the number of publications and the intent of NOAA to engage in rulemaking on the issue, swimming with spinner dolphins should be considered a significant species-specific threat.	Thank you for participating in the NEPA process.
Courbis-13	The Navy cites the Hawaiian Islands Humpback Whale National Marine Sanctuary as reporting as many as 12,000 humpback whales in 2010; however, the citation is not included in the bibliography of the EIS/OEIS. We suggest that abundance of humpback	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	whales be determined based on the primary literature, such as Calambokidis et al. (2008) (Hawai'i) and Barlow et al. (2011) (North Pacific). I encourage the Navy to use abundance estimates from directed scientific studies in primary literature for modeling of population level effects of Navy activities.	
Courbis-14	The EIS/OEIS states on page 3.4-115 'The best assessment of long-term consequences from training and testing activities will be to monitor the populations over time within the Study Area. A recent U.S. workshop on Marine Mammals and Sound (Fitch 2011) indicated a critical need for baseline biological data on marine mammal abundance, distribution, habitat, and behavior over sufficient time and space to evaluate impacts from human-generated activities on long-term population survival." I am aware that the Navy helps to support a variety of research on marine mammal populations in the Hawaiian Islands. I encourage the Navy to continue to support research as an indirect mitigation strategy.	The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States. Active sonar is currently the most effective way to locate submerged enemy submarines before they are close enough to sink U.S. ships. To successfully defend against submarines and other underwater threats, such as mines, Sailors must train realistically with the latest technology, including both passive and active sonar.
Courbis-15	On page 3.4-239, Figure 3.4-15 appears to be incorrect. The text states that there were nine humpback whale vessel strikes in 2009 and four in 2010, but no strikes appear in the figure.	The text and the figure indicate **multiple species** and multiple vessel sources in the years 2009 and 2010. There were **no** Navy whale strikes in Hawaii during 2009 or 2010 which is correctly indicated in the figure.
Courbis-16	On page 3.4-243, the EIS/OEIS states "Based on the probabilities of whale strikes suggested by the data the Navy is requesting takes by morality or injury of 15 large marine mammals over the course of the 5 years of the HSTT regulations from either training activities of no more than 15 large whales from either training activities over the course of the 5 years of the HSTT regulations. This would consist of no more than four large whales in any given year." This is a confusing sentence. It sounds like the proposal is to get a letter of authorization for take of 15 large whales by vessel strike, but it is not clear what a "large marine mammal" vs. a "large whale" is. This request is broad, asking for takes across species and across populations (stocks) of species. In the past, the maximum number of whale strikes by the Navy across the entire SOCAL and Hawai'i ranges in a five-year period was ten. If the Navy were striking 15 large whales in five years, that would be a large red flag with respect to its activities in comparison with the past 20 years. This also must be considered in the context of several endangered large whale species (sperm whales, humpback whales, blue whales, fin whales, and sei whales), urging caution. I suggest requesting permission for striking 10 large whales rather than 15 over a five year period. Alternatively, I suggest that if more than ten whales are struck in five years, it should trigger an investigation into what has caused an increase in whale strikes and how that cause can be mitigated.	The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures must be estimated scientifically using complex modeling, but it is only an estimate, not a prediction. This estimate needs to encompass the capacity of what could occur to ensure Navy's permits are not exceeded. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Courbis-17	I have some concerns about the request for a five-year letter of authorization, as previous letters have been less than five years, though I understand the administrative	The Council on Environmental Quality guidance encourages federal agencies to develop internal processes for post-decision monitoring to

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	burdens and costs associated with constant permit renewals. Although I recognize that the law allowing for a five year permit requires re-authorization with the publication of significant new information, I encourage the Navy to include language in the EIS/OEIS that makes it clear that new science will be used to adjust model outputs and change mitigation strategies as it becomes available and will not wait for the termination of the permit period.	ensure the implementation and effectiveness of the mitigation. It also states that federal agencies may use adaptive management as part of an agency's action. Adaptive management, when included in the NEPA analysis, allows for the agency to take alternate mitigation actions if mitigation commitments originally made in the planning and decision documents fail to achieve projected environmental outcomes. Consistent with the cooperating agency agreement with NMFS, mitigation and monitoring measures presented in this Final EIS/OEIS focus on the requirements for protection and management of marine resources. A well-designed monitoring program can provide important feedback for validating assumptions made in analyses and allow for adaptive management of marine resources. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States. Active sonar is currently the most effective way to locate submerged enemy submarines before they are close enough to sink U.S. ships. To successfully defend against submarines and other underwater threats, such as mines, Sailors must train realistically with the latest technology, including both passive and active sonar.
Courbis-18	I am aware that the Navy has considered and discarded a list of mitigation measures described on pages 5-52 and 5-53. I encourage the Navy to reconsider sharing marine mammal sighting data to augment scientific information, minimizing as much as is possible testing and training activity that takes place during sea states or light levels at which marine mammals are unlikely to be seen by lookouts (or alternatively increasing radii of mitigation, passive acoustic monitoring for marine mammals, or wait time when marine mammals are spotted), and avoiding '"hot spots" of marine mammal activity, particularly for those animals that are listed or candidate species under the Endangered Species Act. I appreciate the value of military readiness but also believe strongly in protection of the resources and culture that make a Hawai'i unique and special place. I encourage collaboration and dialog among stakeholders and the Navy to provide the best protection to both people and the environment.	The Navy shares your desire to preserve marine life. The Navy believes that the proposed training and testing will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at NMFS Office of Protected Resources website. For a complete analysis of stranding events, please see the Marine Mammal Stranding Report, found on the HSTTEIS.com website at: http://hstteis.com/Portals/0/hstteis/SupportingTechnicalDocs/ An integrated monitoring plan for the activities in the HSTT Study Area is also planned as presented in Section 5.5.1.1 (Integrated Comprehensive Monitoring Program) of the EIS/OEIS. The Navy will continue to implement the monitoring and research programs where training and testing has been occurring to determine if there are

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		determinable impacts as a result of those activities and will do so in the HSTT Study Area associated with future training and testing occurring there. The Navy will continue to be a leader in funding of research to better understand the potential impacts of Navy training and testing activities and to operate with the least possible impacts while meeting training and testing requirements.
Cox (Electronic)	Please protect marine mammals from the effects of sonar testing as recommended by the HSUS. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Coyle (Electronic)	We can all appreciate the many jobs the U.S. Navy performs, national security and education in particular. Proposed exercises are known to cause great harm to marine life. While we are protecting the U.S.A., it seems we would want to protect the health of our oceans. My hope is the Navy will take all steps possible to minimize damage. The health of our oceans aids in keeping our country strong. Please take every marine life safety step you can. Thank You for your consistent hard work, Kate	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. Thank you for your comment.
Craddock (Electronic)	I truly do support our armed forces. I know that we need to conduct training exercises in order to further our technology, however, I do not approve of doing so in such a way that endangers wildlife. Please find an alternate solution. I know that you can find other means to ensure both our safety, and the safety of innocent lives. Thank you, A concerned and supportive citizen.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Cramer (Electronic)	I am concerned for the well-being of the marine mammals that may be impacted by sonar and other naval testing. This Environmental Impact Statement (EIS) estimates more than 1,600 marine mammals each year will suffer from hearing loss or other injury from its use of sonar and explosives over the next five years. The EIS also predicts 200 sea mammals could die each year in its Hawaiian and Southern California training and testing areas. I know protective measures are put in place but marine mammals are very important to people and hold a lot of value. Please consider the least harmful alternative.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Cranden (Electronic)	I find the news of the Navy testing explosives and sonar to be both distressing and altogether horrifying. I cannot believe that our country would sacrifice and put in harm's way so many living things. These are not simply after-thoughts; they are living, breathing, feeling, thinking animals. They do not deserve this kind of careless and thoughtless mistreatment. Please reconsider for the sake of our oceans and these incredible animals we have fought so hard to protect over the years.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Crawford (Electronic)	I love my cozy life in the U.S. as a native born citizen, and I want it to continue. I value our Navy, and its role in protecting our country. But..... injuring, terrifying and/or killing the ocean animals for testing explosives and sonar is not acceptable. Please accept this message from a U.S. citizen who abhors the Navy's testing procedures in the world's oceans, and will always stand up against it. Sincerely, Valerie Crawford McMinnville, OR	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Cresko (Electronic)	It is AWFUL that Marine life,such as Dolphins and Whales are severely affected by the Sonar Operations. The Navy should work with NRDC to find ways to eliminate the impact on these species. I am sure the majority of the American people would agree!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. The Navy is working with NMFS, the Navy's cooperating agency and the regulator under the MMPA, to finalize mitigation measures through the permitting and consultation processes for MMPA, ESA, and other laws as required. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Cullen (Electronic)	I fully support the Navy's training and testing activities to the extent necessary, regardless of any so-called environmental effects.	Thank you for participating in the NEPA process.
Cunningham-Welsh-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive.	As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Cunningham-Welsh-02	What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Curington	To the US Navy: Please do not carry through on your proposal to conduct training exercises all along the U.S. East Coast and in the rich marine environment off the coast	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
(Electronic)	of California and Hawaii, involving the use of live explosives and high-intensity sonar. I understand the need for protecting our country, but you can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. If testing plans as they stand happens, it will KILL 17,700 cetaceans. Without their hearing, dolphins will be unable to use their echolocation to hunt. Whales will not be able to communicate. It will make it impossible for all cetaceans to survive. Please rethink this!This operation should not be allowed to go through. The consequences are far too severe. Sincerely, Alexi Curington, Seattle, WA	analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically Navy records have had few to no mortalities from sonar or explosives. Any model predicting takes is only an estimate.
Cutillo (Electronic)	Please stop the testing on whales!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis.
Dako	Opposed.	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
(Written)		
Daly-01 (Electronic)	I am saddened to hear that the U.S. Navy is proposing to conduct training exercises in the rich marine environment off the coast of California and Hawaii. These exercises would involve the use of live explosives and high-intensity sonar. According to its own Environmental Impact Statements, the Navy estimates that the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. I understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. I urge you to please do just that.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically Navy records have had few to no mortalities from sonar or explosives. Any model predicting takes is only an estimate. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis.
Dameron (Oral-Kauai)	Thanks for the opportunity to speak. My name is Karin Dameron. It's not acceptable to the have detrimental impact on the ocean and all its contents so that military people can be trained and munitions can be tested. No level of displacement, harm or death of marine life is acceptable. We as a nation could be pursuing peace and preservation. The billions of dollars spent on building an offense or a defense is a waste of our planet's resources and is a detriment to our livelihood and planet. A blanket EIS to cover whatever harm the Navy may impose is not legal or acceptable. We have many things that the Navy could be cleaning up with the billion of dollars that are being spent. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Daniels (Electronic)	SUCH GREAT GIFTS TO THE EARTH, THESE MAGNIFICENT SPECIES ... WHY MUST WE ALWAYS CRIPPLE OR DESTROY THEM? THE NAVY IS BIG ENOUGH TO FIND ANOTHER WAY AND SHOULD BE ASHAMED IF IT DOESN'T! SURELY MEN OF THE SEA WOULD RESPECT THOSE THEY SHARE WATERS WITH!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis.
Das (Electronic)	Dear U.S. Navy, Please protect marine mammals from explosives and sonar. Thanks, Victor	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Dash (Electronic)	I am writing to protest the testing of weapons that cause mass cetacean injury and death.This is a terrible way to waste a lot of money.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Daussat Adimina (Electronic)	I must protest this appalling proposal resulting in a disaster for a great many fellow creatures.I have lived through four wars and have some knowledge of both duty and catastrophy engineered by man.Please do not inflict destruction on already imperiled life on our precious and fragile planet.If we have the technology and willingness to explore our universe why must we destroy life as we go?We have a solemn obligation as well !as a vested interest in our survival, but first we must preserve what remains of our integrity in preserving it for life's other manifestations here!I spent my entire fifty years of married life as the proud wife of an Officer, if this proposal is implemented, that pride and faith will be tarnished..how sad for us all who believe in the human impulse to nurture life not destroy it.Juanita D. Adamina	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
A. Davis (Electronic)	STOP THIS MADNESS! The U.S. Navy is proposing to conduct training exercises all along the U.S. East Coast and in the rich marine environment off the coast of California and Hawaii. These exercises would involve the use of live explosives and high-intensity sonar. According to its own Environmental Impact Statements, the Navy estimates that the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. We understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. I AM APPALLED BY THIS TRAINING/KILLING ECERCISE. STOP THIS MADNESS angelika davis citizen and taxpayer of the USA	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically Navy records have had few to no mortalities from sonar or explosives.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Any model predicting takes is only an estimate. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis.
S. Davis-01 (Electronic)	I have concerns about the increased use of active sonar as well as explosives and the effects both may have on marine mammals in the area.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
S. Davis-02	In addition I don't think the EIS takes into account the social and cultural impacts caused by this increase in the militarization of seas around Hawaii. By making military use the first and highest priority for the seas around Hawaii it sets a dangerous precedent and could effect other uses of the ocean space that may be more economically, culturally and scientifically valuable for the people of Hawaii. I ask that the training activities of the Navy be curtailed, not expanded.	As described in Section 3.10 (Cultural Resources), Section 3.11 (Socioeconomics), and Section 3.12 (Public Health and Safety) of the Draft EIS/OEIS, the Navy's proposed activities are fully compatible with other uses of the ocean space around Hawaii. The Draft and Final EIS/OEIS fully considers the potential social and cultural impacts associated with the proposed activities. As explained in Section 2.5 (Alternatives Development) of the Draft EIS/OEIS, the range of alternatives considered by the Navy must be reasonable alternatives. To be reasonable, an alternative must meet the stated purpose of and need for the Proposed Action. A curtailment or reduction in the number of training and testing activities would not meet the stated purpose of and need for the proposed action, and would therefore be unreasonable. The Navy is not expanding the area where training and testing occurs, but is simply expanding the area that is to be analyzed in the EIS/OEIS as part of a phased compliance approach.
De Meurisse (Electronic)	This potential disaster must not be allowed to happen. As Americans we are proud of the U.S. Navy and the work being done to protect our protectour country, but to put marine mammals at such cruel and inhumane dangerwould lead to embarassment and protests from all other concerned countries. We should protect, preserve and respect these mammals to the highest degree possible. I urge the Navy to take the appropriate action put forth in the letter. Respectfully Sheila de Meurisse	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis.
De Tavira (Electronic)	Please protect marine mammals from explosives and sonar, Thanks in advance	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis.
DeCaro (Electronic)	Please.. there are other ways to test sonic water frequency range missiles. I know there is a war on, and I know that the NAVY is terrified of the potentiality of long range missiles, but there has to be another way ... a pool or some form of testing that would not do undue damage to which the likes of which a military based operation does not seem to care about. The biological aspects should intertwine with the safety of human kind, because we are animals, with animals and although we have the potentiality to do what we think we can, this will result in hardships of which will cause a cataclysmic undue hardship and end to life to which the ecology of it tying it to our own selves will be unable to right once it is wronged. Please don't be the bad guys, I know you want to be the good	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Currently sonar is the best means of locating small objects in the water. Evaluation of these technologies continues to be a Navy focus as is research into all

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	ones and save people but this effects people too.	technologies that will protect and defend the United States.
DeFalco Lippert (Electronic)	I heard, that you are planning Sonar experiments in and around Hawaii. Please do not do so! Sonar tortures and kills whales and dolphins (as they are loosing their orientation) - and there are so many whales and dolphins living around Hawaii! Please remain sensitive to nature and it´s animals. Hawaii is such a paradise... Thank you very much! How many more whales and dolphins have to die before you admit that Navy testing is causing it???? Cetaceans face enough threats, from toxic pollution to habitat destruction to death from impacts by ships, to outright killing by humans. Stop contributing to their deaths and cease all sonar and other testing that is harming them!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Dente (Electronic)	This can't be a fair process unless communities up and down the entire Pacific coast have hearings in them. I am completely against any military expansion, any sonar at all, and war games anywhere in the world. The military is bankrupting the nation, and creating terrorists by their oppressive presence and their brutal tactics. Bring the troops home. Stop the endless war for the profit of a few. End America's reign of terror, now!	Thank you for participating in the NEPA process.
Dente (Written)	STOP ALL SONAR TESTING!! TOTAL WASTE OF TIME AND OUR TAX DOLLARS PLUS IT IS KILLING UP TO 1600 WHALES AND DOLPHINS AND MAKING DEAF 11,200 MORE. GET OVER THIS WAR MACHINE ATTITUDE!! This nation will not be "done in" by nuclear missiles from the sea, but rather cyber space attacks. Any nation will think twice before disabling by nuclear missiles because they will have to deal with millions of dead bodies. But, knocking out all our satellites is a sure way to gain control of us. Meantime go clean up the radioactive waste ready to land on our beaches any day now. Do something constructive, not destructive.	Thank you for participating in the NEPA process.
Devine (Electronic)	I would like to make the observation that the supposed benefit of the scale of sonar testing/training does not justify the potential harm to marine wildlife. History teaches us that the majority of national security decisions relating to naval matters do not largely rest on technical or technological matters. The fact that the US Navy over-obsesses about technical matters has been noted by many authors. Indeed the decisive moments of US naval history have not been decided by technology but rather by poor decision-making and a lack of understanding of opponents motives. Pearl Harbor, USS Cole, USS Maine, USS Vincennes (CG-49), USS Pueblo, Gulf of Tonkin....etc. These are not	Please refer to Section 5.3.4.1.3 (Reducing Sonar Source Levels and Total Number of Hours) for a discussion on how the Navy uses active sonar at the lowest practicable source level and number of hours consistent with mission requirements. Strike groups are constantly evaluated and exercises are modified to ensure each strike group receives the training necessary to achieve required readiness levels.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	moments when history was changed by Sonar technology but by flawed decision-making. Better to save the marine life and concentrate on wargaming and proper decision-making. Sonar is only a tool but is becoming a fixation for the US Navy. The US Navy should also push for rules limiting the use of Sonar by foreign navies as well – to be enforced by international monitoring and sanctions if rules are violated.	
R. Devine (Electronic)	Errors may sometimes represent approximations to successes or correct paths; other times errors may reveal a total lack of connection to successful paths. Errors of misemphasis or overemphasis can be very serious, as in the U.S. Navy's testing of sonar devices, seriously affecting marine life yet not responsive to a clear and present danger. While sonar is a useful, and necessary device, the over-testing of finely calibrated sonar draws attention away from more serious military matters. Over testing can lead to a false sense of preventing dangers and divert attention from the most serious problems.	Please refer to Section 5.3.4.1.3 (Reducing Sonar Source Levels and Total Number of Hours) for a discussion on how the Navy uses active sonar at the lowest practicable source level and number of hours consistent with mission requirements. Strike groups are constantly evaluated and exercises are modified to ensure each strike group receives the training necessary to achieve required readiness levels. The Navy employs new technology where feasible to reduce impacts. One example is the use of passive sonar to listen for the presence of marine mammals prior to starting a sonar activity.
Diamond (Electronic)	Please do NOT test in ocean around Hawaii and California. Do NOT see any good that can come from such knowing torture our ocean life will go through. This type of testing and training is unnecessary. Please think of other ways that will not impact our oceans and environment to do testing/training exercises. Thank You for your time. If the Navy follows through with this kind of cruel activity, I will re-consider my support and thoughts towards the U.S. Navy. I will be sharing this issue with everyone I know on all types of media available. Thank You and hope you do not follow through with testing/training in Hawaiian/California waters.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Diaz (Electronic)	To whomever it may concern: im very concern that our marine wild life will be harmed by the navy testing of sonar in our oceans please think about our marine life whichis already been harmed by the E-230xtinctionE-230 as well excessive testing in the ocean waters. Stop the testing and save our marine life from E-230xtinction. Let our marine life live in peace and not in misery. The marine life is here for us to enjoy and not to destroy.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Dietrich (Electronic)	I am outraged at the navy's action towards our marine life and oceans. Using DISORIEBTING Sonar should not be used at all anywhere in the world. This is directly directed at all sea life, especially our marine mammals and other human species. I cannot believe that our own Navy is involved in the permanent destruction of our Whales, Dolphins and other Marine Life, destrying family after family with Sonar and also Target Practice. Who knows what else is being done to those highly intelligent creatures. I urge the end of this plan for a five year expansion to destroy our Pacific/Atlantic Coast. This inhumane practice needs to end. No more Sonar Killings of our earths mammals. Please Respect our Oceans.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. It is important to note that the Navy uses sonar not only for testing, but for training. In fact, the majority of the sonar use is related to training, training that is essential to the preparedness of deploying forces.
Disch (Electronic)	Please refrain from the planned bombing and detonation of explosives in the ocean. It will cause irreparable harm to marine species. It is cruel and unnecessary. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Doak (Electronic)	We must stop pretending that the effects of our human actions are unimportant and that the value human life is greater than other life, it is not. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Dobson (Electronic)	Please stop the undersea high frequency, or at least redesign it in a way the does not harm whales and dolphins. Your own estimates of killing 1800 whales and dolphins, and deafening as many as 15,900??? How are we any better than whaling nations like Norway and Japan? We aren't. The United States is being covert and hypocritical in allowing this. Naval practices are much more lethal to endangered sea life than any other "whaling" nation. This is WRONG.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically Navy records have had few to no mortalities from sonar or explosives. Any model predicting takes is only an estimate. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
Dooley (Electronic)	Please do not begin testing in the waters surrounding Hawaii puting any of these precious and amazing animals at risk of injury inCluding hearing loss or worse yet - death. The animals of this area are unbelievable and should NOT be put at risk for any reason. This is such a God given specacular environment and it should be preserved.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Dorothy (Electronic)	This is heartless and inhumane what gives you the right to take away or harm these beautiful creatures some of them may be gone forever how do you take this away from our children and grandchildren	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Downs (Electronic)	Sonar testing is dangerous to marine life,you are destroying life.This sonar testing is more dangerous than good...please stop!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
B. Doyle (Electronic)	I have recently read about the Navy's plan to use sonar testing which will damage hearing on whales and dolphins which will result in a slow lingering death to whales and dolphins whose existence now is hanging by a thread, a thread which connects all of us. We humans have done so much damage to this beautiful planet. The creatures on this	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	planet are to be revered and respected and yet we continue on with species disappearing on a daily basis. What is going to be left for future generations? Why do you need to test battle equipment when we are not at war, except a war in which the creatures and the environment on this planet struggle to survive in spite of damage caused by man to the environment. Every time a military "test" is conducted, every time a gun is made, every time a warship is launched, every time a rocket is fired steals from real things needed on this planet, including the whales and the dolphins you seek to destroy. Furthermore you are not spending and wasting just money and destroying endangered species, you are spending the work of people who should otherwise be helping this planet, you are taking the genius of its scientists who should be finding ways to save the environment and you are taking away the hopes of its children who should be able to see beautiful things in the world. Further as a taxpayer, and as someone who pays your salary and benefits and healthcare and pension and retirement and who also pays for the equipment you use and as someone who works 2 jobs to do so and as someone who cares about the environment, I am requesting a written response from you as to why this testing is being done and as to why these animals mean so little.	decade.
E. Doyle (Electronic)	I fail to see the long-term term benefit of endangering a species that are already under a great deal of pressure. I urge you to reconsider.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Dozier (Electronic)	I understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree by taking certain steps. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Drake	This should have been stopped long ago.	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
(Electronic)		
Dressin (Electronic)	We are saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. We look forward to hearing from you with your views on the above, if you have any queries please do not hesitate to contact us, yours, Aaron Dressin	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Duggan-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Duggan-02	What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Duncan (Electronic)	I am very concerned about the impact your testing will have on our precious marine mammals. There is so much destruction and toxicity already in our oceans. Please reconsider and make the best choice for all of life.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Dux (Written)	I find it an insult that the Navy should use the word "Green" or insinuate that it is such to boost its tarnished image. We are all aware of the damage this branch of the military has	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	done to the Environment. No amount of cardboard colored pictures can undue that knowledge! Your "War Games" are an assault to this wonderful Earth. I challenge you to cease and desist your activities in our oceans and work towards a sustainable Peace to the Planet. If you find these words strong it is because your presence on Kauai waters and elsewhere have inflicted much harm to life there.	
Eaise- (Electronic)	I am writing to ask that the Navy protect marine animals from explosives and sonar along the east coasts and California/ Hawaii coasts. Please rethink your plans and incorporate protective measures for marinelife. I thank you! Ms. Florence Eaise	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Eaton (Electronic)	Sonar and radar impact the whales and dolphins in a harmful way. Please discontinue testing in their waters.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ebert	We are saddened to hear that the Navy is considering conducting exercises involving	The Navy is committed to protecting the marine environment during

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
(Electronic)	the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. We look forward to hearing from you with your views on the above, if you have any queries please do not hesitate to contact us, yours, sophie ebert	the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ebrahimian-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ebrahimian-02	What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	development of alternatives. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Eck (Electronic)	Please think about what you are doing before you act. Much of the marine life will be needlessly destroyed if you proceed with these tests. Surely with your advanced technology you could find less destructive means to make your target. I ask that you please put an end to these training tactics and keep our ocean life safe the same way you keep this country safe.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Currently sonar is the best means of locating small objects in the water The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
A. Edwards (Electronic)	Please do as little testing as possible that would harm the marine life...dolphins and whales, etc. We appreciate your exercises to keep America safe! But also don't want to harm marine life!!! THANK YOU!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
D. Edwards (Electronic)	I am a gainfully employed citizen who has served in the United States Military. I am not a 'tree-hugger', or some wild-eyed lefty. I believe in having a robust military that is capable of defending our country. However, the routine sacrificing of so many marine mammals in the name of national defense is unacceptable. These are intelligent animals, and are a vital part of our marine ecosystem. We, as humans, can figure out alternative methods to meet our security needs….. we are better than this. Respectfully, David Edwards San Diego, CA	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Elise (Electronic)	"NO SONAR IN OR NEAR HAWAII, NO SONAR IN OR NEAR CALIFORNIA, NO SONAR IN THE PACIFIC OCEAN, NO SONAR AT ALL! STOP!!!!!!!!!!!!!!!! IT TORTURES AND KILLS WHALES AND DOLPHINS!!! dO YOU REALLY WANT THIS???	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Engert (Electronic)	Please consider steps to reduce the harmful impacts to marine mammals of the planned training exercises. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that extraordinary numbers of whales, dolphins, and porpoises might be harmed or killed. Please re-think the training exercise plans as they are	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	currently proposed and incorporate additional protective measures. Thank you.	actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Engh (Electronic)	I concur with John Flynn: I too am saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. Please give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. I look forward to hearing from you with your views on the above. Sincerely Yours, Maureen Engh	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ephigene-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive.	been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ephigene-02	What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Epperson (Electronic)	Is it true that our Navy's use of high frequency underwater sound for testing in Hawaii, the California and Atlantic Coasts, and the Gulf of Mexico could deafen 15,900 whales and dolphins and kill 1,800 more? If yes, I petition that the Navy stop this program. Thank you, Kathleen	See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded few to no mortalities from sonar or explosives. Any model that is meant to predict future takes on marine mammals is only an estimate.
Amanda Evans (Electronic)	It is utterly inconceivable to me how backward, inhumane and sociopathic the Americans can be when it comes to their defense forces. You cut the legs off live goats, train and kill dolphins and dogs and now you propose to wipe out millions of marine mammals for some testing. GET OVER YOURSELVES. This is not your planet to destroy. One day in history people will observe you and your actions and they will be horrified by how blinkered and backward a society you are. It is inconceivable to me that a government	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	would even allow such a violent and destructive training practice to ensue. I will circulate this story on my blog, facebook and all over the internet if this really goes through. People in the world are waking up to you and your dastardly acts. This is an opportunity to do the right thing - DO IT. Amanda Evans	testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Amy Evans (Electronic)	You need to re-thing your testing ideas and consider the thousands of helpless mammals you are going to injure and kill. What about considering the environment and the animals in it that we continue to distory every single day. The Navy should go back to the drawing board and think about what impact its having on the world in which we live in; the world that is not going to exist for long if we continue are distructive human ways. As an American citizen who pays taxes, I strongly urge you to stop this and please reconsider the very harmfu actions you are about to take.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
D. Evans-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate,	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	communicate and survive.	with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
D. Evans-02	What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
E. Evans-01 (Electronic)	The U.S. Navy is proposing to conduct training exercises all along the U.S. East Coast and in the rich marine environment off the coast of California and Hawaii. These exercises would involve the use of live explosives and high-intensity sonar. According to its own Environmental Impact Statements, the Navy estimates that the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. THIS IS NOT EXCEPTABLE! The careless project would not just kill a few already ENDANGERED marine mammals but thousands! What will there be left?? The environmental impact would be devastating!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded few to no mortalities from sonar or explosives. Any model that is meant to predict future takes on marine mammals is only an estimate.
E. Evans-02	This not only affects all ocean animals but humans as well! Not only do oil spills and Asian countries such as China and Japan hunt hundreds of whales and dolphins and other marine mammals. But THE UNITED STATES OF AMERICA is posing a threat worse??? The navy is a brave organization and does many things for our country but this new proposed plan and the effects it will create is just wrong!! I thought we were smarter and more civilized them that! America wants to help the earth not destroy it! That's what makes out country great! We take into consideration things other countries don't! Well this proposed act is NOT doing anything to help the country but destroy part of the planet EVERYONE shares!!! God made this planet all the animals, the enviorment the fish in the sea Everything! It's not meant to be risked or be destroyed. We are smarter then that! I pray this act gets overturned! People who swim in the water will be exposed to the harmful effects as well! The fish that humans eat from the ocean will be contaminated with radiation as well leading humans to be internally affected!!This new project is not a far cry from the numerous atom bomb tests in the 50's. Except it will permantly damage much more! PLEASE PLEASE consider differant options for this project! All of us share the planet animals and humans! Please help it to be better for the future!!	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. The Navy used the best available science and a comprehensive review of past, present and reasonably foreseeable actions to develop a robust Cumulative Impacts analysis. See Chapter 4 of the EIS/OEIS.
K. Evans (Electronic)	THIS IS SO DISRESPECTFUL TO THE BASIC RIGHTS OF THE OCEAN, AND THE INHABITANTS OF THE OCEAN, AND THEREFORE ALL LIVING THINGS BECAUSE WE ARE ALL CONNECTED AS ONE LIVING EARTH. FOR GOD'S SAKE, PLEASE STOP THIS INHUMANE BEHAVIOR/PROCEDURE!	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Fain (Electronic)	I can appreciate how live testing is a better form of training, but the detrimental consequences to marine and mammal life are so great I am against this training and testing program. Sincerely, Marla Fain	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Fallon-01 (Electronic)	I find it appalling and deeply disturbing that this level of damage to marine creatures is being contemplated. There must be some way, or hopefully many ways, to reduce these terrible consequences.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Fanizza-01 (Electronic)	Unbelievable,that our own Navy would cause such pain and death for our marine mammals. You must stop!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Farhadi-01 (Electronic)	When I heard about the U.S. Navy's Environmental Impact for training and testing in the ocean around Hawaii and California during the next five years I was shocked. I wish to be added to the petition to stop such activity. Thank you!	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Fergerstrom (Oral-Hilo)	Please excuse me. I am grossly unprepared for this. I did not even know of this meeting or that the process had gone this far until yesterday afternoon. One of my major concerns is, is that I've been involved with the military buildup here in the islands. Aloha.	The Navy shares your desire to preserve marine life. The Navy believes that the proposed training will not pose a risk to marine mammals, fish, and other wildlife given that these same activities have

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	My name is Hanalei Fergerstrom. I am a spokesman for Na Kupuna Moku O Keawe, which encompasses all six major districts of the island of Hawaii. So for those of you who do not know, this is the council of the elders. I'm also a haumana of the Heiau O Lono. This is a religious organization (inaudible). Anyway, I have been involved with the military buildup here for over 12 years. I was involved with the low sonar frequency testing that was done here, I believe, about 12 years ago. I actually filed suit against the Navy. During that time, my suit was denied because it was basically moot. You were just pulling out of Hawaii. But I am on your mailing list, so I am very shocked that this has gone this far and I have not been provided with information. As you know, information is critical for a proper response. I have been working with different branches. I've spent the last two years working with the Army on the Pohakuloa buildup, which is actually coupled with this in some fashion or form. Again I'm a little bit outraged because I do not have this information. I am grossly unprepared, but I have to try to do something. I have been successful in getting myself on the mailing list. People are aware of me. I've been promised a hard copy because I need the hard copy to make a proper response by your July 10th deadline. Of course when I looked at your timeline, this has been going on for quite some time, and if I had had this information from the start, perhaps I would not feel so intimidated and overwhelmed. One of the things that is extremely important to add into this fray of things is that the environment includes me. I am a part of this environment. The Hawaiian people, the Hawaiian Islands are part of this environment. It is not just the ocean. Secondly, because a lot of this testing that is going to be done or this project that is going to be deployed is going to be done in large part in international waters, and when you talk about in the EIS, it affects many countries -- and I refer to subjects such as RIMPAC -- that other countries also need to be informed of where you are and participate in the EIS process because it affects all the Pacific region. Sorry. You threw me off with that one-minute thing. Please don't hold me to that. As long as we make sure, I'd like to utilize the time. Again I am grossly unprepared. I did not find out about this meeting until last evening. And interestingly enough I went to the Pacific Command to try to get some information, and Google cited it as an unsafe link. That's something that you should be aware of. As I said 12 years ago, the kohola and the nai'a that are the most impacted that have been most frequently (inaudible) are not just large fish. They are my family, my blood, my blood, which can be established through the Kumulipo, the Hawaiian creation chant. I am also a Hiapo Na Koa O Pu'ukohola, or the Warriors from the Mound of the Whale. So we are very familiar with this. We are very, very concerned that a whole lot of things are not being considered. You refer to the larger species of mammals like the porpoises and the whales, but we are island people, and so the effect on smaller fish and the crustaceans and how it affects -- Okay. So you see the problem we have here, not being able to talk about this because how can you possibly do this if you're constantly cut off after three minutes? Thank you, and I want to register my objection. Thank you.	been conducted for many years in this Study Area and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. The Navy is not aware of any documented cases of sonar harming people.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Ferry (Electronic)	I am in the UK - I volunteer for a charity which rescues stranded marine mammals. Have you ever seen a whale up close, & tried to help him survive? No, I think not. All animals are precious, as humans we are responsible for caring for them & protecting them, not continually destroying them & their habitats. You should be ashamed this activity is even being considered. You need to rethink your plans, with immediate effect.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Firestone (Electronic)	Please do not do this! These beautiful animals have a right to live in their ocean without being killed or deafened by YOUR TESTING. This is their home, not yours.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Fischer (Electronic)	Please do not allow any marine life to be damaged in any way by any training, testing, or drills of any kind. I am very pleased to see that the Navy does have a program in place to protect marine life. My sincere hope is that this program is implemented and carried out with the highest standards of integrity,and that integrity will be unfaltering. Marine mammals are threatened in so many ways at this time. We must all protect these species from any further abuse. I thank the Navy for stepping up to the plate, and responding with a program to protect these precious creatures. Most Sincerely,	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	Antoinette Fischer Wife of a Wartime Navy Veteran	Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
K. Fisher (Electronic)	Please cease and desist and do not further plan to test explosives and utilize sonar and other devices which will disrupt and harm Marine life, particularly cetaceans.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
S. Fisher (Electronic)	Please DO NOT conduct training exercises all along the U.S. East Coast and in the rich marine environment off the coast of California and Hawaii. There is no need for the use of live explosives and high-intensity sonar that kills our ocean life. They have just as much right to live freely without threat as all the humans of the earth.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Fitting-Gifford (Oral-Kauai)	I haven't had the opportunity to read your draft environmental impact statement in completeness, but I did notice one particular little item. And I hope that the rest of the report was not done with as much brevity and lack of concern as this one. It's on page 13, and it's about social economics. And it reads, Impacts from the proposed action on social economic resources would be short term and temporary and, therefore, negligible. If we look back over the economic impact of having the military here in Hawaii since 1940, later, during my lifetime at any rate; I think that we find that the social economic impact is tremendous. The report talks about the practice in bringing people out here to serve and giving them practice in different techniques on the way out. But they don't say	The Hawaii-Southern California Training and Testing EIS/OEIS Proposed Action does not include any actions that result in individuals being based permanently in the Study Area; therefore, no analysis of the economic impact of real estate is warranted. Other socioeconomic issues are described in Section 3.11 (Socioeconomics) of the EIS/OEIS.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	anything about taking them back. And our habit has been here that when someone comes to Hawaii and loves our country as much I do, that they don't want to go home. And one of the impacts, the long-range impacts, is certainly the governor's and the state deciding that we should take a thousand acres of our farmland on Oahu and turn it into houses for people to live in. Clearly the military has contributed significantly to the demand for homes on Oahu, if not here on Kauai as well. Hence, I would like to see in particular this item expanded and some of the ramifications of our social economic policies as far as the military goes in terms of permanence be considered more fully. Thank you.	
Flagg (Electronic)	I support the following statement by Dr.Gans: There is much we don't know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return because of education and protection. We have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing. Most sincerely, Patricia B Gans MD	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Folman (Electronic)	Please stop the abuse of marine mammals through the U.S. Navy !!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Ford (Electronic)	We understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. PLEASE protect marine mammals from explosives and sonar!!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded few to no mortalities from sonar or explosives. Any model that is meant to predict future takes on marine mammals is only an estimate.
Forst	Hi, What is the Navy doing to animals off the coasts of California and Hawaii? Please	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
(Electronic)	think of them before you start. Thanks, Fran	analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Forsythe (Electronic)	Please incorporate additional protective measures to protect the dolphins and other marine mammals, please consider them . What a horrible painful death they suffer . Being The United States Pacific Fleet of the U. S. Navy, i feel that it is your duty to protect all creatures God has created. After all it is their home that was created for them ,that you encroach upon exposeing them to danger .Thank you for taking the time to read this comment. I `m counting on you to do everything that can be done to protect our marine mammals .	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Denise Foster (Electronic)	I am here to raise my voice for those who can not speak for themselves to STOP the US Navy's War Technology and War Game Expansion that is directed to destroy all Sea Life & Marine Mammals!! There is NO need to "test" ANYTHING with sonar! YOU ARE KILLING MINDS OF THE OCEANS!! I'm sure you wouldn't like it! WHY DO IT TO THEM?!! PLEASE STOP ALREADY! ENOUGH IS ENOUGH!!	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
David Foster (Electronic)	I understand national security, but is the risk that great that our Navy has to bang its sonar so loud that it disorients and damages the creatures in the sea? I work with a former sailor and he thinks not. Yes, he's just one and I am just one, but collectively we are all. What is done must be done for the good of all. I am not convinced that these "war games" and sonar tests are necessary due to such a great threat. Do we really have an enemy what will attack us from the sea? The enemy can get to us without that and proved it on 9/11/01. Do we really have intentions of attacking another country? There is no winner in war. If we destroy the sea life, we destroy ourselves. Man must evolve and stop leading us all to extinction. We don't inhabit this planet. We are an integral part of the Earth life system. I would hope that the one that claims to be the most intelligent species on the planet would not responsible for destroying it. Sincerely, David J. Foster	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Currently, sonar is the best means of locating small objects in the water. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
Peter Foster (Written)	Opposed.	Thank you for participating in the NEPA process.
Fox (Electronic)	Please mitigate and reduce the impact of sonar and explosives testing on dolphins and whales. These are intelligent creatures whom we, as the superior species on the planet, are charged to protect over the long haul. We must protect them! I recognize the need for military testing but the protection of the environment and sea life must be a priority too. We are all on this planet together. Do you want dolphins and whales to be here 500 or 1,000 years from now for example for our descendants to enjoy and interact with? I certainly do. So we must shepherd them carefully now.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Franco (Electronic)	I live on the ocean, my work involves photographing and documenting any cetaceans I come in contact with off the Western Coast of Oahu. The idea that we are injuring the animals we learned Sonar from simply befuddles me. I've read the reports and done my research and am still opposed to this proposal.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Free (Electronic)	We are saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. We look forward to hearing from you with your views on the above, if you have any queries please do not hesitate to contact us, yours,	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Freehill (Electronic)	This comment is about the Navy Sonar Warfare Testing program in the Pacific. There is ever increasing evidence and clear indication that simply turning off sonar tests when marine mammals are visually spotted is not sufficient to protect them from serious injury and death resulting from these tests. This testing is devastating to vast numbers of marine mammals. Knowing this, I can only implore those reviewing this practice to immediately STOP these tests. They are injuring and killing precious and defenseless marine mammals. I refer you to NRDC article documenting this "staggering" and severe harm here: http://www.nrdc.org/wildlife/marine/sonar.asp and here: http://switchboard.nrdc.org/blogs/zsmith/harm_of_staggering_proportions.html The WASHINGTON POST stated that: (Associated Press) May 11, 2012 – "New Navy study says use of sonar, explosives may hurt more marine mammals than once thought "…HONOLULU-The U.S. Navy may hurt more dolphins and whales by using sonar and explosives in Hawaii and California under a more thorough analysis that reflects new research and covers naval activities in a wider area than previous studies…" "The Navy estimates its use of explosives and sonar may unintentionally cause more than 1,600 instances of hearing loss or other injury to marine mammals each year, according to a draft environmental impact statement that covers training and testing planned from 2014 to 2019. The Navy calculates the explosives could potentially kill more than 200 marine	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	mammals a year" Please tell us how, with this brutally painful injury imminent and clearly KNOWN, the Navy can continue this destructive warfare testing? “Mass dolphin deaths in Peru caused by acoustic trauma” were announced by “…Dr. Carlos Yaipen Llanos of ORCA in Peru informed Hardy Jones of Blue Voice that acoustical trauma is the cause of the Mass Mortality Event (MME) that killed an estimated one thousand dolphins along the coast of northern Peru in March 2012…”. Digital Journal News Report – “Mass Dolphin Deaths in Peru Caused by Acoustic Trauma” May 17, 2012 - Read more: http://www.digitaljournal.com/print/article/325075#ixzz1vnKmJkGL http://www.digitaljournal.com/print/article/325075 This is another reason to begin to limit sonar, laser, radar, and electromagnetic weapons testing in the Atlantic, Pacific, and the Gulf of Mexico. Some more documentation here about the connection between tests and MARINE MAMMAL STRANDINGS ASSOCIATED WITH U.S. NAVY SONAR ACTIVITIES April 2012: http://hstteis.com/Portals/0/hstteis/SupportingTechnicalDocs/Marine%20Mammal_Stranding_Report_v02.pdf Thank you for your attention and serious consideration of this comment & grave matter. May true honest intelligence & moral compassion guide your decisions in this matter.	whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, “(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching.” When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60’. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in “calm sea conditions” is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier’s and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the “one or two personnel” described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy’s reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Freeland (Electronic)	Thank you for taking the time to read this letter and authentically consider its message. And thank you for the in depth assessment the Navy has produced in its EIS report regarding the impact of sonar weapons testing on marine mammals and seabirds in the Pacific region. My father served in the Navy in the Korean war and I am grateful to those who serve in the Navy for any contributions they have made to make the world a better place. However, when it comes to the issue of underwater sonar testing which include underwater detonations, explosions and high frequency sonar blasts, I have to voice my opposition. Who will defend the defenseless sea creatures and eco systems of the ocean from these violent disruptions? As stated in the Navy assessment, many deaths of dolphins, whales, and other marine mammals will result from escalated sonar testing, as well as lung and gi tract damage and traumatic stress. This level of stress will affect mating and the robust propagation of these species. In your assessment, however, you did not calculate the toll of human suffering. When large numbers of deaths and declining populations of of these majestic marine mammals occur, consider the psychological suffering it will incur on people who love God's creatures. There is a highly evolved level of communication and empathy between humans and the dolphins and whales. If the tax dollars of millions of Americans continue to be used to fund weapons systems that aggressively and violently disrupt the eco system of the ocean, it could result in a domino effect of population decline and down the road, possible extinction, of these vulnerable populations of marine mammals and other sea creatures. If this occurs, all humanity will suffer a profound loss. To ponder the loss of these majestic marine mammals tears at the very fabric of how humans make sense of the meaning of life. If being alive as a human being on this planet means that we helplessly participate in the perpetuation of endless conflicts, ceaselessly manufacturing weapons of destruction to blow up underwater, overwater, in the air and everywhere we can manage to explode something, with the end result of polluting and destroying the very air, water, food and shelter that we depend on for life ...then why even be here at all? Is this how God intended for human beings to "steward" His precious creation? Just reading the Navy report on projected mortality rates, damage to the lungs and gi tracts and traumatic stress to dolphins, whales and monk seals, actually makes me physically ill. We live in	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	Hawaii where the economy is driven almost exclusively by tourism. Can you imagine dying dolphins washing ashore on Waikiki beach witnessed by hundreds of shocked visitors? Can you imagine hundreds of live videos being beamed instantly around the world showing people the world over this tragedy? Can you imagine what may happen if people realize they have been paying the government 60% of their tax dollars over a lifetime of dutiful IRS contributions - to fund this insanity? It's not humane, it's not necessary, it's not right, it's not pono. It's a nightmare. The dolphins, whales, monk seals, turtles - they are a part of my family. You are using my money to kill my own family. That is an outrage. The US spends more money on "defense" than 60 major countries combined. We see that our government is building up a military presence in the Pacific. We see that the Navy is planning on escalating the sonar testing three fold. I am a Hawaii resident. I don't want the Navy to continue to detonate explosives in the ocean waters surrounding the Hawaiian islands. I don't need that to happen in order to feel safe, secure or protected. As a matter of fact, underwater military explosions and sonic blasts create the opposite feeling - that the ocean is no longer a safe place to fish and to swim, that the very balance of the oceanic realm is being violently disturbed and that makes me feel personally violated. I want the killing to stop, I want the destruction of the ocean to stop. I want this madness to end. No more detonations, explosions, drilling, mountaintop removal, poisoning and polluting. It must stop. If we have any interest at all in leaving behind a world worth living in for our children's children and beyond. We must shift our global attitude from "Every man for himself" to "We're all in this together". Again, in regard to the continuation and escalation of Navy sonar weapons testing in the Pacific ocean, I am appalled at how my tax dollars are being used. It implicates me and every other tax paying American in the destruction of the planet and the killing of defenseless marine mammals. Respectfully, Candace Freeland Kapaa, Kauai, HI 96746	
Freeman (Electronic)	As a concerned voting citizen, I strongly wish to register my wishes that no, repeat NO, whales, dolphins or fish be injured, impacted or killed by any actions of the US Navy or other military groups. Thank you!!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Freitas (Electronic)	To whom it may concern, Almost everybody agrees that we need a robust and strong Navy to protect national security. And almost all of us agree that whales, dolphins, and porpoises deserve to live and to have a healthy ocean environment. We understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. We know that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. Pleaser consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Please re-think your plans and incorporate additional protective measures. Thank you. Sincerely, Tatiana Freitas	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
French (Electronic)	You can't be serious about the sonar testing being a good thing?! Really??? DON'T DO IT!!!! Being a monster is not cool.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Fuchs (Electronic)	No sonar in Hawaii or near Hawaii - this is a sanctuary and needs to be protected and RESPECTED - even by the Navy. Sonar kills!!!! and it kills the innocent, wahles, dolhins, turtles, fish, monk seals and the ocean - haven't you done enough damage to the	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	oceans yet??? how come you ignore life that much???? STOP IT!!!!!!!!!!!	Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Furukawa (Electronic)	Please utilize methods to ensure national security without sacrificing the lives of so many marine creatures (some that are endangered) and without causing permanent damage and suffering to thousands of others. How about safety zones? Avoiding seasonal feeding areas and calving areas? Take time to research the areas before moving forward. "The greatness of a nation and its moral progress can be judged by the way its animals are treated"- Gandhi	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Futral (Electronic)	I understand that for safety & security purposes ship hulls need to be tested for strength. However, believe if we can send men to the moon & can have humans orbit our planet on a space station, we can find a way to test ships without causing harm to the ocean-life we've not yet exterminated. I'm from a NASA town & grew up in a NASA family so I know our government has the know-how. Perhaps funding could be diverted from the testing to find out why monkeys fling their poop. Don't laugh, this is listed as a current legitimate budget expense of our government. We can't keep killing off these amazing creatures in our [*Incomplete comment presented as submitted.]*	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
Gaalaas (Electronic)	Please consider modifying your training methods to avoid injuring/ killing marine mammals in the Calif and Hawaii waters.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Gallegos (Electronic)	Stop the Naval exercises which would do great harm to marine life living in the waters where the U.S. Navy proposes to experiment. These exercises would causes permanent or temporary damage to animals' hearing and lung damage to the marine life. The marine life in the proposed area deserve to live undisturbed by human contamination. Much work has been done to conserve the species and endangered species, such as the right whale, would be affected. Why does the Navy ignore the fact that all life is reliant upon one other? We are many species of creatures that make up our earth. Being a good steward of this earth is our first responsibility. Harming marine life does not uphold this practice.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Garman (Electronic)	I beg of you to please consider some other way of testing this equipment that will be harmful to delicate marine life that is under siege by so many other environmental hazards. Surely your scientists can find a method of testing that will not cause pain and death to our fellow creatures.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
Garner (Electronic)	Please consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Gawboy (Electronic)	Hello U.S. Navy, I will comment on your plans to expand on the 5 - year Warfare range in the oceans surrounding the United States of America. I have read a tremendous amount of information on the subject, and I have attended a meeting with representatives from the Navy talking to the public at the Wharfinger building in Eureka, California. I met someone who saw the whale that traveled up the Klamath river that later died there. We know that the sonar testing is hurting the cetaceans in large numbers and this is unacceptable to me and many others. We know that a lot of the bombs that are tested and even ship cleaning procedures pour toxins into the ocean. Maybe some people think the ocean is big enough and can take it. But we know that there are now huge dead zones forming in the ocean. We eat fish from the ocean and they are becoming more toxic due to many things including pollution from the Navy. I know that even the oceans have a finite ability to take our abuse and keep the wildlife thriving. There are other ways to protect this nation besides more bomb and sonar testing. One is to actively developing peaceful, fair, and just relations with other nations. We need to be spending more money on communicating, and rearranging our priorities so we do not have such fearful "enemies". We are smart enough as a people to do this. We are aware that there are some corporations that make a lot of money selling weapons and when they are used by testing, more have to be made and sold. I am saying that the motive for polluting our oceans, damaging our wildlife, and threatening the health of our people may not be based on our protection, it may be based on greed. I do not fear these other nations, more than I fear the system that allows you to pollute and harm us so severely. So I am asking you to create a new policy, that will instead protect our oceans and in turn the health of the people of our nation. Like I said before, we need to make a concerted effort to make peace, that is the best defense. I understand that some people are not ready for peace and we still need a military that is well trained. I have faith that we can protect ourselves without escalating our use of weapons. The other point is that if we keep testing at this rate, there will be no nation left to protect. So you just need to come up with healthy alternatives to protecting this land, sea and nation. Give us a chance to restore the health of our surroundings. That would be the best defense. Thank you, Stephanie Gawboy P.O. Box 871 Redway, CA 95560	The Navy is not proposing to expand the areas in which it conducts training and testing. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, “Today’s simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments.”
Geddes (Oral-Kauai)	My comment was somewhat the same because I go halfway to the bank. So it's a 13-hour run and 13 hours back. And so the ops, I get a hold of some of my buddies on the base, yeah. And they let me know. But if there was an easier way because sometimes it's hard to get ahold, and then the schedule gets changed, and we get kicked out. We got to go 80 miles south, and then we get ahold of da kine Honolulu Coast Guard then maybe day, day and a half, and so a couple days where we no can fish 'cause, you know, so it's a mile and a half deep. And halfway bank, you know, it's all about the up, you know, the up, the shallows. And so yeah, just give us a better, some way to know your scheduling of your practices. One other comment. Please don't get mad. A lot of	Navy training and testing activities have the potential to temporarily limit access to areas of the ocean for a variety of human activities associated with commercial transportation and shipping, commercial recreation and fishing, subsistence use, and tourism in the Study Area. As discussed in Section 3.12.2.1.1 (Sea Space) of the Draft EIS/OEIS, when training or testing activities are scheduled that require specific areas to be free of nonparticipating vessels due to public safety concerns, the Navy requests that the U.S. Coast Guard issue Notices to Mariners to warn the public of upcoming Navy activities. Training

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	you folks, you know, you plenty compassion for the animals, and I understand that. But I don't know if you ever done outreaches Cambodia, Vietnam. I'm a Vietnam vet, and so I did other things after that and have the heart for the people, you know, because 99 percent of the world is starving. It's all about where the next job is come from because no can afford their rice. And just remember the people, too.	and testing activities occur in established restricted or danger areas as published on navigation charts.
George (Electronic)	Please protect marine mammals from explosives and sonar. Please consider steps to reduce the harmful impacts to marine mammals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Georgi (Electronic)	(1) Noticed one typo on page 365 of volume 2. The name of the port on Kauai is Nawiliwili, not Hawiliwili. (2) Other than that, the EIS is reasonably thorough, and alternative 2 represents a good balance of protecting our national security interests versus endangered species, etc. (3) In the past, I worked at PMRF for 16 years and saw major exercises delayed (once for 2 days!) because marine mammals (whales) were in the operations area. (4) The Navy tries to stay 1,000 yards away from marine mammals. If a skipper gets too close, it can end his/her career. On the other hand, whale watching vessels are allowed to approach to 100 yards of whales...and if they get closer, the crew may get bigger tips! The encouragement of whale watching is far more dangerous to the whales than the proposed Navy actions under the EIS!	Thank you for your comment. The error you pointed out has been corrected.
Germano (Written)	Opposed. Stop what you are doing. You have no respect for the ocean. Hawaii is a natural country. You military forces yourself on our country. We do not need you to destroy the life of our air and ocean. The only one that want war is you. This ocean belong to those whom love Mother Nature.	Thank you for participating in the NEPA process.
Gherini (Electronic)	Please don't do this. These creatures are part of California and America's population, and I cannot proudly say im an American and let this happen.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Gibson (Oral-Hilo)	I'm Inga Gibson. I'm the Hawaii State Director with the Humane Society, United States. We will be submitting formal written comments, but I wanted to make a few comments for the record, if I may. We are very concerned, obviously, with the potential impacts on marine mammals and other animals in the Pacific and Hawaii. We're especially concerned about the potential permanent and temporary hearing loss, lung injuries, gastrointestinal injuries, and death. We understand that there's no presentation or analysis of alternatives at this time that would in any way significantly reduce the unprecedented impacts and level of harm to these marine animals, many of which are protected under both the MMPA and the SMR, or in some cases are critically endangered, such as the Hawaiian monk seal. We are concerned with the Navy's mitigation scheme, centered on the ability of lookouts for whales and dolphins, and do not believe that it will result in an appreciative decrease in marine mammal take. Furthermore, we are concerned that the Navy appears to dismiss what is acknowledged to be the most effective means to reduce marine mammal take and avoiding areas associated with high marine mammal density. That, again, is what we would like to see, is an avoidance and a better scheme in avoiding altogether some of the areas where there is strong marine mammal presence. We also encourage the Navy in their continued efforts to be seen as an effective steward of the ocean environment to take steps to significantly reduce the level of harm in training and testing activities. Again, we'll be submitting formal more detailed written comments. There is also concern about the significant increase in the proposed takes under the new DEIS from the prior EIS and the numbers of animals potentially impacted. Also a concern with the verification of take, and the methods used to verify take, if that is even verified. Again, thank you for this opportunity.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ginsbach (Electronic)	How does a human mind get to the point where this type of deadly testing would even be considered?? You guys must be well on the way to the crazy house if you go through	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	with killing all these innocent sea mammals. There are always other methods available to do this research.	analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Gitzel (Electronic)	Please, please, for the mercy of the living creatures who reside in the ocean STOP THE UNDERWATER SONAR/SOUND TESTING. The US military is without question, the strongest, most advanced military on our great blue planet. It is now time for our great military to make its future technical advances in humane ways. As a future resident of Hawaii, I speak out for the whales and dolphins who cannot be heard but who CAN HEAR YOU. They are suffering greatly from the effects of underwater sonar. Dolphins and whales use sonar not only to navigate, but to communicate with each other. Our sonar testing, much louder than their own voices, drowns out their own calls, destroys their hearing, and can lead to loss of life. Please, please be conscious of how sonar testing affects them and cease this practice. We can use our technical prowess to create lab environments to test our equipment. Thank you sincerely for your consideration.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Gobioff (Electronic)	It is outrageous any action would be taken that would put whales and dolphins in harms way	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Godin (Electronic)	I am writing to voice my concern for the marine life so negatively affected by the sonar testing being done by the US Navy. I strongly object to thIs manner of testing. Every effort should be made to make sure that this practice is halted. The ocean life whose home is invaded and whose livlihood is jeopardized are creatures of the Earth like you and I. If anyone bombed the US, killing and maiming American people, and impairing our ability to obtain food, surely the US Navy would be sent forth to protect and aid the people. Marine lives depeNd on US to speak up for them... No whales will come from the ocean to wrong Navy testers in the way they have been wronged but that merely makes them vulnerable & defenseless - not expendable. Use those sonic testing apparatuses to locate your hearts, please!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Goden	I hope that the concerns of many regarding this sonar testing find their way to listening ears, dEspite any troubles encountered while submitting this form...	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, “Today’s simulation

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Gold (Electronic)	Please, for the love of G-d, stop the underwater sonar-sound testing. It is a cruel practice that destroys the quality of life of our dolphins and whales, who have no voice and no choice to protest this assault on their lives. It destroys their hearing, which in turn makes it impossible for them to communicate with each other, something essential to their survival. I beg you to take this into consideration. Thank you, Talia Gold	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Goldman (Electronic)	Stop any and all of this abuse to the animal's the only thing your doing is wasting tax payers money that could be used to teach and help find the veterans jobs and schooling	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Goldsmith (Electronic)	Cetaceans have been described as "non human persons" by scientists...this is extremely distressing and disgusting for me. Please cease this program!	Thank you for participating in the NEPA process.
Goldwyn (Electronic)	I'm appalled to hear about the proposed testing because of the impact it will evidently have on the hearing and very lives of so many precious whales and dolphins. It's hard to believe that the extensive damage to these mammals is worth the benefits gained from the testing. PLEASE... do not proceed with this testing. Thank you very much. Lori Goldwyn	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Gomez	Opposed.	Thank you for participating in the NEPA process.
Gonzalez (Electronic)	Stop the testing now! You are hurting and killing countless animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Goodwin-01 (Electronic)	Of course, the marine ecosystem would be best served if the Navy cancelled this exercise. That decision makers conclude that there are overriding consideration is a	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	topic for another venue: Is it possible to simultaneously prepare for war and prevent war? The Navy and NMFS by admission don't understand the current level of health of the eastern Pacific basin ecosystem and are guessing at the impacts of this exercise. For a scientifically correct and ethical study there must be research and data collection to establish a baseline against which future studies can be measured.	Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. The Navy has used the best available science in the development of this EIS/OEIS.
Goodwin-02	The Navy needs to be more aggressive in publicizing the scoping sessions to promote community awareness and participation. An item on the back pages of one newspaper is insufficient when there are many media, government and civic organizations that can get the word out. The Nay plans only one scoping session on the west coast, in San Diego. They should occur in communities north through California and Oregon where impacts from the exercise may be felt.	NEPA requires federal agencies to provide opportunities for meaningful public involvement. For this EIS/OEIS several opportunities have been afforded the public to become involved beginning with the 60-day scoping period that commenced with the publication of a Notice of Intent to prepare an EIS in the Federal Register on July 15, 2010. Advertisements were also published in local newspapers. During the scoping period, six public meetings were held where Navy staff members were available to answer questions and take comments from the public. In addition to holding scoping meetings, the Navy made significant efforts to notify the public to ensure maximum public participation during the scoping process, including the distribution of stakeholder notification letters, postcard mailers, press releases, and newspaper display advertisements. The release of the Draft EIS/OEIS initiated a 60-day public review period. The Navy announced five public meetings in the Federal Register and local newspapers. These public meetings provided members of the public opportunities to learn about the proposed action and its potential environmental impacts and comment on the Draft EIS/OEIS. The public was also offered the opportunity to comment on the Draft EIS/OEIS via an internet web site and via the U.S. Mail. Comments received during the scoping period were considered in the development of the Draft EIS/OEIS. Comments received on the Draft EIS/OEIS have been considered in the development of this Final EIS/OEIS.
Goodwin-03	Because the proposed exercise is more intense in its use of sonar and explosives than anything before attempted, the Navy should instead maximize computer simulation practices to mitigate harm. The Navy should conduct minimal as possible exercises as far from marine habitat, especially habitat of endangered species, as is possible.	As described in Section 2.5.1.3 (Simulated Training and Testing), the Navy currently uses computer simulation for training and testing whenever possible. Computer simulation can provide familiarity and complement live training; however, it cannot provide the fidelity and level of training necessary to prepare naval forces for deployment. The Navy is required by law to operationally test major platforms, systems, and components of these platforms and systems in realistic combat conditions before full-scale production can occur. Substituting simulation for live training and testing fails to meet the purpose of and need for the Proposed Action and therefore was eliminated from

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		consideration as a mitigation measure.
Goodwin (Written)	I'm appalled to hear about the proposed testing because of the impact it will evidently have on the hearing and very lives of so many precious whales and dolphins. It's hard to believe that the extensive damage to these mammals is worth the benefits gained from the testing. PLEASE... do not proceed with this testing. Thank you very much. Lori Goldwyn	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Goslow-Zwicker (Electronic)	Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing. Sincerely, Annemarie Goslow-Zwicker	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Govea (Electronic)	Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return because of education and protection. We have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing. Most sincerely, Rio Govea	maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Graham (Electronic)	Please do not kill living creatures in order to protect living creatures. Surely the intelligent human mind can come up with a better plan to perform your tests and not maim and kill the intelligent beings of the sea.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Grant (Electronic)	How will destabilizing an ocean ecosystem by deafening or killing marine mammals contribute to our security? If we cause the collapse of our fisheries with the resultant loss of jobs and food sources, how are we safer? It's already well established that the fisheries off our coasts are strained and nearing depletion. This exercise will only hasten this demise. It's time to step back and really analyze how we defend ourselves and our coasts without harming the ocean ecosystem.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Navy has conducted training in these operating areas regularly for approximately 60 years. Though the intensity of live training will increase, the events are of relatively short duration and therefore the Navy does not anticipate that fish will be affected as a result of the training exercises and testing activities. Fish may respond behaviorally to sound sources in their hearing range (most Navy sound sources are not in the hearing range for most fish species), but this reaction is only expected to be brief and not biologically significant. Most commercially important fish species are not believed to hear mid- and high-frequency sound sources which make up the majority of sound producing activities.
Gray (Electronic)	I understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historic records from the Navy show few to no mortalities from sonar or explosives. Any model used to predict numbers of animals affected is only an estimate.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Greenwood (Electronic)	As a concerned citizen, educator, ocean & environmental health instructor, I feel compelled to address your ongoing assault on our ocean's health and the well being of all sea life. I feel equally perplexed at your decision to double warfare training exercises for a 5 year period and your aggression toward our oceans. Just who or what are we at war with? Whales? Seals? Fish? Dumping countless tons of toxic chemicals into her waters, and killing whatever life might get in your way just does not humanly make any sense. Enough is enough. When will the military ever figure that out? I deploy you to double down your trainings, take the exercises BACK to pre-2008 levels and protect our oceans, NOT blow the hell out of them. Our oceans, which support ALL life on our fragile planet, are under severe and relentless attack from over-fishing, to pollution, to carbon sequestration which turns our waters more acidic. Our inter-tidal zones are dying, our coral reefs disappearing, our large fisheries, already GONE. So does this vast emptiness just look like a playground to the Navy? An empty stadium for the global gladiators to flex their muscles, scream their insults and destroy life and peace in nature? We DO NOT need more toxins pumped into our air or waters by the Navy's desire to flex and dominate. At these times of severe budget cuts throughout education, health care and assistance for the elderly, I find your wanton doubling of exercises and its expense insulting and abhorring. Our economy is still attempting a recovery and at the time of your decision to double exercises, was at a state of collapse. Yet, you pushed on at the expense of life, of education and health and the well being of all. This hellbent attitude of destruction and vast waste of much needed financial resources must end. Why do we need this constant drive to KILL, to CONQUEST, to DEFEND? What enemy are you truthfully fighting? The whale, the dolphin, the salmon, the seal? OUR CHILDREN'S FUTURE? Your actions on these matters leave me speechless and angry. Why can't we truly BE a country which leads by example, a country which values life, which values our oceans, our forests, our environment? "Taking" life from the ocean to study the effects of blowing them up is insane. Stop stop stop this madness! For the future of our children and their children and their children, leave the oceans alone, to heal, to replenish, to continue to bring health and well being to all life on Earth. I ask you to cut back your training exercises to pre-2008 levels, and to immediately stop polluting our waters with your toxic chemicals and your doubled fossil fuel emissions. Stop! If a private citizen were to act in the manner you act, that citizen would be locked up for years. Look in the mirror, truly ask yourself what good will be accomplished in having a strong Navy, a trained Navy if there are no oceans to sail, no planet to protect. There you go, how about defending and protecting the health of the planet and NOT the corporations which make their money off of WAR! Enough is enough. As you look in that mirror, ask yourself why you treat our Mother Earth and Mother Ocean with such contempt and uncontrollable harm and destruction. It makes NO SENSE. Leave HER alone, to heal or I fear, we shall ALL perish from your actions. For the Earth, Education & Peace Len Greenwood	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Griffith	I am horrified at your disregard for lifeforms other than our own. Most, if not all, of the	The Navy is committed to protecting the marine environment during

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
(Electronic)	animals you will be affecting are on the endangered species list, and those lives are just as valuable (if not more so) than a human's. With such superior intelligence that we humans have been blessed with, one would think that the US Navy would be able to come up with a better plan--one which doesn't wipe out or handicap tens of thousands. The species that you would kill and endanger are crucial to the underwater ecosystems they live in, and without them, our world would be in chaos; it already is in chaos from the damage we've done. Please don't cause such harm for your own means. I have a deep and profound respect for the Navy that supports and protects my country. I also have an equally deep and profound respect for our planet--one that friends and enemies alike must share--and I truly hope that the US Navy keeps that in mind. The consequences of what you are planning to do are not worth the means that you would achieve. Find another way; one that doesn't harm the innocent.	the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Groeber (Electronic)	It is known that the use of sonar and explosives in naval maneuvers threatened the lives of marine mammals and fish. Since many species of marine mammals are threatened with extinction, I can not understand that use of sonar and explosives are required for these exercises. Don't inflict such damage to the habitat ocean for only a maneuver!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Navy has conducted training in these operating areas regularly for approximately 60 years. Though the intensity of live training will increase, the events are of relatively short duration and therefore the Navy does not anticipate that fish will be affected as a result of the training exercises and testing activities. Fish may respond behaviorally to sound sources in their hearing range (most Navy sound sources are not in the hearing range for most fish species), but this reaction is only expected to be brief and not biologically significant. Most commercially important fish species are not believed to hear mid- and high-frequency sound sources which make up the majority of sound producing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Grosch (Electronic)	Please remember that whatever decision you make to help the whales and the dophins they are also for our cuntry because everything on this planet is interconnected. I f the decision is harmful for whales and dolphins it will also be harmful for all living in our country.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Guanson (Written)	Opposed.	Thank you for participating in the NEPA process.
Guglielmelli (Electronic)	The ocean is very important to this planet... The lives of the dolphins whales and all other marine life are dependent on humans... We must be the voices for our oceans.... This is not acceptable and should not be allowed. I stand firmly against the testing of sonar in OUR OCEAN.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Gyedu (Electronic)	USA STOP YOUR PLANS.MARINES MAMMALS NEED PROTECTION! DARIA GYEDU,POLAND	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Hale (Electronic)	Please consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Thank you for your time and consideration.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Hall (Electronic)	You cannot possibly allow the atrocities of deafening and killing the beautiful dolphins and whales in these waters!!!!! They are living creatures who feel pain, emotion, and fear. Why would anyone think that it is OK to kill a living being for the purposes of Navy exercises or for any other reason. As a citizen of this world I demand that the deafening and killings of Dolphins and whales be absolutely prohibited. Humanity must be much more evolved than to stoop to these barbaric and dim witted measures for their own futile purpose. Kathleen F. Hall PhD Candidate The University of Victoria, British Columbia, Canada	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Hallowell (Electronic)	Protect whales and dolphins. Stop sonar testing in the Pacific Ocean.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Hambley (Electronic)	The military uses nearly any excuse to continue doing whatever they are doing...overthrowing the marine mammal act should not be something the Navy needs to do...wild marine mammals do not need to be included in the military necessary kill ratios...they have enough humans killing them as it is...	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Hammonds (Electronic)	The US Navy has released its initial Draft Environmental Impact Statements for the next 5-year round of permits it will seek from the National Marine Fisheries Service for its at-sea training activities. I would ask the NMFS to place an extremely high priority on the protection of marine mammals as it reviews the permit applications. I note with alarm that the numbers of marine animals expected to be affected have skyrocketed. The Navy's estimate of the number of animals whose behavior could be affected has jumped from 770,000 to 14 million, including 2 million cases of temporary hearing impairment, in addition to 2,000 animals experiencing permanent hearing loss. And, the Navy estimates that explosives training and testing could kill 1,000 animals. This is simply not an acceptable level of take. Marine mammals are extremely valuable creatures and we don't know enough about them to risk causing them this level of harm. This action, without substantial mitigation, is outside ethical boundaries. There is a solution that would balance national security needs with the need for environmental protection. So far, the Navy is refusing to set aside areas of high marine mammal density where sonar should not be used. NMFS should take every possible step to require the Navy to change its position on this. Sensitive breeding and foraging habitats and biologically unique areas within the training area must be protected from use for sonar and underwater explosives training. Safeguarding specific areas of sensitive habitat is the best way to lessen harm to whales and dolphins from sonar and other activities. I understand the need to balance national defense with protection for the environment.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of the Draft EIS/OEIS. The Navy is proposing to implement several mitigation measures within pre-defined habitat areas in the Study Area. For the purposes of this document, the Navy will refer to these areas as "mitigation areas." As described throughout this section, these recommended mitigation areas may be based off endangered species critical habitats, endangered species reproductive areas, or bottom features. The size and location of certain habitat areas, such as the critical habitats, is subject to change over time; however, the Navy's effectiveness and operational assessments and resulting mitigation recommendations are entirely dependent on the mitigation area defined in this document. Therefore, it is important to note that the Navy is recommending implementing mitigation measures only within each area as described in this document. Applying these mitigations to additional or expanded areas could potentially result in an unacceptable impact on readiness. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	The best way to do this is not to use the technology in the same areas where whale and dolphin numbers are high or during breeding seasons. The Navy must do more to identify and set aside the most environmentally sensitive portions of its training areas and not conduct training and testing in such areas.	implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Han (Written)	Opposed.	Thank you for participating in the NEPA process.
Hansen (Electronic)	Visual detection can miss anywhere from 25–95 percent of the marine mammals in an area. It's particularly unreliable in rough seas or in bad weather. We learn more every day about where whales and other mammals are most likely to be found. We need a healthy ecosystem in the ocean. Would the Navy be allowed to drop bombs on animal sanctuaries on land? Enough destruction of the Ocean and it's inhabitants. Protect marine life.	The Navy's mitigation plan involves more than just visual monitoring. Aerial monitoring and passive acoustic monitoring are used as well. The EIS/OEIS, Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring), presented the U.S. Navy's mitigation measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training and testing events. In addition, the probability of trackline detection is for visual observers during a survey. In general, there will be more ships, more observers present on Navy ships, and additional aerial assets all engaged in exercise events having the potential to detect marine mammals, than is present on a single, generally smaller (having a lower height of eye), survey ship. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Harden-01 (Electronic)	Please evaluate this incident: State cites Navy for hazardous waste violations Tuesday, July 3, 2012 6:33 PM ESTUpdated: Jul 03, 2012 5:08 PM <em class="wnDate">Tuesday, July 3, 2012 11:08 PM EST The Hawaii State Department of Health (DOH) has issued a notice of violation with a penalty fine totaling	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	$80,000 against the U.S. Navy Public Works Center Makalapa Compound for alleged violations of the state's hazardous waste and used oil rules. Makalapa Compound operates as a base yard for maintenance activities for Pearl Harbor Navy Region Hawai'i. Makalapa faces four counts of failure to make a hazardous waste determination and two counts of storage of hazardous waste without a permit. During a routine inspection on August 31, 2011, DOH found Makalapa failed to make a hazardous waste determination for corrosive wastes generated during coil cleaning of refrigerant equipment and for wastes generated from the use of solvents containing methyl ethyl ketone and perchloroethylene. These wastes were disposed of in the trash instead of handling them as hazardous wastes. Makalapa also stored hazardous waste paints and fuels in open containers, thereby violating the requirements for a permit for storage of hazardous waste. The Navy has 20 days to contest its notice of violation and request a hearing. Navy responds to State Dept. of Health The Navy received a Notice of Violation from the State Department of Health (SDOH) in June 2012 for non compliance activities discovered during an inspection at Naval Facilities Engineering Command, Hawaii in August 2011. The Navy took immediate corrective action, provided refresher training, and increased internal reviews to ensure compliance. An unannounced follow-up visit by SDOH in February 2012 revealed no negative comments or report. The Navy is committed to protecting and preserving the environment. The Navy has formally requested a hearing to contest the Notice of Violation and Order and penalty. During an unannounced inspection in August 2011, one (1) open hazardous waste drum in a hazardous waste accumulation site and three (3) open paint-related cans were identified as being improperly managed under the Resource Conservation and Recovery Act. The Navy addressed the concerns immediately and implemented procedures to ensure these actions are not repeated. Internal periodic reviews by subject matter experts indicate that the facility remains in compliance. "The Navy in Hawaii takes its environmental stewardship very seriously and is constantly working towards being in compliance with all hazardous waste laws," said Aaron Poentis, Navy Region Hawaii Environmental Program Director. "In this case, SDOH inspectors found concerns at one of our local commands in August 2011 which we immediately corrected. A follow up SDOH visit occurred in February 2012 which did not generate any comment or report. I am confident that after our requested hearing for the Notice of Violation and Order much of the allegations will be resolved to the satisfaction of the SDOH." The Navy plans to discuss SDOH's allegation and assessment. The Navy received the inspection report in November 2011, and a summary of our efforts and corrective actions was immediately forwarded to DOH in a January 2012 correspondence. As always the Navy is committed to operating in a manner protective of the environment. The Navy has a long history of demonstrated environmental compliance. National defense and environmental protection are, and must be, compatible goals. [http://www.hawaiinewsnow.com/story/18946134/state-cites-navy-for-hazardous-waste-violations]	

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Harden-02 (Electronic)	Please evaluate this incident: During a routine inspection on August 31, 2011, DOH found Makalapa failed to make a hazardous waste determination for corrosive wastes generated during coil cleaning of refrigerant equipment and for wastes generated from the use of solvents containing methyl ethyl ketone and perchloroethylene. [http://hawaiiindependent.net/story/department-of-health-fines-navy-80000-for-hazardous-waste-used-oil-violatio] Hawaii fines Navy $80K for hazardous waste Tuesday Jul 3, 2012 18:52:43 EDT PEARL HARBOR, Hawaii — Hawaii's health department has cited the Navy for hazardous waste and used oil violations. The state Department of Health said Tuesday it issued a violation notice with an $80,000 fine against the U.S. Navy Public Works Center Makalapa Compound in Pearl Harbor. Health officials say the base yard compound violated the state's hazardous waste and used oil rules by disposing of corrosive waste and solvents in the trash instead of handling them as hazardous waste. Another violation involves storing hazardous waste paints and fuels in open containers. The violations were discovered during a route inspection in August 2011. The Navy has 20 days to contest the notice of violation and request a hearing. Navy Region Hawaii did not immediately comment. [Navy Times, http://www.navytimes.com/news/ 2012/07/ ap-hawaii-fines-navy-hazardous-waste-070312/] July 3, 11:35 PM EDT Hawaii fines Navy $80K for hazardous waste PEARL HARBOR, Hawaii (AP) -- Hawaii's health department has cited the U.S. Navy for hazardous waste and used oil violations. The state Department of Health said Tuesday it issued a violation notice with an $80,000 fine against the U.S. Navy Public Works Center Makalapa Compound in Pearl Harbor. Health officials say the base yard compound violated the state's hazardous waste and used oil rules by disposing of corrosive waste and solvents in the trash instead of handling them as hazardous waste. Another violation involves storing hazardous waste paints and fuels in open containers. The violations were discovered during a route inspection in August 2011. Navy Region Hawaii spokeswoman Agnes Tauyan says the Navy has taken corrective action, provided refresher training, and increased internal reviews to ensure compliance. The Navy has formally requested a hearing to contest the violation notice. [Stars and Stripes, http://ap.stripes.com/dynamic/stories/H/HI_NAVY_VIOLATIONS_ HAZARDOUS_ WASTE_HIOL-?SITE=DCSAS&SECTION=HOME&TEMPLATE=DEFAULT&CTIME=2012-07-03-23-35-05]	Thank you for participating in the NEPA process.
Harden-03 (Electronic)	Please evaluate this information: Navy to resume sinking old ships in US waters Published: 7/02 11:26 pm Updated: 7/02 11:30 pm PEARL HARBOR, Hawaii (AP) -- The U.S. Navy is resuming its practice of using old warships for target practice and sinking them in U.S. coastal waters after a nearly two-year moratorium spurred by environmental and cost concerns. Later this month, three inactive vessels - Kilauea, Niagara Falls and Concord - will be sent to a watery grave off Hawaii by torpedoes, bombs and other ordnance during the Rim of the Pacific naval exercises, or RIMPAC. The military quietly	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	lifted the moratorium on Sinkex, short for sinking exercise, last year after a review of the requirements, costs, benefits and environmental impacts of the program, the Navy said in a statement to The Associated Press. It will be the first time since 2010 the Navy has used target practice to dispose of an old ship. Previous targets have ranged from small vessels to aircraft carriers such as the USS America, which was more than three football fields long. Conservation groups argue that the ghost ships should instead be recycled at a ship-breaking facility. Concerns about the long-lasting effects of toxic pollutants onboard the ships spurred a lawsuit by those groups to force the Environmental Protection Agency to better catalog and regulate Sinkex. The case, filed in U.S. District Court in San Francisco, is ongoing. The groups said they did not plan to seek an injunction to stop the Navy from restarting the exercises. "We are appealing to the Navy to continue their moratorium at least until our case is heard," said Colby Self of the environmental group Basel Action Network, which joined the Sierra Club in suing the EPA. "After the vessels hit the sea-bottom, it will be a little too late to redress damages to our precious marine resources." The Navy says Sinkex offers valuable live-fire training for times of war and provides clean vessels for at-sea, live-fire exercises. The ships can be targeted from the air, ocean's surface or underwater, with the results aiding the acquisition, planning and design of future vessel classes and systems, the Navy said. For decades, the Navy destroyed the vessels with little or no oversight. Then in 1999, the EPA ordered the Navy to better document toxic waste left on the doomed ships while removing as much of the material as possible. In return, the EPA exempted the military from federal pollution laws that prohibit any such dumping in the ocean. The Navy is still in charge of estimating the amount of pollutants onboard after the ships are prepared for sinking. In addition, the Navy must file an annual report with EPA estimating the amount of PCBs, or polychlorinated biphenyls, carried by the vessels. High levels of the chemical are believed to increase the risk of certain cancers in humans. It was banned by the U.S. in 1979 in part because it is long-lasting and accumulates throughout the food chain. Vice Admiral Gerald Beaman, commander of the combined task force running the exercises, said Monday that each ship will be stripped of PCBs and other contaminants such as asbestos, as required by the Navy's agreement with EPA. "There are severe restrictions that are placed on any hulk of that nature," Beaman said during a news conference at Pearl Harbor, flanked by commanders from participating countries. The Navy must also conduct the exercises at least 50 nautical miles from shore and in water at least 6,000 feet deep. Beaman said decisions about sinking the ships versus recycling them are made outside the scope of the exercises. A previous AP review of records from the past 12 years found the Navy got rid of most of its old ships over that time through target practice. Records show the Navy sunk 109 peeling, rusty U.S. warships off the coasts of California, Hawaii, Florida and other states during that period. Navy documents show some of the ships it sunk contained an estimated 500 pounds of PCBs. During the same time, 64 ships were recycled at one of six approved domestic ship-breaking facilities. RIMPAC, which lasts for five weeks, features training exercises for thousands	

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	of military personnel from 22 nations. [KHON news]	
Harden (Written)	"What if someone took an air horn and blasted it directly into your ear? Now turn the volume up twice as high." That's what Earthjustice says about how sonar could sound to endangered marine animals off the Northwest U.S. Coast. Earthjustice is suing to move Navy actions to less sensitive areas. [Email to Cory Harden from Earthjustice, 5-29-12][Navy admits greater harm to sea mammals, Earthjustice press release 5-17-12] For actions proposed in this Hawaii/California EIS, the Navy seems unconcerned about sonar. They say "International council for the Exploration of the Sea… noted, taken in context of marine mammal populations in general, sonar is not a major threat, or significant portion of the overall ocean noise budget." [DEIS p. 3.4-114] But the Navy doesn't report that the Council also says: "The full effects of sonar on cetaceans are not well known… behavioral alteration is more important than the direct effect of the sound on hearing mechanisms. It is unknown how many animals that are affected further out to sea can survive and not strand. Little is known of the sub-lethal effects of sonar on beaked whales or on other cetacean species." http://ec.europa.eu/environment/nature/conservation/species/whales_dolphins/docs/sonar_impact_cetations.pdf] some say marine animals trying to avoid sonar may get the bends. The Woods Hole Oceanographic Institute says "blood and tissues of some deceased beaked whales stranded near naval sonar exercises are riddled with bubbles… human divers can suffer from bubbles-induced decompression sickness, also known as the bends." [Stranded dolphins exhibit bubbles, and ability to recover, WHOI press release, 10-19-11] The Navy again seems unconcerned. They say "Recent modeling suggests that even unrealistically rapid rates of ascent from normal dive behaviors are unlikely to result in super saturation to the extent that bubble formation would be expected in beaked whales…" [DEIS 3.4-93 to 95] But the Navy doesn't report that the scientists they cited also say "… modeling indicates that repetitive shallow dives, perhaps as a consequence of an extended avoidance reaction to sonar sound, can indeed pose a risk for DCS…" [Decompression sickness] [Repetitive Shallow Dives Pose Decompression Risk in Deep-Diving Beaked Whales, Zimmer and Tyack, Marine Mammal Science, 10-07] The current EIS finds that 16 times as many marine mammals might be harmed by Navy actions, compared to an estimate from an EIS just a few years ago. The earlier EIS did not consider in-port sonar testing or actions in waters between Hawaii and California. And behavioral research and computer modeling was less accurate. How much more harm will be discovered in the next few years? [Sonar, explosive pose high risk for marine mammals, Associated Press, 5-12-12] And when will old Navy and other military sites ever be cleaned up? A GAO (General Accounting Office) report found that military "policies do not specify when to conduct public health assessments… beyond the initial assessment of certain priority sites… officials… did not know what actions, if any, installations had taken on about 80 percent of… recommendations." [DOD (Department of Defense) Can improve its Response to	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The potential risk from sonar and other sound sources affecting the behavior of marine mammals, including the potential for acoustically mediated bubble growth, was taken into account in the Draft EIS/OEIS analysis. The discussion of this phenomenon is presented in the EIS/OEIS in Section 3.4.3.1.2.2 (Nitrogen Decompression). As noted in that section, recent modeling by Kvadsheim, Miller, et al. (2012) determined that while behavioral and physiological responses to sonar have the potential to result in bubble formation, the actually observed behavioral responses of cetaceans to sonar did not imply any significantly increased risk of over what may otherwise occur normally in individual marine mammals. The reports cited in the comment (Bernal de Quiros et al. 2012a, 2012b) were reviewed, but do not add any substantive new information to the analysis of proposed actions covered in this EIS/OEIS.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	Environmental Exposures on Military Installations, GAO-12-412, 5-1-12] The Navy May not be concerned about all this, but many citizens are. Include information from this report in the analysis of cumulative impacts—DOD [Department of Defense] Can Improve its Response to Environmental Exposures on Military Installations [by U.S. General Accounting Office] GAO-12-412, May 1, 2012 DOD relies on four types of policies to identify and respond to many but not all aspects of environmental exposures: (1) environmental restoration policies address hazardous releases at military installations; (2) occupational and environmental health policies address workplace exposures; (3) deployment health policies address the collection of occupational and environmental health data for deployed individuals; and (4) public health emergency management policies. Nonetheless, there are some limitations in the policies' coverage. For example, DOD's environmental restoration policies do not specify when to conduct public health assessments at its sites beyond the initial assessment of certain priority sites required by the Superfund law. In addition, DOD has not fully documented its responses to recommendations that result from the assessments. DOD officials responsible for oversight reported that they did not know what actions, if any, installations had taken on about 80 percent of the recommendations. Without a comprehensive tracking system, DOD has no assurance that it is addressing recommendations appropriately and could be missing opportunities to identify and resolve concerns about some health threats. Further, DOD has no policy guiding services and their installations on appropriate actions to address health risks from past exposures, which DOD attributes to the Super fund law not specifically requiring responsible parties to address such risks. http://gao.gov/products/GAO-12-412 The aggregate impacts of past, present, and other reasonably foreseeable future actions are expected to result in significant impacts on marine mammal and sea turtle species, although the contribution to those impacts from the Navy's proposed activities is low… The No Action Alternative, Alternative 1, or Alternative 2 would contribute to cumulative impacts, but the relative contribution would be low compared to other actions. Compared to potential mortality, stranding, or injury resulting from Navy Training and testing activities, marine mammal and sea turtle mortality and injury from bycatch, commercial vessel ship strikes, entanglement, ocean pollution, and other human causes are estimated to be orders of magnitude greater (hundreds of thousands of animals versus tens of animals). [p. ES-16] But the Navy requires citizen consent and is using taxpayer money. Bubble Formation A suggested indirect cause of injury to marine mammals is rectified diffusion (Crum and Mao 1996), the process of increasing the size of a bubble by exposing it to a sound field… There is considerable disagreement among scientists as to the likelihood of this phenomenon (Piantodosi and Thalmann 2004) Evans and Miller, 2003). Although it has been argued that traumas from recent beaked whale stranding are consistent with gas	

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	emboli and bubble-induced tissue separations (Fernandez et a. 2005, Jepson et al. 2003), nitrogen bubble formation as the cause of the traumas has not been verified… The hypothesis speculates that if exposure to a startling sound elicits a rapid ascent to the surface, tissue gas saturation sufficient for the evolution of nitrogen bubbles might result (Jepson 2003, Fernandez 2005)… Recent modeling suggest that even unrealistically rapid rates of ascent from normal dive behaviors are unlikely to result in super saturation to the extent that bubble formation would be expected in beaked whales (Zimmer and Tyack 2007)… no marine mammals addressed in this analysis are given differential treatment due to the possibility for acoustically mediated bubble growth. [3.4-93 to 95] The DEIS contradicts the Zimmer and Tyack article I found—"ABSTRACT The impact of naval sonar on beaked whales is of increasing concern. In recent years the presence of gas and fat embolism consistent with decompression sickness (DCS) has been reported through postmortem analyses on beaked whales that stranded in connection with naval sonar exercises. In the present study, we use basic principles of diving physiology to model nitrogen tension and bubble growth in several tissue compartments during normal diving behavior and for several hypothetical dive profiles to assess the risk of DCS. Assuming that normal diving does not cause nitrogen tensions in excess of those shown to be safe for odontocetes, the modeling indicates that repetitive shallow dives, perhaps as a consequence of an extended avoidance reaction to sonar sound, can indeed pose a risk for DCS and that this risk should increase with the duration of the response. If the model is correct, then limiting the duration of sonar exposure to minimize the duration of sonar exposure to minimize the duration of any avoidance reaction therefore has the potential to reduce the risk of DCS. [bold added, REPETITIVE SHALLOW DIVES POSE DECOMPRESSION RISK IN DEEP DIVING BEAKED WHALES, Walter M. X. Zimmer, Peter L. Tyack, Article first published online: 10 SEP 2007, http://onlinelibrary.wiley.com/doi/10.1111/j.1748-7692.2007.00152.x/abstract;jessionid=6EA38DCE37C4ADC452C707C5736538F3.d04t02?denied AccessCustomisedMessage=&userIsAuthenticated=false] I don't see Piantadosi and Thalmann 2004 in the bibliography or in Google Scholar. As international Council for the Exploration of the Sea (2005b) noted, taken in context of marine mammal populations in general, sonar is not a major threat, or significant portion of the overall ocean noise budget [p. 4.3-113]. This EIS section does not mention the ICES report also says: "The full effects of sonar on cetaceans are not well known, mostly due to the difficulty of studying the interaction…high-intensity (>215dB) mid-frequency (1-10 kHz) sonar… has led to the deaths of a number of cetaceans in some places. All incidents have been investigated have occurred in the North Atlantic, or Mediterranean and have related to the use of military sonar… the most consistent deduction form the evidence is that behavioral alteration is more important than the direct effect of the sound on hearing mechanisms. It is unknown how many animals that are affected further out to sea can survive and not strand. Little is known of the sub-lethal effects of sonar on beaked whales or on other cetacean species."	

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	[http://ec.europa.eu/environment/nature/conservation/species/whales_dolphins/docs/sonar_impact_cetaceans.pdf] The increase in proposed testing activities under Alternative 2 over the No Action alternative would in turn lead to an approximately 389 percent increase in predicted impacts (behavioral reactions, TTS, and PTS) to marine mammals [p. 4.3-173]. This seems to contradict the news: " The Navy estimates its use of explosives and sonar may unintentionally cause more than 1,600 instances of haring loss or other injury to marine mammals in one year… the old analysis… estimated the service might unintentionally injure or kill about 100 marine mammals." [Navy says their sonar and explosion tests could harm more marine life than previously thought, CBS News Los Angeles, 5-10-12]	
Harden (Oral-Hilo)	Thanks for taking comments. So the way Earthjustice describes the sound of sonar is they describe it as an air horn blasted directly in your ear and then turning the volume up twice as loud, and that's what they're saying how sonar could sound to endangered marine animals off the northwest U.S. coast. And as you know, Earthjustice is suing to move the Navy actions there to less sensitive areas. But for actions that are proposed in this EIS, the Navy is not as concerned about sonar as citizens are. The Navy says, "International Council for Exploration of the Sea noted, taken in the context of marine mammal populations in general, sonar is not a major threat or significant portion of the overall ocean noise." But the Navy doesn't report that the Council also says, "The full effects of sonar on cetaceans are not well known. Behavioral alteration is more important than the direct effect of the sound on hearing mechanisms. It is unknown how many animals that are affected further out to sea can survive and not strand. Little is known of the sublethal effects of sonar on beaked whales or other cetacean species." Some people say marine animals who are trying to avoid sonar may get the bends. The Woods Hole Oceanographic Institute says blood and tissues of some deceased beaked whales stranded near naval sonar exercises are riddled with bubbles, and human divers, when they get bubbles-induced decompression sickness, that's also known as the bends. The Navy doesn't seem concerned. They say recent modeling suggests that even unrealistically rapid rates of ascent from a normal dive are unlikely to result in supersaturation that would form bubbles in beaked whales. But the Navy didn't report that the scientists they cited also said modeling indicates repetitive shallow dives, maybe as a consequence of trying to avoid sonar, can indeed pose a risk for the decompression sickness. The current EIS finds 16 times as many marine mammals might be harmed by Navy actions compared to an estimate from the EIS just a few years ago. The earlier EIS didn't consider in-port sonar testing or actions in waters between Hawaii and California, and research and computer modeling was less accurate. So I wonder how much harm we'll discover in the next few years. And when will old Navy sites and other military sites ever be cleaned up? A General Accounting Office report found that military policies don't specify when to conduct public health assessments beyond the initial assessment, and officials did not know what actions, if any, installations have taken on about 80 percent of	Earthjustice is incorrect in making the comparison of sound in the air and sound underwater for a number of reasons and there are no circumstances where sonar underwater would be like an air horn "blasted" directly in a human's ear. Sound in air and sound in water are two different scales somewhat like comparing Fahrenheit and centigrade temperature scales. Unlike these temperature scales there is no completely accurate means to convert in air sound levels to sound levels underwater although a rough approximation is that there is a 62 dB difference (80 dB in air could be equivalent to 142 dB underwater). In addition, the weighted dB scale in air is meant to reflect human perception and the frequencies best heard by humans. The point being that the frequency component of the sound is of critical importance in how a sound is perceived. Also compounding the understanding of dB scales in air and underwater is that often the dB scale in air is not always (although should be) referenced to a distance from which the source level is measured. Underwater the standard is to measure source level at one meter (approximately 1 yard) from the source. Therefore what a marine mammal hears as a received sound level at any distance from sonar beyond one meter is the sound level reduced by various factors as explained in the HSTT EIS/OEIS Section 3.4.3. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	recommendations. So the Navy may not be concerned about a lot of things, but citizens are.	
Harmon (Electronic)	Someone who works at PMRF on Kauai island told me recently that it's all about money. Jobs and money to the military industrial complex. These exercises are not making us safer. We already far surpass our enemies in military expertise. We win over our enemies by being a good shepard of the planet. We rejuvenate the ocean so it can give life providing nourishment to our present and future generations. As it is the ocean is dying from being over fished and used as a dumping grounds for toxins which includes those created by the military shooting off missiles and creating ear drum deafening sonar. one of the largest dump sites for plastic is between here and San Diego, larger than the state of Texas. Such sites, called gyres are found in oceans around the globe. The toxins from broken down plastics are found in fish and humans that eat those fish. It is no wonder the oceans are dying. What we need is to stop the killing of marine life so it can recuperate from the present harm we inflict daily. 1. strict fishing quota enforcement because the ocean is over fished. 2. we need an aggressive full on assault of plastic dumps in the ocean. 3. stop military exercises that harm the life of the ocean.	Thank you for participating in the NEPA process.
L. Harris (Electronic)	It's time to stop testing. Please do so.	Thank you for participating in the NEPA process.
M. Harris (Electronic)	Please, please, for the mercy of the living creatures who reside in the ocean STOP THE UNDERWATER SONAR/SOUND TESTING. The US military is without question, the strongest, most advanced military on our great blue planet. It is now time for our great military to make its future technical advances in humane ways. Please stop!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Harrison-Hinds (Electronic)	We know that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. The HSUS is joining other environmental and animal welfare groups to ask the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. We are calling on the U.S. Navy to re-think its plans and to incorporate additional protective measures. This is not a dress rehearsal, ladies and gentlemen. We only have one chance to get this right so let's do so. Let's do the right thing and think of all the beautiful and wonderful creatures and do no harm, especially in the name of humanity.	Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Regarding the 2003 Washington State stranding event referred to in the comment, although mid-frequency active sonar was used by the Navy, the distribution of harbor porpoise strandings by location and with respect to time surrounding the event do not support the suggestion that mid-frequency active sonar was a cause of harbor porpoise strandings. Rather, a lack of evidence of any acoustic trauma within the harbor porpoises, and the identification of probable causes of stranding or death in several animals, supports the conclusion that harbor porpoise strandings were unrelated to Navy sonar activities. Regarding the 2005 North Carolina stranding event, NMFS was unable to determine any causative role that sonar may have played in the stranding event. All of the species involved in this stranding event are known to occasionally strand in this region. Although the cause of the stranding could not be determined, several whales had preexisting conditions that could have contributed to the stranding. Cause of death for many of the whales was likely due to the physiological stresses associated with being stranded. A consistent suite of injuries across species, which was consistent with prior strandings where sonar exposure is expected to be a causative mechanism, was not observed. For a complete analysis of these and other stranding events, please see the Marine Mammal Stranding Report, found on the HSTTEIS.com website at: http://hstteis.com/Portals/0/hstteis/SupportingTechnicalDocs/ Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Harrold (Electronic)	DO NOT DO THIS! you have no right to inflict pain and injury upon innocent, unsuspecting animals. Be a compassionate navy, PLEASE!!!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Harte (Electronic)	Continuing to conduct tests that will seriously damage huge numbers of marine animals will further damage important marine ecosystems that are already being stressed through other human activities, including overexploitation and climate change. We derive a significant amount of food and revenues from our marine environment. Damaging it further damages us and weakens our national security. Given this, the Navy should seriously consider terminating such tests.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Hasler (Electronic)	Please do not do sonic testing in the waters that will harm ocean animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Haug (Electronic)	NO SONAR USE IN OUR OCEANS! YOUR AGENDA IN NOT AS IMPORTANT AS THE LIFE YOU ARE HARMING AND ENDING. FIND ANOTHER WAY TO ACCOMPLISH WAIT YOU ARE TRYING TO ACCOMPLISH.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Hawthorne-01 (Electronic)	I recently learned that the Navy has projected that they will deafen 1600 cetaceans and kill 200 marine mammals EACH YEAR IN A 7-YEAR PROGRAM in the name of training for our defense. I am writing to add my voice of outrage against the horror of this plan. With all the creativity humans possess, and the resources of our military, I urge you to find other ways to plan for our defense. This plan is unconscionable. Thank you.	The Navy does not anticipate any mortality from its activities. Though the model estimates the potential for mortality based on very conservative criteria, with the implementation of proven mitigation and decades of historical information from conducting training and testing in the study area, the likelihood of mortality is near zero and would not impact populations. Additionally, there is no evidence that the type of injuries that could potentially occur (fully recoverable or limited permanent threshold shift) have or will result in follow on mortality. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures must be estimated scientifically using complex modeling, but it is only an estimate, not a prediction. This estimate needs to encompass the capacity of what could occur to ensure Navy's permits are not exceeded. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		decade.
Hawthorne-02	I beg you not to test the Navy's underwater system at the expense of deafening thousands of dolphins and whales. They will lose their own ability to navigate. Please say no to this life-damaging activity! These creatures are too important to the balance of life on earth.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Haydon (Electronic)	We know that sonar blasts kill ocean life. I am writing to state my strong opposition to the sonar tests and exercises along the coast. These exercises will be devastating to whales, dolphins, and other animals. Please reconsider your plans. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Hays (Electronic)	Please refrain from endangering thousands of marine mammals on the East Coast and West Coast and implement protective measures as part of the Navy's training program. These marine mammals are an incredibly important part of our ecosystem, and there are many ways in which the Navy can mitigate the impact of its training programs. Please increase your efforts to protect whales, poroises, and dolphins from harm during naval training and testing. There are several steps the Navy can take to reduce the impact on these animals, including avoiding calving areas and migratory pathways, creating a safety zone around testing areas, and monitoring the training/testing areas for marine mammal activity. Please do the right thing and take important but simple steps to protect our seas and sea life.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Hazard (Electronic)	Please suspend this operation now!	Thank you for participating in the NEPA process.
Hazarika (Electronic)	This should not be done...there are a lot of intelligent people from the govt. and armed forces.that are involved in these operations ..i belive they should opt. for some other alternative..and no living being should be harmed from these operations or experiments..	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
Heard (Electronic)	National security takes many forms. If we ruin our oceans at the rate we're going, we'll all be dead anyway. Please widen the definition of "security" This is my respectful request, Cassandra Heard	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Heizer (Electronic)	There MUST be a way that the Navy can do tests WITHOUT killing all this marine life!! In THIS DAY AND AGE we should be peaceful instead of trying to kill everything around us!! PLEASE PLEASE consider this!!!!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Hennessy (Electronic)	As a citizen of the United States of America, I do not understand how the world's most powerful navy justifies harming other species in order to improve military techniques. Marine mammals, birds, fish, turtles, and habitat could be harmed with sounds, explosions, detritus, and electromagnetic impulses that are being implemented to supposedly train our navy personnel for future combat. This is complete nonsense. No other military in the world is as advanced or as well-funded as ours, and the ones that we would possibly need to prepare for war against do not have navies of any substantial power. We could easily beat them with conventional weapons, that we already know how they work and have an ample supply of. Radiation levels in some places in the southwest are still elevated due to atomic tests in the 1940's and 1950's; the long-standing effects of these tests are rarely, if ever, accurately estimated beforehand. Do we really need to cause irreparable harm to creatures that have no part in human warfare? Including those that are already suffering from dwindling populations? When is enough enough? Let's see this for what it truly is; a job-advancement ladder for weapons engineers, using "training" as a scrim, and meted on the backs of taxpayers and wildlife. How many whales would be deafened, disoriented, and killed by this operation? And for what purpose do we ask them to make that sacrifice? The costs outweigh the benefits, if only we would take all costs into consideration.	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Hepworth (Electronic)	No live explosives and sonar exercises, please! They kill thousands of precious animals that have right to live.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Hernandez (Electronic)	it's not right that the navy would do something like this KNOWING what harm it could do to the environment. Your disrupting the balance which in the end the results will be tragic and that will be on you who are trying to go through with this. Do the research and think how this can harm not just you, but everyone. Please reconsider. Sincerely, Cristina Hernandez	The Navy shares your concern for the environment. All of the reasonably foreseeable effects from the proposed activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Herrera (Electronic)	I understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Herron (Electronic)	Please don't do it. Find a laboratory way to test your sonar weapons. Leave the oceans and their inhabitants to peace. They, like civilians, should have rights.	Thank you for participating in the NEPA process.
Hess (Electronic)	The injury or morality of any marine mammals due to the actions of the Navy are completely unacceptable. There is no legitimate reason that national defense should ever cause harm to any wildlife. The Navy should be implementing the protection and recovery of the wildlife they have harmed over the past two centuries, not further endangering these creatures.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Hidaka (Electronic)	I understand the need for protecting our country, but please find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. I know that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. I support the HSUS and other environmental and animal welfare groups in asking the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Regarding the 2003 Washington State stranding event referred to in the comment, although mid-frequency active sonar was used by the Navy, the distribution of harbor porpoise strandings by location and with respect to time surrounding the event do not support the suggestion that mid-frequency active sonar was a cause of harbor porpoise strandings. Rather, a lack of evidence of any acoustic trauma within the harbor porpoises, and the identification of probable causes of stranding or death in several animals, supports the conclusion that harbor porpoise strandings were unrelated to Navy sonar activities. Regarding the 2005 North Carolina stranding event, NMFS was unable to determine any causative role that sonar may have played in the stranding event. All of the species involved in this stranding event are known to occasionally strand in this region. Although the cause of the stranding could not be determined, several whales had preexisting conditions that could have contributed to the stranding. Cause of death for many of the whales was likely due to the physiological stresses associated with being stranded. A consistent suite of injuries across species, which was consistent with prior strandings where sonar exposure is expected to be a causative mechanism, was not observed. For a complete analysis of these and other stranding events, please

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		see the Marine Mammal Stranding Report, found on the HSTTEIS.com website at: http://hstteis.com/Portals/0/hstteis/SupportingTechnicalDocs/ Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Hill (Electronic)	The Navy's mid-frequency sonar has been implicated in mass strandings of marine mammals in, among other places, the Bahamas, Greece, the Canary Islands, and Spain. In 2004, during war games near Hawai'i, the Navy's sonar was implicated in a mass beaching of up to 200 melon-headed whales in Hanalei Bay. In 2003, the USS Shoup,operating in Washington's Haro Strait, exposed a group of endangered Southern Resident killer whales to mid-frequency sonar, causing the animals to stop feeding and attempt to flee the sound. "In 2003, NMFS learned firsthand the harmful impacts of Navy sonar in Washington waters when active sonar blasts distressed members of J pod, one of our resident pods of endangered orcas," said Kyle Loring, Staff Attorney for Friends of the San Juans. "Given this history, it is particularly distressing that NMFS approved the Navy's use of deafening noises in areas where whales and dolphins use their acute hearing to feed, navigate, and raise their young, even in designated sanctuaries and marine reserves." In 1996 twelve Cuvier's beaked whales beached themselves alive along the coast of Greece while NATO (North Atlantic Treaty Organisation) was testing an active sonar with combined low and mid-range frequency transducers, according to a paper published in the journal Nature in 1998. The author established for the first time the link between atypical mass strandings of whales and the use of military sonar by concluding that although pure coincidence cannot be excluded there was better than a 99.3% likelihood that sonar testing caused that stranding.[16][17] He noted that the whales were spread along 38.2 kilometres of coast and were separated by a mean distance of 3.5 km (sd=2.8, n=11). This spread in time and location was atypical, as usually whales mass strand at the same place and at the same time. The Navy's mitigation plan for sonar use relies primarily on visual detection of whales or other marine mammals by so-called " watch-standers" with binoculars on the decks of ships. If mammals are seen in the vicinity of an exercise, the Navy is to cease sonar use. "Visual detection can miss anywhere from 25–95% of the marine mammals in an area," said Heather Trim, Director of Policy for People For Puget Sound. "It's particularly unreliable in rough seas or in bad weather. We learn more every day about where whales and	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Regarding the 2003 Washington State stranding event referred to in the comment, although mid-frequency active sonar was used by the Navy, the distribution of harbor porpoise strandings by location and with respect to time surrounding the event do not support the suggestion that mid-frequency active sonar was a cause of harbor porpoise strandings. Rather, a lack of evidence of any acoustic trauma within the harbor porpoises, and the identification of probable causes of stranding or death in several animals, supports the conclusion that harbor porpoise strandings were unrelated to Navy sonar activities. Regarding the 2005 North Carolina stranding event, NMFS was unable to determine any causative role that sonar may have played in the stranding event. All of the species involved in this stranding event are known to occasionally strand in this region. Although the cause of the stranding could not be determined, several whales had preexisting conditions that could have contributed to the stranding. Cause of death for many of the whales was likely due to the physiological stresses associated with being stranded. A consistent suite of injuries across species, which was consistent with prior strandings where sonar exposure is expected to be a causative mechanism, was not observed.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	other mammals are most likely to be found—we want NMFS to put that knowledge to use to ensure that the Navy's training avoids those areas when marine mammals are most likely there." Some of the mid-frequency sonar systems the Navy employs are capable of generating sounds in excess of 235 decibels. A normal human conversation takes place at 60-70 decibels; a loud rock concert is about 115 decibels; permanent hearing damage for people can occur from short-term exposure to 140 decibels. The decibel scale is a logarithmic scale, and each ten-decibel rise along the scale corresponds to a ten-fold increase in power: a sound measuring 130 decibels is ten times more intense than a 120 decibel sound, a sound of 140 decibels is 100 times more intense, and a sound of 150 decibels is 1,000 times more intense. Judge David A. Ezra found that the Navy was violating federal law, after Earthjustice sued the Navy last May for violating the National Environmental Policy Act (NEPA) and the Coastal Zone Management Act (CZMA. Judge Ezra said, "there is little disagreement that MFA [mid-frequency active] sonar can cause injury, death, and behavioral alteration to these animals." The judge noted that the Navy's harm threshold -- 173 decibels (dB) -- contradicts the best available science and "cast into serious doubt the Navy's assertion that, despite over 60,000 potential exposures to MFA sonar, marine mammals will not be jeopardized." Further, he ruled that the Navy's reliance on a noise level of 173 decibels, below which it claims harm to animals from its sonar will not occur,was "arbitrary and capricious," an acknowledgment that even sonar noise at much lower intensity levels can harm and kill marine mammals."Whales have stranded and died at predicted noise levels of around 150 decibels – 100 times less intense than the threshold set by the Navy," said AWI President Cathy Liss. "Such a level is without scientific justification." The court determined that the Navy had failed to explore reasonable alternatives to conducting its exercises, failed to notify and involve the public as required by law. The Navy must, take greater precautions to protect marine life and use the latest scientific information to identify these biological "hot spots" and establish protection for marine mammals and other species." Examples of mitigation measures include not operating: at nighttime,at specific areas of the ocean that are considered sensitive,when dolphins are bow-ridings,low ramp-up of intensity of signal to give whales a warning, air cover to search for mammals,using fish-finders to look for whales in the area	For a complete analysis of these and other stranding events, please see the Marine Mammal Stranding Report, found on the HSTTEIS.com website at: http://hstteis.com/Portals/0/hstteis/SupportingTechnicalDocs/ Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Hines (Electronic)	The Navy is PROPOSING A REAL INCREASE TO THEIR ACTIVITES, ESPECIALLY WAR GAMES AND SONAR. SONAR TORTURES AND KILLS whales and dolphins and people apparently or at least assists them in killing people (under the name of so called protecting people) and apparently helps them refine killing people (war games)! I am a kind, loving human whose intentions are to honor life. By dedicating myself to seeing the sacredness of all life, thereby reveres all of life, I walk through the day lifting the consciousness of many, many people simply by being. As the EIS becomes reverent the tendency to allow harm to anything including its self as an entity, diminishes and the overall consciousness raises on this planet and peace reigns supreme. I ask to please	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	consider what the navy is asking. we are either in a fear based solution attracting more fear/war or a love based solution attracting more loving/kind solutions. The Navy is stating its going to kill. I am living in opposition to what the navy proposes. Please allow my influence to count in not allowing the navy a permit for any of the proposed activities. Aloha and peace to whomever this my reach, -Craig Hines	whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Hitch (Electronic)	Please do not go through with the Navy sound testing. It will have major repercussions to the state of our ocean and the balance of life. It will KILL many creatures, make many whales and dolphins go DEAF!! This would be a HUGE MISTAKE! Please don't do it!!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
J. Ho (Oral-Hilo)	Hi. My name is Jennifer Ho, and I live here in Hilo, Hawaii. I thank you for coming and making an opportunity for us to give you public testimony. I'm very concerned. My brothers both served in the -- two of my brothers served in the Navy, and I'm concerned about today's Navy. I know that in your mission to take care of America, you do a lot of submarine sonar, and that is something that I know has harmed sea life. It's harmed whales, other cetaceans, dolphins, and I understand turtles also are at risk. And it's of great concern for me about the increased militarization of Hawaii and of our oceans because I know on Jeju Island, we've had increased military presence and that as we're closing bases abroad, more of the military are moving to new places. So here we are wanting to make room for you and wanting to see you as heroes, and you wanting to see yourself as heroes, and yet I see what you are being asked to do is not heroic. You are in ships that use sonar to detect an enemy, an enemy that might not even be there. I think if we changed our American policies not to be so militaristic, if we work with other nations to help them have a better quality of life, who would attack the person that's helping them have a better quality of life? And your need to be so wary is -- if you're only looking for enemies, that's what you'll see. And I don't think whales or dolphins are	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from electromagnetic sources, active sonar, and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	enemies, and I know water amplifies sound. And I really wish that those of you who want to see yourselves doing the right thing would ask that your policies, the Navy's policies, and the increased militarization would change. And I thank you for taking this time to let me speak.	
N. Ho (Oral-Hilo)	Yeah. Aloha. Can everybody hear me? My name is Nelson Ho. I live here in Hilo, am a lifetime resident of Hawaii. I'd like to thank the military for presenting this opportunity, and I hope it's recorded and heard by more than you folks here in the room. First of all, I'd like to speak out for the whales having their three minutes. In fact, I'd like to reverse it. I'd like for the Navy to have three minutes and then silence for the whales, for the turtles, for all the mammals and all the marine organisms that you folks are impacting. That's one of the concerns that I have. The second one is for the overall militarization of Hawaii, an independent Hawaiian kingdom that was overthrown at the point of a bayonet by -- I think it was the Marines. Is that right, Moani? Thank you. This was an independent nation, and it's still under occupation. And it was the military that enabled a civilian government to be overthrown. I'd like to bring that to your attention. The third thing, openly I'd like to create cognitive dissonance within the military because I think the military's mission has been distorted. And this whole desire for protection has led us into, I think, an overwhelming political force, military force, that is really bullying the rest of the world. And I, as a citizen who pays my taxes, wish that with stop. And I want you to see a person here who is willing to stand up and say that as a tax-paying American citizen, who believes in the Constitution even though I feel it's being dismantled by the corporations and the powers that be. I want to stand in opposition to that. So while I believe that the military may, in fact, be the largest researcher for marine studies, that's insufficient given the nature of your business and given the impacts, the adverse impacts that you are creating to our environment and our human society because while all this money and research goes to speak in favor of your military activities, our society is decaying. We can't pay for teachers. And in summary our society is becoming a third-world society, and we are creating way too many enemies that we don't need. So I thank you for listening to me and recording this testimony.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Hofacre (Electronic)	As a visitor to Kauai for many years, I am opposed to any testing that harms the dolphins and whales. Please find another way and spare these beautiful creatures.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Hoffmann (Electronic)	I heard, that you are planning Sonar experiments in and around Hawaii. Please do not do so! Sonar tortures and kills whales and dolphins (as they are loosing their orientation) - and there are so many whales and dolphins living around Hawaii! Please remain sensitive to nature and it´s animals. Hawaii is such a paradise... Thank you very much!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Holt (Electronic)	We are saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. We look forward to hearing from you with your views on the above, if you have any queries please do not hesitate to contact us, Thanks, Justin Holt	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Holtz (Electronic)	Please consider steps to reduce the harmful impacts of training and testing to marine mammals. Please consider avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Thank	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	you.	Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Holzman (Oral-Kauai)	Hi, my name is Greg Holzman, and I'm a resident of the west side of Kauai for 30 plus years and fishing out there 25 years off Niihau, Kailua, and Kauai. You know, my biggest concern that I want to get on record right away is that we would like to see as fisherman who go out to kolua rock and the middle banks, which is right up against the marine sanctuary at Northwestern Hawaiian Islands, and we would like to see a better warning of scheduling so that if we go up all the way up, you know, it takes us 17, 18 hours to get up there that we're not having a helicopter telling us we have to move, you know, eight hours out of our fishing grounds or going out to Kaula Rock and then being told in the middle of the night to move. If we can schedule our fishing trips around, you know, better scheduling, then we would really appreciate that. How you guys do that, I'm not sure whether it's a website or we can call a number. I know that you have that already in effect for the parts around Kauai on a lot of the missile work that goes on. But not as much for the bombing that comes out of Honolulu at Kailua or, you know, the things that go on up at the Northwest Hawaiian Islands. So that's just one thing I wanted to point out. The other thing is is that access to the area around Nahili Point should be open at least at some time. I was part of the West Side Access Committee. We really appreciated the fact that the Navy went out and made that contact to allow us back in to surf and fish and has continued to work with the surfers and fisherman to increase those areas. We would like to see some time, one, two days a month that at least, you know, the Hawaiian people really, it's one of the few areas that has a clear, clean reef water that they can fish off of for nenue, palani, kala on the west side. And so that's really important to the Hawaiians for their benefit and for any of our people that need to fish for their diet. So I appreciate that. Thank you.	Navy training and testing activities have the potential to temporarily limit access to areas of the ocean for a variety of human activities associated with commercial transportation and shipping, commercial recreation and fishing, subsistence use, and tourism in the Study Area. As discussed in Section 3.12.2.1.1 (Sea Space) of the Draft EIS/OEIS, when training or testing activities are scheduled that require specific areas to be free of nonparticipating vessels due to public safety concerns, the Navy requests that the U.S. Coast Guard issue Notices to Mariners to warn the public of upcoming Navy activities. Training and testing activities occur in established restricted or danger areas as published on navigation charts.
Horzely (Electronic)	Is there not a better solution? Have you calculated the potential disturbances based on the mammals not being able to hear!!!! These are sonar-based animals? Please don't.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Houser (Electronic)	There is much we don't know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return because of education and protection. We have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing Jennifer Houser	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Howell (Electronic)	This is ridiculous! Test in the dead sea, a deep lake or anywhere else but our oceans!!!!	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
Huart (Electronic)	Please spend your money on Something worthwhile like cleaning up the oceans and preservation of endangered spcies and preventing illegal fishing	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Hubbard (Electronic)	This is something that the people should be able to vote on. My vote is no for this testing. Why is it that too much power is granted to those who want to kill or who are responsible for so many deaths in the animal kingdom and sea world? There is already too much "not caring" anymore about natural life in exchange for easy solutions that involve death and murder. WE NEED TO CARE MORE TO PROTECT LIFE; ALL LIFE HERE ON THIS PLANET, and it is very serious. PLEASE RECONSIDER THESE HORRIBLE TESTS THAT ARE NOT ABSOLUTELY NECESSARY AS THEY CLAIM THEM TO BE. Seek other solutions and options, and let the American people vote on it too.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Hunt (Electronic)	We know that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. Please no sonar exercises, killing innocent marine mammals!! sincerely, Traci Hunt	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Huntemer (Electronic)	Very briefly, I would like to state my total opposition to the Navy's proposed actions off the coasts of California and Hawaii. These waters are home to numerous species of cetaceans. Cetaceans are by nature very sensitive to sonic and other vibrations. Manoeuvers involving noise and other vibrations could injure or kill them. This is a well known fact. Not only might these prosposed actions be detrimental to cetaceans but theier disruptive effects on other types of marine life have not been adequetely studied. Indeed comprehensive studies on the cetacean populations have not even been carried	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	out yet. however, all evidence pionts to thier sensitivity. PLEASE do not go ahead with these manoeuvers! Thank you for your time and attention. Angela Huntemer.	testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Hurd (Electronic)	I'm dismayed to read: The Washington Post (Associated Press) May 11, 2012 – Revealed today that a "New Navy study says use of sonar, explosives may hurt more marine mammals than once thought"[25]. "…HONOLULU-The U.S. Navy may hurt more dolphins and whales by using sonar and explosives in Hawaii and California under a more thorough analysis that reflects new research and covers naval activities in a wider area than previous studies…" and... On May 17, 2012, news reports that "Mass dolphin deaths in Peru caused by acoustic trauma" were announced by "…Dr. Carlos Yaipen Llanos of ORCA in Peru informed Hardy Jones of Blue Voice that acoustical trauma is the cause of the Mass Mortality Event (MME) that killed an estimated one thousand dolphins along the coast of northern Peru in March 2012…" [28]. This is another reason to begin to limit sonar, laser, radar, and electromagnetic weapons testing in the Atlantic, Pacific, and the Gulf of Mexico. You guys are destroying that which you are charged to defend. There will be a burn-out cinder before you're through with no life forms still extant except Dick Cheney breathing through a filtration system in a bunder in Wyoming. STOP THE SONAR!! Oh, and while you're at it please put IN WRITING that you will no longer use DU munitions in practice or ever!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. In 2008, Commander Pacific Fleet directed that all Pacific Fleet ships offload all depleted uranium rounds at the earliest opportunity. The use of depleted uranium is not included in the Navy's Proposed Action. The Navy was not conducting sonar or explosives training activities within 500 miles of the Peruvian coast in the 3 months prior to or during the 2012 stranding event in Peru. The Peru stranding event did not result from acoustic trauma based on (1) the condition of the animals' ears, which clearly were not impacted by an acoustic event; (2) the timing of the strandings, which is not typical for strandings from acoustic trauma; and (3) the types of animals affected, which suggest the Peru strandings more likely occurred due to weather or biological

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		factors such as toxic algae or disease. The Navy will continue to assist the National Marine Fisheries Service and stranding networks as needed, and remains committed to protecting marine life while performing its national security mission.
Hurley-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Hurley-02 (Electronic)	What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Hurt (Electronic)	My comment concerns the proposed Navy training exercises off the coast of California and Hawaii - some of the most incredible and rich marine environments in the world. I am a live-aboard, world cruiser. I just returned by sailboat from Hawaii where I visited the whales breeding grounds. The Humpback whales are an endangered species. In the past, the global humpback whale population size was about 750,000 to 2 million animals while the current global population is only about 30 to 40 thousand. With about 66% of the North Pacific population wintering in Hawaii each year, up to 10,000 humpback whales are expected to come to Hawaii this winter. I understand the need for protecting our country, but I strongly oppose destroying our marine environment to do it. We must find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures as would occur under the Navy's training exercises planned for the California coast and Hawaii. Consider steps to reduce the harmful impacts to marine mammals: including avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. We know that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. This kind of devastation to the marine environment will have great costs beyond just the loss of marine mammals. There will be a significant loss of revenue from tourism and fishing as well as a great ecological cost. It just takes planning and modifying your training plans to avoid this. These marine animals are already struggling for their existence. Don't add this assault to their plight.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Huvard (Electronic)	Please develop and use training methods that do not harm or kill marine life. Thanks.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Hyman (Electronic)	I hope the US Navy will take steps to reduce the impact that sonar has on marine life.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Hyson (Oral-Hilo)	Okay. Well, thank you for letting me speak here. I hope my input can have some value. Star Newland and I, through the Sirius Institute and Planet Puna, have been studying mostly the effects of birth and general birth and water birth on the constitution of humans. And one of the major experts in underwater birth and birth in general is a French medical doctor named Dr. Michel Odent. And he points out that nearly all cultures have messed around with the birth imprint or the birthing process. For example, some cultures will express the mother's colostrum and throw it away to make sure that the baby never has it in spite of the fact it's the most helpful thing it could get right at birth. Other cultures would put sand, salt, bread, sugar, rice, anything other than milk as the first taste for an infant. So we have planet-wide messed up the process of birth. Recently -- well, not recently but over the last decades, they've been using more and more synthetic Oxytocin, Pitocin, and it's causing great fetal distress, but it also messes up the bonding and the suckling between the mother and infant. So we are rapidly losing	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	the ability to give birth properly. The punchline of this is when you do this to an infant, since the type of life they have is dependent on their birth imprint, you end up -- if you interfere with birth in a major way like we've been doing, you end up with people that have missed connecting with their mothers, with the Earth, and they are great warriors, and they are traumatized. They're enraged, and they're ready to kill at some point because we have messed up their birth imprint. So we have fallen into this, and that might be one of the major reasons why we have such a warlike planet. So fortunately the Navy has agreed to partner with Star Newland and the Sirius Institute for domestic harmony, and so we're here to talk to them about that. And we hope that the Navy can start this process that one could imagine, for example, Navy wives giving birth in the water with the service dolphins that the Navy already has. One can imagine the service dolphins helping the returning veterans with their traumas and post-traumatic stress disorders and so on. And this could lead to a much more harmonious planet, which is consonant with the Navy goals right now, that they will pursue humanitarian efforts to avoid or reduce conflict before they will choose to attack and to do other things like that. So we're very proud that the Navy wants to do that, and we're hoping they'll continue, and we're here to help in any way to reverse this trend on the planet. Thanks.	
Igel-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Igel-02	What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Inciong (Written)	Strongly Opposed. The kingdom of Hawaii still exists albeit under prolonged belligerent occupation. Thus, as a subject of the kingdom of Hawaii, I contend there is no treaty of annexation and the U.S.A. is violating the law of occupation and the law of neutrality. We have not given our consent to the U.S.A. nor any other nation to use our territory without jurisdiction or permission. The U.S.A. government or contractors EIS/OEIS are deemed unacceptable.	Thank you for participating in the NEPA process. However this comment is outside the scope of this EIS/OEIS. Please see Chapters 1 (Purpose and Need) and 2 (Description of Proposed Action and Alternatives) of the Final EIS/OEIS for a clear definition of the scope of this project.
Ingram (Electronic)	There is much we don't know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return because of education and protection. We have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	mammals are respected, I cannot condone Navy sound testing. I see these animals swimming in the ocean every day as I drive sown my hilland their rights need to be respected, Most sincerely, Barbara Ingram	
Islas (Electronic)	I do not agree or support this effort. It is not protecting and maintaining our oceans mammals. This testing is causing harm, and I do not see any use or good coming from it.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Ivascyn (Electronic)	Please rethink the US Navy plans to conduct training exercises all along the US East Coast and in the rich marine environment off the California and Hawaii coasts. If these training sites are used, please ensure that the Navy protects marine mammals from explosives and sonar. especially in calving grounds and migratory corridors, The Navy should create large "safety zones" around the exercises so that marine mammals are not harmed. This would allow training to go forward and minimize the liklehood that whatles, dolphins and porpoises would be harmed or killed. thank you for your help with this matter.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Jackman (Electronic)	I respectively ask you, the United States Navy, to rethink your training exercises. There MUST be a way that you can safeguard our Nation and safeguard those animals that have the right to live in these waters. We depend on them for a balanced world and ecosystem. I grieve to think of the pain and suffering these beautiful, amazing, intelligent creatures will endure due to your training exercises. PLEASE revise your plans, and take into greater consideration the importance and worth of these creatures, and the responsibility we have as humans to make sure our actions don't cause undue, unnecessary, and uncaring harm to those we share the earth with. I have faith in your capabilities to make a different, more compassionate, and more sensible plan. Thank you.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
James (Electronic)	This training program is both devastating and unnecessary. The projected mortality rates are staggering. The number of animals left deafened will slowly starve. The impacts of this kind of testing are well documented in numerous studies. These impacts are far	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	ranging and are damaging and lethal to ocean life -- from fisheries to marine mammals to all kinds of flora and fauna in the ocean. The only responsible action is to not use this lethal technology.	Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Navy has conducted training in these operating areas regularly for approximately 60 years. Though the intensity of live training will increase, the events are of relatively short duration and therefore the Navy does not anticipate that fish will be affected as a result of the training exercises and testing activities. Fish may respond behaviorally to sound sources in their hearing range (most Navy sound sources are not in the hearing range for most fish species), but this reaction is only expected to be brief and not biologically significant. Most commercially important fish species are not believed to hear midand high-frequency sound sources which make up the majority of sound producing activities.
Janton (Electronic)	ALOHA...I am a long distance swimmer on the Na Pali Coast of Kauai. The date of June 11,2012 I was swimming from Miloli'i to Polihale when I heard thunder under water....what was that....my kayak escort man heard the thunder too , he thought it was real thunder over by the island of Ni'ihau. I was concerned. Later that same day, back at Miloli'i beach a group of us heard the "thunder" again and again. Then we saw he big grey ship over in the water west of Polihali. The sound of just that kind of booming was very disturbing . I was wondering why the ocean here in a marine life sanctuary would be subject to this kind of "drills". I am concerned that the tests with sonar will effect all of us who are in the sea, swimmers, divers, all the marine life . When the tests were done by the Navy off the Kona Coast several years ago I was in the ocean swimming. One of my fellow swimmers was damaged by the sounds in the sea coming from the Navy vessel. To this day she has nerve damage as a result of being in the water too close to where the sonar tests were being done.I wish to swim with confidence that I will not be damaged by sounds that are being tested in the sea. I am also concerned for all marine life especially in designated Marine life sanctuary areas.Mahalo.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. The EIS/OEIS analysis indicates that no impact on public health and safety would result from training activities using sonar, based on the Navy's implementation of strict operating procedures that protect public health and safety. The Navy is not aware of any documented cases of sonar harming people. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Jesus (Electronic)	I just learned at the Rio+20 that the ocean is more polluted than the lands.Because we can not see what is really happening,so the marine life is suffering,with fish nets and so on,which causes the trapping of the poor animals,causing the death and suffering of the fishes.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Cayetana Johnson (Electronic)	Please, no more killing of the sea with these experiments.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Colleen Johnson (Electronic)	Navy Training, Please reconsider the testing mission of the live explosives and high-intensity sonars. The animals in the ocean are far more important. Please. This is life that will be lost. Suffering that will be caused... Please.... Someone has to take a stand and save the animals. They are all apart of the bigger picture. We are all interconnected. As we destroy species after species, we are destroying ourselves... We may not see the impact in this life, but it does exist. Thank you, Colleen Johnson Sebastian, FL	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
D. Johnson (Electronic)	Yes, Please stop the Sonar Sea Testing, for this is not good for our Sea Creatures ... Put yourself in their place ... would you want to live in an area where testing is done where you live, eat, sleep??? Gratitude for what we have received as gifts in many forms on	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	this earth brings more benefits to mankind when we carry this Attitude/Mindset. Please Find Healthier Alternatives. Thank You, Sincerely, Dody Johnson	Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
J. Johnson (Electronic)	Please don't use sonar and explosives that will harm marine wildlife.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
H. Johnson (Electronic)	Almost everybody agrees that we need a robust and strong Navy to protect national security. And almost all of us agree that whales, dolphins, and porpoises deserve to live and to have a healthy ocean environment. But a recent proposal from the federal government tries to make Americans pick between these options, and it's a false choice. The U.S. Navy is proposing to conduct training exercises all along the U.S. East Coast and in the rich marine environment off the coast of California and Hawaii. These	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	exercises would involve the use of live explosives and high-intensity sonar. According to its own Environmental Impact Statements, the Navy estimates that the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. We understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. Please protect marine mammals from explosives and sonar along the East Coast and California/Hawaii. We know that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree.	testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
K. Johnson (Electronic)	I just want to express my concern for the dolphins, whales and other marine life affect by your under-water testing. There must be a better way than to harm these beautiful, innocent beings. Please consider alternatives and/or whether this testing is absolutely necessary! Thank-you!!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
T. Jones (Electronic)	Please consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
K. Jones (Electronic)	Why is it ok for this gov'ment to do whatever they want, when they want. This is not money well spend.	Thank you for participating in the NEPA process.
Jose (Electronic)	I know Navy sonar testing is necessary to protect Americans, but please limit testing around known cetacean migratory paths (geographically and seasonally). Whale watching boats, fishermen (both recreational and commercial) and scientists are a good resource for that information. Please use passive sonar to check for any cetaceans in the immediate area before testing and the animals will thank you for saving their lives! Thank you for your time, Cherilyn Jose	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Joseph (Electronic)	I'm writing to ask that you please stop the sonar that is killing mammals in your test areas. We went from 155,000 incidences to the potential for millions of times per year? Unacceptable. I live on the West coast and want future generations to be able to love the oceans, whales, and dolphins, that I have been able to enjoy.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Of the millions of annual exposures resulting from the Navy's proposed training and testing activities, nearly all are expected to result in "Level B harassment," defined as harassment that, "disturbs or is likely to disturb a marine mammal or marine mammal stock in the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behavioral patterns are abandoned or significantly altered." Only Level A harassment would have the potential to injure a marine mammal. As described in the Draft EIS/OEIS, marine mammals would potentially be exposed fewer than 1,000 times annually, throughout the entire Study Area, to sound levels that could result in Level A harassment. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities, designed to reduce marine mammal injury. As a result of these mitigation measures, impacts to marine mammals are not expected to decrease the overall fitness of any given population.
Jubran (Electronic)	Please do not deafen and kill marine life with your military practices. Why is it something you are not concerned with? Find a way to practice without hurting anything. We know you can do it with computer simulation - so why hurt our marine life? WHY?????????	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the EIS/OEIS, today's simulation technology does not permit effective training and testing.
Ken K. (Electronic)	Don't do these activities if they harm living animals. You've got enough ways to kill and maim people, these tests are not important enough to kill innocent animals over. How about we do tests on you and your family? Would that be ok?	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Kaempfer (Electronic)		Blank
Kahele (Written)	Enough is enough – no more military. This is not America, so go home. For the record I'm against all Navy and Military here in Hawaii, it's take, take, take. No end to it. You say you're here to protect us but who is going to protect us from you? Stop already. This is Military occupation. Stolen Land!	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Kaiu (Written)	Opposed.	Thank you for participating in the NEPA process.
Kaiwi (Oral-Kauai)	Aloha, my name is Ed Kaiwi. I was formally in the United States Marine Corps, Echo Company, Second Battalion. So I talked to this lady here, and she told me all about the Navy. Why are we trying to chase the Navy out of here? I just want the Navy to remove the sonar from all military ships within 300 miles within our sights. So I want to give this to the captain. This is a handbook. It says, Consultant with Native Hawaiian Organizations in Section 106, review process handling. So the Navy has to go through procedures with the Native Hawaiian Historical Preservation Officer, which I am. And then Sheryl Lovell is the other historical preservation officer for the Office of Hawaiian Affairs. So I represent the Office of Hawaiian Affairs and the Department of the Interior. So these policies and procedures things that I'm going to have Scott read after me identifying the historical properties. So the Navy hasn't identified what area, like the lady said, that they're going to test this thing. And now the whole northern islands is a sanctuary. So no military ships supposed to be in the sanctuary. So right now the Navy is violating many rules by bringing any military ship within the sanctuary area, which is the Pacific Missile Range. So the other one is adverse effect on it, and then there's how to resolve the adverse effect. What is the implementation of the MOA? The memorandum of agreement is what we need to sit down with the Navy and the historical preservation officer and the state preservation officer before anyone can proceed in whatever you're doing today. And the last part is charter Native Hawaiians and the public, so the public informant is the key ingredients in sufficient Sections 106 consulting, and the views of the public should be listed and considered throughout the whole entire process. So I'm a Native Hawaiian, and these are the public. And so the public and us are complaining about the sonar that you guys destroy it. You have called the mermaids aquatic eighth. So anyway, my time is up. And he can read the rest of this to you and follow the policies and procedures of the federal government before you even start to bring EIS in our waters. They're not allowed here and please follow the instructions. Let that be known the procedures and policies of the military. So do I.	As described in Section 3.10.1.2 (Identification, Evaluation, and Treatment of Cultural Resources) of the Draft EIS/OEIS, "Section 106 of the National Historic Preservation Act requires federal agencies to consider the effects of their actions on cultural resources listed in or eligible for inclusion in the National Register. The regulations implementing Section 106 (36 C.F.R. Part 800) specify a consultation process to assist in satisfying this requirement. Consultation with the appropriate State Historic Preservation Offices, the Advisory Council, Native American tribes and Native Hawaiian organizations, the public, and state and federal agencies is required by Section 106 of the National Historic Preservation Act. Scoping letters for this EIS/OEIS were sent to appropriate State Historic Preservation Offices and federally-recognized Native American tribes." The Navy will continue to comply with the National Historic Preservation Act.
Kaleiwahea (Oral-Hilo)	I hope that you guys understand in the three minutes that I have because one reason I'll be (inaudible). I want to ask you a question to you, you people. Do you know what Hawaii is here in the contribution to the world? Do you know what Hawaii is? Because you guys have to have an understanding that what we're here as a contributor to the world. We represent the heart in the (inaudible) system of humanity. This is why we have a culture Kanaloa. And for what you guys are doing, it's, you know, a beautiful culture that we have. You know, you guys are destroying it on the land, the water. You know, you guys not thinking. Why we're here, the way our (inaudible) put us here in this master plan because we have a culture. You guys don't. You guys are manmade culture. Ours organic. And this is why you guys got to know what we represent in this world by the	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	system of humanity. We represent the heart, brah. This is why we (inaudible). And because you no can understand that (inaudible), you know, how we going to pull this world together? You got to understand. You see that mountain up there? That's the (inaudible), the gods. Okay? (Inaudible) has three sides that connect the four pillars of the world. You understand me? Four pillars of the world: north, south, east, west. Okay? You people come to the west, go in there. You represent (inaudible). Go into the east (inaudible). We come from Kanaloa, the living spirit over the land and the water, and we come from a culture Kanaloa. You guys have to make that connection so we can pull the world together. I'm not (inaudible). America, Japan, China (inaudible). Okay? Why? Because this reason: They're supposed to come here and understand. (Inaudible.) It's a power play, one with the (inaudible) and one with military gain. That's not the way, man. We got to pull the world together. The world is the heart, and that's what we're here for. Okay?	
Kanaka'ole (Electronic)	Dear Sirs/Madams, I am strongly in opposition to any/all proposed use of the Hawaiian Archipelago as a training/test site for the US Navy et al as it is evidently detrimental to the critical habitat of these Hawaiian Islands & its' people. I am a lineal heir descendant/3rd party beneficiary of the Cleveland-Liliuokalani Assignment/Agreement who has never willingly/knowingly conveyed and/or ever been compensated for my assets (inherent vested undivided interest to what was under the lawful management of the Crown/Hawaiian Kingdom Government prior to January 17, 1893) as a matter of fact or pursuant to the law of Nations (Geneva IV & V). The Apology Resolution (Public Law 130-150) & Act 359 of the Hawaii State Legislature acknowledges the historical injustices committed upon the Crown). The Hawaiian Kingdom Government & its' People never conveyed nor have we been justly compensated for what was under the lawful management of Liliuokalani (Queen of these Hawaiian Islands). It has been reported today that the US Navy has knowingly dumped hazardous waste into Pearl Harbor (Oahu) & are being fined $80,000.00. The ridiculous fine shall not compensate or financially cover restoration/reparation of the critical habitat affected by the US Navy's illegal dumping of hazardous materials into Pearl Harbor!!! Furthermore, no consultation has ever been made with me & my ohana directly possessing an undivided interest to the entire Hawaiian Archipelago as pursuant to Section 106 of the National Historic Preservation Act of which compliance is mandatory!!! Whereas, I demand that all directly/indirectly concerned cease & desist immediately. Your failure to cease & desist would give cause of action for me & my ohana to file grievances with the international court of justice for cultural genocide & civil rights violations pursuant to applicable sections of Title 18; 28; & 42 of the United States Code etc!!! Please govern yourselves accordingly with due diligence!!! Aloha nui & Mahalo!!! Simbralynn Leiolani Kanaka'ole	Thank you for participating in the NEPA process.
Kane (Electronic)	Please do not continue with your sound testing in the Pacific	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Kastel (Electronic)	Almost everybody agrees that we need a robust and strong Navy to protect national security. And almost all of us agree that whales, dolphins, and porpoises deserve to live and to have a healthy ocean environment. But a recent proposal from the federal government tries to make Americans pick between these options, and it's a false choice. The U.S. Navy is proposing to conduct training exercises all along the U.S. East Coast and in the rich marine environment off the coast of California and Hawaii. These exercises would involve the use of live explosives and high-intensity sonar. According to its own Environmental Impact Statements, the Navy estimates that the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. We understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, porpoises, and many other marine creatures. We are asking the Navy today to protect marine mammals from explosives and sonar along the East Coast, and California and Hawaii. We know that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. The HSUS is joining other environmental and animal welfare groups to ask the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. We are calling on the U.S. Navy to re-think its plans and to incorporate additional protective measures. PLEASE CARE ABOUT THE MARINE LIFE! HAVE MERCY! BE RESPONSIBLE!	
D. Katir (Electronic)	I respect the thought and care you are using in your efforts to make our country safe and also for your efforts to reduce any adverse effects to wildlife. However, I ask that you please find a method, a time, or a location that will result in few to zero fatalities or injuries while you strive to achieve your goals. All marine life is in need of our protection, but especially sea turtles, whales and beaked dolphins. Please do not seek to use methods that have adverse effects on marine life.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
U. Katir (Electronic)	First, I praise you for inviting comments. Please help us to understand why using potentially lethal testing methods is necessary. I hereby state my objection to any sonar testing that would damage whales, dolphins or any other sea creature sensitive to such testing. Please DO NOT DO THIS!!! Is there another way? Is there another location? Please help the public to understand what you are doing! Again, thank you very much for allowing the public to comment. I just wish I had known sooner. You have my phone number, please call if you have any information that will help me to understand. I appreciate you and pray that everyone's needs can be met. Very best regards, Usha Katir	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Kaur (Electronic)	To whom it may concern, Sometimes as an individual one feels very impotent to stop an exercise of this magnitude. All I want to remind the people behind this is that we are NOT alone on Earth. The continuance of life on Earth requires balance and respect to all those we share this planet with. In the name of progress we ignore the collateral damage we cause but we don't realize that the Earth has a pulse too and it has reminded us, through Tsunamis and Earthquakes and disasters of horrible magnitudes, that payback is tough. So lets respect non-humans on Earth and not inflict such damage on them. Best, Simran	Thank you for participating in the NEPA process.
Keanu (Written)	Opposed.	Thank you for participating in the NEPA process.
Keeble (Electronic)	I'd appreciate it if you didn't test your sonar and explosives in proximity to defenseless marine life. C'mon, with all the pollution and overfishing those guys have a hard enough time getting by as it is don't you think? Do we have to be the planets biggest a-hole neighbor every time?	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. The Navy has conducted training in these operating areas regularly for approximately 60 years. Though the intensity of live training will increase, the events are of relatively short duration and therefore the Navy does not anticipate that fish will be affected as a result of the training exercises and testing activities. Fish may respond behaviorally to sound sources in their hearing range (most Navy sound sources are not in the hearing range for most fish species), but this reaction is only expected to be brief and not biologically significant. Most commercially important fish species are not believed to hear midand high-frequency sound sources which make up the majority of sound producing activities.
Keefauver (Electronic)	Please put the safety of the whales & dolphins first and keep your testing off the shores of Hawaii & California.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Keller (Electronic)	This is too high a price to pay. You know how the animals will be damaged. The damages will be in effect for many years in some cases. Spend the money to go somewhere less harmful if this "testing" must be done. Frankly, you people are not dumb. Why can't you figure out a way to test your merchandise without the harm? This is too high a price to pay.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
A. Kelly (Written)	Opposed. I'm opposed to the use of High frequency Sonar. I further believe that this EIS is incomplete as it does NOT mention the effects on Humans Due to the impact on the sea reafs and animals. There is no mention of Cultural or food impacts as a result of High frequency Sonar.	This EIS/OEIS fully analyzed all impacts to the human environment. The reasonably foreseeable effects to coral reefs and other marine species were analyzed in Chapter 3. Impacts to cultural resources were analyzed in Section 3.10 (Cultural Resources) of the EIS/OEIS.
G. Kelly (Oral-Hilo)	I'd just like it to go on record that I'd like the meetings to go back the way they were, where we were able to reach the whole public and not just the choir so that we can reach out to our community, and I feel like this is a suppressive tactic even if it wasn't intentional. On the first introductory panel that declares your mission, one of them is to	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	"maintain, train and equip combat-ready military forces capable of winning wars." I just said to myself, wow, imagine if you went up to the pearly gates and they said, "Well, what was your mission in life?" and you said, you know, "I'm capable of winning wars." I wonder how that would go over with the Creator. And I looked at that word, military forces. Two syllables in forces. What's the first syllable? That's got to tell us something. Force. In regards to the environmental studies, most of these studies have kind of failed the people. You know, we may be thrown a crumb once in a while where they'll save a bird or a patch of habitat, but for the most part our wishes are overridden while military toxins continue, everything from heavy metals to depleted uranium and to unexploded ordnances. So even though we're here for an environmental study, I can't detach that from the bigger mission, which I see as empire-expanding. And by empire, you know, okay, U.S., NATO, Israel kind of joining forces to dominate the rest of the world one country at a time, Iraq, Afghanistan, Egypt, Libya, Pakistan, Syria, with the intention of circling of course some nations that still show some independence like Russia and China, all moving towards the ideal of globalization, which steals every country's sovereignty. And we will be then led by leaders in the U.N. half a world away, whom we have not elected, and have less of a voice and less local authority to decide how our lives are led. And now going into Mother Africa, and we know that it's about resource grab, about owning the oil and owning the water and owning the ports and the poppies, the heroin poppies and the opium poppies and every other resource out there. And so when I talked to everyone here, everybody was passing the buck including you, sir. You said, "We do not make the decisions," but you do serve those who make the decisions. And I guess the last part of what I want to say is outreach to those of you who are holding up the military killing machine because I see it as such. You choose to settle conflicts by taking lives, and that's a very primitive way to advance civilization. Please think about our words tonight. We're reaching out to you. We'll be here for you if you decide on a different course in life. It's not too late.	
Kemp (Electronic)	Please do not do this!! Stop the testing...NOW!	Thank you for participating in the NEPA process.
Kendrick (Electronic)	Please do not endanger the hearing or lives of whales and dolphins. Isn't there another way?	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
Kenzie (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Kenzie	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Kershner (Electronic)	as vast as the oceans may seem to us landdwellers, for many creatures, it is their only home. please consider the following steps to reduce the harmful impacts to marine mammals: avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ketcherside (Electronic)	Almost everybody agrees that we need a robust and strong Navy to protect national security. And almost all of us agree that whales, dolphins, and porpoises deserve to live and to have a healthy ocean environment. But a recent proposal from the federal government tries to make Americans pick between these options, and it’s a false choice. The U.S. Navy is proposing to conduct training exercises all along the U.S. East Coast and in the rich marine environment off the coast of California and Hawaii. These exercises would involve the use of live explosives and high-intensity sonar. According to its own Environmental Impact Statements, the Navy estimates that the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. We understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Khomyakov (Electronic)	I am saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. I look forward to hearing from you with your views on the above, if you have any queries please do not hesitate to contact me.	analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Kieckhefer (Electronic)	I am shocked and angry that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5 million instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that a cetacean with a permanent hearing loss is a dead animal as whales and dolphins depend on sound to navigate and live. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals. Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must take steps to significantly	There are several contributing factors that make it inappropriate to compare takes from previous studies: • An increase in training and testing activities and the inclusion of more activities and sources to meet emerging requirements. • Combined geographical areas (areas not previously analyzed) • Updated marine mammal density information • New acoustic effects model • New acoustic threshold criteria extended the ranges to effects of sound sources and result in higher numbers of predicted level A takes. The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	
Kingsley (Electronic)	I'm concerned about the harm potentially caused to marine mammals by your project. Surely it would be unthinkable for someone to come to your home and deafen your family members. Why then is it acceptable to do it to another species? Because they don't talk? Because they don't vote or have any influence? Are any species other than humans at risk from other "projects"? We are not being good custodians if we think we are so far above everything else that lives here that we can't be compassionate and use restraint when we exert our "supremacy" over other life forms. These creatures were here long before humans but we think nothing of harming them to advance ourselves. They need their hearing to eat, mate, communicate...all the things we do without a second thought. What if those things were taken from us through no fault of our own but by a, supposedly, more advanced society? We have no more right to harm another than they have to harm us. I know I sound like a bleeding heart hippie or something. I may be but I'm trying to give a voice to those we can't understand. Shouldn't we side with compassion and respect instead of arrogance? Thank you for your time. Sincerely, Michele Kingsley	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Kirch (Electronic)	Don't kill & or deafen innocent animals for testing, please find a better way.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Kislak (Electronic)	As a taxpayer and supporter of the U.S. military, I implore you to please NOT destroy or injure in any way any marine animals with naval (or other) exercises. It is an abomination in the eyes of God. You MUST figure out a way to exercise military hardware and forces WITHOUT significantly damaging ANY of God's creatures. I am generally in favor of national defense exercises, and I understand collateral damage during war, but killing and injuring simply for exercises is a sin of the highest magnitude.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
Kitch (Electronic)	Please do not threaten the lives of whales and dolphins on East Coast, California, Hawaii by conducting experiments using explosives and sonar. This is unacceptable and unnecessary. Please take into consideration and develop another plan.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		(Alternatives Development) for more detailed information on the development of alternatives.
Kivlen (Electronic)	Whales and dolphins depend on sound to navigate and live. Please stop the useless killing of 1,800 whales and dolphins and the deafening of 15,900 more by ceasing the operation of the Navy's underwater sound system in the Hawaiian Islands, the California and Atlantic Coasts, and the Gulf of Mexico. The use of high-frequency underwater sound testing should be better managed by working with Environmental groups. The Navy should plan to test during a safer time period, or if necessary stop the testing completely if it can't be done without harming thousands of whales & dolphins.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Klick (Electronic)	The proposed plan is indefensible from the point of view of putting at risk many thousands of marine mammals, who are considered by leading scientists to be sentient and self-aware. A similar proposal that involved the planned death of 2000 primates, many of endangeded species, along with irreversible damage to tens of thousands of others would never even be considered. If indeed these exercises are important to our future security, it is imperative that measures be taken to minimize the impact on marine manmmals. These measures could include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Knable-Crook (Electronic)	I realize your work/testing is critical. But so is the survival of these wondrous creatures... please, please pursue alternative solutions to actions that will inflict such pain and devastation. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
Knight (Electronic)	Hi, I am opposed to this testing based on the environmental impact on marine wildlife such as whales and dolphins. The Navy should be able to find ways to operate without harming the environment!!!! Theresa Knight	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
K. Kocsis (Electronic)	I am commenting to ask the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	I am calling on the U.S. Navy to re-think its plans and to incorporate additional protective measures.	testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
L. Kocsis (Electronic)	I am commenting to ask the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. I am calling on the U.S. Navy to re-think its plans and to incorporate additional protective measures.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Kohn (Electronic)	Please protect our seas and precious sealife from military proliferation. We need to live in harmony with all species. These practices would deafen and kill sea mammals and the longterm effects on the oceans are really unknown. Especially important to protect migrating whales and our beloved dolphins. There is no need for such a large area. Please, protect our seas!	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Kolons (Electronic)	Enough is enough. It's been proven that sonar is deadly to marine mammals. It's there home, not ours. Get real and stop this unessacary torture of these innocent marine mammals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Koopmans (Electronic)	plz do not do this its to cruel we need Animals on this world	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Korhonen (Electronic)	We are saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. We look forward to hearing from you with your views on the above, if you have any queries please do not hesitate to contact us, yours,	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Kozin	As important as your mission is it is equally as important that we protect innocent and peaceful creatures. It is our responsibilty as stewards of this planet to not them cause	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
(Electronic)	harm.	analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Krinsky (Electronic)	Marine mammals live in the ocean. They do not have a choice on their location of residence. They rely on their sense of hearing to survive in their native environment. Sonar interferes with their ability to live. Every technology invented by humans has an impact on the world. Some of these impacts turn out to be severely negative consequences that were unintended but very real. When that occurs, it is incumbent on mankind to change its implementation of those technologies to mitigate the harm done to other beings or the environment. We now understand the destructive impact of sonar use in areas of high marine mammal activity, particularly in the areas off of Southern California and Hawaii. We should develop and use alternative technology in these areas at the very least, but also in other sensitive areas to ensure that other species have the right to live their lives in a safe, peaceful and positive manner without the kind of unnatural interference provided by our deployment of the sonar technology in their homes and feeding and breeding grounds.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Navy employs new technology where feasible to reduce impacts. One example is the use of passive sonar to listen for the presence of marine mammals prior to starting a sonar activity.
Kronsnoble (Electronic)	I am outraged that the Navy is planning an operation which will harm dolphins and whales not to mention other creatures in the ocean. Please do not do this!!! It is just wrong.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Kujanson (Electronic)	Please reconsider your testing where dolphins and whales are put in danger of losing their hearing and lives. I am so appreciative of our freedom and soldiers. And so proud. But this is nothing to be proud of. Please do not do this.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Lafferty (Electronic)	Please consider protecting marine mammals from sonar exercises and explosives in order to reduce the harmful impacts to these innocent creatures. As a patriotic American, I support the US Navy but without consideration and respect and for these majestic beings, we are engaging in what seems like an outdated and cruel practice. Certainly, as a nation, we are better than that.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Landsberg (Electronic)	I am writing to ask the Navy to please implement all protective measures while using sonar and explosives in areas where marine mammals live. We know the harmful effects sonar and explosives have on marine mammals and we need to make sure we protect them in the process. Thank you, Marisa Landsberg	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
A. Lane-01 (Electronic)	Please do not conduct training exercise along the US East Coast or off the coasts of California and Hawaii. Your own environmental studies indicate that a large number of marine mammals including some endangered species will be impacted negatively, even killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded few to no mortalities from sonar or explosives.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Any prediction of mortality made by a model is only an estimate.
A. Lane-02	With the technology that our nation possesses, we can certainly find more humane and ethically/environmentally responsible ways to test live explosives and high-intensity sonar. I urge the U.S. Navy to listen to the majority of the public and use and observe protective measures in your testing excercises-all creatures on this earth have a right to a peaceful existence. April Lane Whitefish,MT	Currently sonar is the best means of locating small objects in the water. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
K. Lane (Electronic)	STOP UNDERWATER SOUND TESTING!!!	Thank you for participating in the NEPA process.
Lang (Electronic)	I urge and request the US Navy to adopt safeguards during sonar training. The upcoming testing, please protect Whales and Dolphins. I know there must be ways to keep our country safe WITHOUT torturing non human life. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Lauer (Electronic)	I am urging you to consider steps to reduce the harmful impacts to marine mammals when conducting training exercises. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Many animal welfare organizations, including The Humane Society of the United States, are happy to work together to come to the best, most humane solution for all. Please explore all options before sacrificing the precious species that call our oceans home. Thank you in advance for your compassion.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Leach-01 (Electronic)	Don't do it! Lives are at stake, not human, just as meaningful.	Thank you for participating in the NEPA process.
Leach-02	Please don't do it! We have done enough to destroy, then try and save sea life!	Thank you for participating in the NEPA process.
Leder (Written)	Opposed.	Thank you for participating in the NEPA process.
A. Lee (Electronic)	For me, part of being an American is knowing that our actions are what make this country great. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Thank you, Andrew Lee	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
C. Lee (Electronic)	Please protect animals during training exercises.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
M. Lee-01 (Electronic)	Humpback Whale Breaching Photo: Thomas R. Kieckhefer I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
M. Lee-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4)

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
R. Lee (Electronic)	To Whom It May Concern, We just returned from a vacation to Texel, a small island in north Holland in the North Sea. Walking along the beach one evening we found a dead, beached harbor porpoise. The entire time we stayed on the island, we observed construction in the water near the beach. There is no way to know if this had anything to do with the porpoise's death, but it was clear that it significantly affected the environment these beautiful animals live in. It is disturbing to know that in our home state of	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	California, our own government is considering activities that will risk the health and lives of marine mammals, such as whales and porpoises. Our son's second grade teacher took her class to Point Reyes, CA in the spring to show them the migrating whales. The class counted a number of whales together and returned home with beautiful images and stories in their minds. These are the very whales that would be affected by the Navy's tests. I urge you to please consider alternatives to the planned testing, that would allow these animals to continue living in our waters unharmed. With much appreciation, Dr. Ria Lee	
Legere (Electronic)	To the Navy, Please stop murdering the sentient beings of the oceans. Stating you are doing it for our defense makes no sense and only proves how insane or rather unsane your department is. Murdering divine beings protects no one, it only endangers the planet even further. Stop this horrid practice now! Have you ever heard of karma (cause and effect)? Saying you are just following orders is not an excuse and does not protect you from your cause and effect.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Leland (Electronic)	Considering the state of the world's oceans this exercise is irresponsible if not completely moronic. And why can't these exercises be conducted in simulators or with as little negative impact as possible? Monstrous.	Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the EIS/OEIS, today's simulation technology does not permit effective training and testing.
Leo (Electronic)	This is truly outrageous! Please, I am asking the Navy to consider steps to reduce the harmful impacts to marine mammals. We must value and preserve our oceans and the marine mammals that inhabit the ocean, in addition to protecting our national security. There must be a balance. Please avoid the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; create a larger "safety zone" around the exercises; and use aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Thank you for the consideration.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Leonard (Electronic)	I urge finding in favor of the No Action alternative. Multiple past studies and environmental assessments have found that current levels of Navy training and testing activities do have detrimental effects on marine resources' including on protected and endangered species. These include some with permissible takes of zero. Any increase in training and testing levels' or increase in use of active sonar would result in greater	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	impact than current' and would be contrary to National environmental laws.	maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Lerandeau (Electronic)	We will always have the military and their various war games. If we are not careful, we will NOT always have dolphins, whales and other sealife. The Navy must stop their sonar testing if it will damage or kill sealife.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Lett (Electronic)	I am truly saddened to learn that the US Navy is planning to use live explosives and high intensity sonar that will affect the lives of 2000 marine animals. I have seen programs about marine mammals affected by navy exercises involving the use of explosives and that footage is highly disturbing as it highlights the effect such equipment has on marine life. In addition, the US Navy is carrying out these exercises without any regard for the marine life that is being affected in other countries by the use of it's sonar equipment. It is well documented that sound channels in the sea allow sound to travel over vast distances. Other countries deserve to be made aware and consulted about the US Navy's exercises. Please consider this matter seriously the Navy's actions impact upon lives of so many marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
M. Levine (Electronic)	Please do not do this. Our marine mammals are so precious and are such an important part of the greater ecosystem. We've already done so much damage to our oceans and the life there -- we should be doing everything we can to return the ecosystems to their previous state, not destroy them further.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
R. Levine (Electronic)	I urge the Navy to limit the number of sonar exercises which negatively effect marine mammals. Evaluating necessary vs unecessary testing is a fair compromise between the navy & environmental groups. These magnificent animals play a vitally important role on earth. Disrupting their enviornment , in such profound ways, is inhumane. We are the stewards of this planet and are responsible for protecting all of the earth's creatures. I hope that the navy makes sound decisions based on good science, and with the assistance of marine experts, so less stress is placed on the oceans ecosystems, which are so important to life on earth. Thank you.	The Navy's requirements for training and testing have been developed through many years of iteration to ensure Sailors and Marines are prepared to properly respond to the many contingencies that may occur during an actual mission. These training requirements are designed to provide the experience and proficiency needed to ensure Sailors are properly prepared for operational success. Current testing levels are necessary to provide safe, reliable, effective systems to Sailors. There is no "extra" training or testing built into the Navy training and testing program. Any reduction of training or testing would impede the Navy's ability to achieve the levels of certification, proficiency and readiness required to accomplish assigned missions.
Levitt-01 (Electronic)	This comes up year after year. Please understand something. We, the concerned, care for the safety and preparation of the US Navy. AND, we accept that we (humans), MUST act responsibly regarding our actions here in relation to ALL who may be effected by it. You need to train. You also need to find a way to do so without bringing harm to the creatures with whom we share our waters. We aren't better or more important than them and we haven't the right to disregard their lives in pursuit of our own aims.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Levitt-02	We need to find a solution that works, and if that involves taking a radically new approach, applying innovative, out-of-the-box thinking to this problem, then it's about time. This principle is universal. No culture or industry ever survives, let alone thrives, without seeking to improve itself. And these improvements must benefit themselves as well as all others effected byit their endeavors. If it doesn't, it is doomed to failure and will, inevitably, cause a de-evolution of all those associated and effected by it. So. DO you think you're able to access the genius required to come up with such a solution? I think you are. To do so, you'll have to fore-go your traditional approach to problem solving. Please, please, show us what you're really made of. Show us you're more than grunts with guns. Help us to remember that you are in fact intelligent, motivated, inspired protectors of things good in this world. Show us that you've found an elegant, brilliant, remarkably effective solution to this and we won't just get out of your way, we'll help you along. Can you imagine that? When you can, you're on the right track. in gratitude, Jason	Currently sonar is the best means of locating small objects in the water. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
J. Lewis (Electronic)	Please protect the future of our wildlife.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
O. Lewis (Electronic)	We are saddened to hear that they Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. We look forward to hearing from you with your views on the above, if you have any queries please do not hesitate to contact us, yours, Olivia Lewis	whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
S. Lewis (Electronic)	I strongly oppose any further sonar testing in our ocean waters. This testing is repetitive and unnecessary. The resulting stranding and deaths of marine mammals in these kinds of numbers is totally unacceptable. Whales and dolphins are aready struggling to survive the existing global human impact, and there is no justification for the amount of anticipated deaths. The military should not be given any special permissions to kill federally protected marine mammals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Li (Electronic)	I have heard through the Humane Society that the Navy is proposing to conduct training exercises all along the U.S. East Coast and in the rich marine environment off the coast of California and Hawaii. The Navy proposes the use of live explosives and high-intensity sonar. Your own Environmental Impact Statements estimates that the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. How is this justifiable? This is unacceptable and horrific. These intelligent, sensitive creatures do not deserve to have their habitat recklessly destroyed and their lives impacted by unnecessary training exercises in their area. There must be a better way. Please consider steps to reduce the harmful impacts	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	to marine mammals. Please avoid areas used as calving grounds or migratory corridors; avoid seasonal high-use feeding areas; create a larger "safety zone" around the exercises; and use aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Please have compassion.	with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Lilja (Electronic)	We are saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. We look forward to hearing from you with your views on the above, if you have any queries please do not hesitate to contact us, yours, Louise Lilja	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Lima (Electronic)	This testing is appalling!! And not moral in any form. No testing is worth many innocent lives and any living being. You all must find an alternative! We will not stand to let this happen to innocent marine life!!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Lincoln (Oral-Oahu)	My name is Lancelot Haili Lincoln. I am a direct descendent of Kamehameha I. If you look at the crescent of our royalty, the two twin brothers you see there, this is my family. My question to the Navy is when are they going to clean up Kahoolawe, which they have been bombing for many years? Another question I have, when are they going to clean up that oil spill over there at Pearl Harbor at the war memorial? Please, you make a mess in our islands, you must clean it up. You destroy the islands by bombing our islands, Kahoolawe, please, now you must clean it and make it the way it was when you first started. Pearl Harbor, that ship is still leaking oil. Anywhere in the world a ship dumps oil, everybody comes in to clean it up, environmentalists are all over these people, like BP. Please, clean the oil spill up over there at Pearl Harbor so we can -- again one day hopefully my grandchildren can eat the oysters that come from Pearl Harbor, Ewa Beach, Waipahu, like I did when I was a child. Now, my keiki, my children, and my grandchildren, my opio, they are not able to eat these urchins from these areas because of the destruction and oil spill from these ships. Please, you created this disaster, please clean it up for us. That's all I ask, Captain Nicholas. Thank you very much.	Thank you for participating in the NEPA process.
Lindsay (Electronic)	Crimes against the earth are crimes against humanity. What you do to the earth, you do to the people. We are all ONE. This is a human rights issue because EIS/OEIS is destroying life on earth. Protecting life, means protecting each other. Do no harm.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Linzer (Electronic)	I am upset that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. There must be reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Whales and other ocean animals are already at risk from the changing acidity in the ocean. Please help keep them safe for the years they still have left in the ocean. Thank you. Mary Linzer	analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. The Navy historically has recorded few to no mortalities caused from sonar or explosives. The estimated number of marine mammals sonar testing could affect is based on a scientific model, and it is only an estimate.
Livesey-Fassel (Electronic)	With great respect for all the Navy in particular and the military do to protect USA citizens may I please beg and plead that you consider the harm that is done to dolphins and whales in some of the excercises that harm their guidance systems! We MUST consider the great benefit of these creatures to our World and not destroy them in the process. Thank you!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Locascio (Electronic)	Has an analysis indicated the level of sonar testing that will have a minimal effect on marine mammals? With all of the scientific brainpower and experience concerning sonar testing they should arrive at an environmentally friendly solution. Has consideration been	The Navy shares your concern for marine life. The analysis and the science show that there is not a significant impact on marine species. All of the potential effects from Navy training and testing activities were

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	given to conducting sonar tests in waters avoiding marine mammals?	analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of the EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy implements the most practical mitigation measures with the aim of achieving the least practicable adverse impacts to marine mammal species or stocks, to the maximum extent practicable, during its training and testing activities. The Navy has conducted active sonar training and testing activities for decades in the seaspace depicted in the Study Area with no documented proof of injuries to marine mammals.
Lochlaer (Electronic)	Cetaceans are facing many threats: hunting, pollution, loss of food sources (due to overfishing by humans). We should not be adding to their problems. The relationship between sonar and stranding events is already documented. I know that the Navy's intentions are noble and honorable. But the cost in cetacean lives will be too high. Please abandon your plans to conduct these exercises.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Lockhart (Electronic)	I am concerned about the impact the upcoming training exercises will have on marine life off the coasts of California and Hawaii. Please consider using protective measures when conducting activities that will harm or kill the marine mammals that many Americans appreciate and respect. Thank you for considering my comments.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Loe (Electronic)	Please do the right thing and respect our oceans. The living organisms are more allowed to exist than us even. They do nothing but mind their own business and we do nothing but hurt them and their environments. Please again, do the right thing and leave the oceans alone. Spend less on war and more on friendships. It is possible.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Loew (Electronic)	I urge you to protect Pacific marine mammals from injury & death by NAVY Sonar Weapons testing. Underwater sound systems damage and destroy organs that whales and porpoises need to survive. The under-ocean noise literally blasts apart the delicate fluid sacs (similar to our human ears) and makes the whale and other sea mammals unable to hunt which is essentially a death sentence. Projections indicate that 11.7 Million mammals would be affected. Please rule on the basis of reason and human conscience, not in response to an unconscionable escalation of military might. We have no looming threats being made by sea that require such magnitude of testing, and this particular plan's ramification is unacceptable.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Logan (Written)	Opposed.	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
A. Loggie (Electronic)	Please protect all animals when testing your sonar and explosives. NO animal should die when you are testing. That is not fair to them. THANK YOU!! Anneke	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
M. Loggie (Electronic)	Please don't kill a bunch of Animals just so you can be "prepared" for a fight.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Longa (Electronic)	Please stop conducting sonar training and testing exercises which are endangering millions of marine mammals. These unnecessary practices are destroying our environment and wasting tax payer money. I am sickened by the thought that my hard earned money is being wasted by the Navy to conduct experiments that are killing and maiming endangered species.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Lopatka (Electronic)	We are saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. We look forward to hearing from you with your views on the above, if you have any queries please do not hesitate to contact us, yours, Trina Lopatka	actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
H. Lopez-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
H. Lopez-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly,

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	I hope to hear this testing is stopped since the damage to our oceans would be horrific.	however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
J. Lopez (Electronic)	We understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. We MUST protect marine mammals from explosives and sonar along the East Coast» and California/Hawai. We know that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. Please to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. We are calling on the U.S. Navy to re-think its plans and to incorporate additional protective measures	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Lord (Electronic)	I am opposed to any testing or other process by the US Navy that puts our valuable sea creatures at unnecessary risk. Whatever the purpose for this "testing", it should not interfere with the health and safety of ocean creatures. I'm sick of hearing how my own government kills, wounds, and maims creatures for 'science' or 'necessary drills'. You do not have to right to kill indiscriminately in the name of progress. You will not use my tax payments for any more deadly ventures. How about making sure you are not in an inhabited area, or find some way not to harm dolphins and whales with your deadly devices.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Lotts (Electronic)	Please stop this madness. There are other ways of testing, please don't kill marine mamals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
Lucas (Electronic)	How absolutely absurd that we would allow such a heinous act to even make it this far. What evil men propose such cruel displays of 'muscle'? There will be no hope for mankind as long as our military and leaders are allowed to act as such, with such disregard for our Oceans and the beautiful, feeling beings which live there. I believe you may have no souls, I will never stand behind our government until you start acting appropriately and decently. Shame on you! The government keeps waving their 'one nation under God' flag around but more and more are starting to realize who the real enemy is. You harm Gods creatures and destroy this beautiful planet with every act, the consequences will be dire. "Thou shalt not kill." No exceptions!!!!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Lucky (Electronic)	I am concerned about the impact of this sonor on our sea life. I hope that more testing can be done to determine the effect upon sea mammals and the use of any device be postponed until some less harmful device is invented. I believe in the USA and its protection but hopefully we can also avoid killing the wonderful creatures of our planet except during unavoidable wartime. This sounds excessive.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Currently sonar is the best means of locating small objects in the water. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
Ludwig (Electronic)	We don't need to hurt marine mammals in order to stay ready to defend our country. The thinking that says we do, is thoroughly mistaken.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Lunardi (Electronic)	Please do not let our precious marine animals die from your experiments. Please have a conscious.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
L. Lynch (Electronic)	I am writing to The Navy requesting that you include my comments on your Environmental Impact Statement (EIS) re: the use of high frequency underwater sound	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	for testing in Hawaii, the California and Atlantic Coasts, and the Gulf of Mexico. According to your estimates it will deafen more than 15,900 whales and dolphins and kill 1,800 more over the next 5 years. Whales and dolphins depend on sound to navigate and live. I am requesting that you please reconsider your Naval program, and save the lives of these ocean creatures.	analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. As noted in the Final EIS/OEIS, the design of the modeling and input factors has insured that the quantification of effects to marine mammals is a purposefully conservative overestimate of impacts. The impact analysis in the Final EIS/OEIS has been refined in coordination with NMFS. The number of marine mammal harassment exposures is only an estimate, not a prediction. The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
S. Lynch (Electronic)	Please do all that you can to minimize the effects of sonar testing on marine wildlife. The reports that have been aired on reputable programs like the Today show indicate that temporary or permanent hearing loss among marine creatures that depend on their own sonar for navigation is likely, by your own estimates, in an enormous number of animals. The numbers are unacceptably high, and by working with other agencies (governmental and private environmental), you can significantly reduce the negative impact and still conduct the necessary research to protect our service men and women. Thank you! Susan Lynch	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Lynne (Electronic)	I wish to state that the use of sonar testing in the pacific waters and the damage that will be done to marine life because of it is not okay at any level with this tax payer. I believe that if it were to be put to a vote at a national level that this would not be something that the citizens of this country would support. We do not want the endless wars either on our fellow human beings and we do not want it waged on our fellow creatures of the sea. Jefferson stated that taxation without representation is tyranny. Stop the tyranny of the military industrial complex and listen to your citizens!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Lyter (Electronic)	U.S. Navy needs to re-think its plans and to incorporate additional protective measures. It is inhumane to harm the whales and other sea creatures. do what is right, please.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Maat (Electronic)	I have learned that the Navy is proposing to conduct training exercises that would involve the use of live explosives and high-intensity sonar and would kill up to 2,000 marine mammals. Please reconsider and do not do these exercises. For what? So many creatures are risk to be killed, maimed and/or otherwise disabled. Do don't this please. Leave nature alone. Thanks, Doris Maat	See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. The Navy historically has recorded few to no mortalities caused from sonar or explosives. The estimated number of marine mammals sonar testing could affect is based on a scientific model, and it is only an estimate.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Macey (Electronic)	This meeting was a disservice to the public. Nowhere was the true reason spelled out for the public as to what is being done or why. This meeting was called I assume because it is required for public notification but there was no notification here. Several pretty displays that do not say anything or educate the public as to what is really going on here. How about you redo this meeting and actually inform the public and allow the public to respond with questions. This format is very deceptive for the public by seeming to provide information but not doing so. I would like for someone in charge of this project or a decision maker to actually give an informative brief to the public and allow the public to respond to them. What does this project entail? How does it really affect the public and environment? That's nice that the Navy recycles their oil and is trying to be a good steward for the environment but what does that have to do with this project. I have more questions now then when I came about the true nature of what this project is.	The specifics of the Navy's Proposed Action were described in Chapter 2 and Appendix A (Navy Activities Descriptions) of the Draft EIS/OEIS. Due to the large number and variety of activities proposed, the EIS/OEIS is the best source for the detailed information. The intent of the public meetings was to provide an overview (through the posters and handouts), and also to allow an exchange of information with the subject matter experts on hand.
MacInnis-01 (Electronic)	Dolphins and whale mothers use sound and echo location to communicate with their babies. The Navy will literally be ripping apart family units if it tests in sensitive areas. The whole process smacks of a disregard for life on this planet, not protection. It's shameful.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ma---	Opposed.	Thank you for participating in the NEPA process.
J. Madela (Written)	Opposed.	Thank you for participating in the NEPA process.
P. Madela (Written)	Opposed.	Thank you for participating in the NEPA process.
Maish (Electronic)	It is with disgust that I look out on the ocean and know that the plans to obliterate the lives of thousands of whales and dolphins are being set forward. This world has dangers and I am proud our Navy protects us from them, however, it is not a better world with this complete disregard for aquatic life.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Makely (Electronic)	Please find another way to test. Do not harm our wildlife!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Mancini-01 (Electronic)	Please, do NOT do the testing. Earth is not ours to destroy. We MUST protect the environment and all the living creatures. It is unacceptable to go through with these tests knowing whales & dolphins will be harmed. Stop now!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		(Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Mancini-02	Whatever cost/ benefit analysis you did, your numbers are wrong! The cost is unfathomable!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Mandell (Electronic)	Hello: I am writing because I strongly oppose sonic testing. Animals exist in their own right as individuals pursuing their way of being, which is no more or less sacred and holy then yours or mine. My most recent concern is Decompression Related Embolism in Stranded Whales and Dolphins, which occurs exclusively due to the US Navy. I am a citizen. I do not support cruel and grievous conduct to human or non-human creatures. Moreover, means do not justify ends - even when those ends may seem justifiable to those employing unjust means. I do not support hurting or violence towards others, human or otherwise. I appreciate a strong defense but not one that disrupts, upsets or destroys others, human, non-human, plant, mineral, rock, water or soil. I look forward to your response. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Mangan (Electronic)	Stop the killing of and or potentia1 killing of 1,600 whales and dolphins and the deafening of 11,200 more by ceasing the operation of the Navy's underwater sound system in the Hawaiian Islands and California coastline. Or anywhere else for that matter. It's 2012 - catch up with technology and adapt. I can't even believe I have to state the obvious.	See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded few to no mortalities from sonar or explosives. Any prediction of marine mammal takes is made by a model and is only an estimate.
Mann (Electronic)	I am very concerned about what the naval testing will do to sea life, especially whales and dolphins. Please do not let the sound testing happen.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Scarlett Manning (Electronic)	Please do not hurt or kill our marine relations, It will not only hurt them but ultimately will have such a strong and a far reaching effect for the whole planet. There needs to be limits for scientific advancement and in this case not only will they suffer the consequences, but we, as a human race will too. We are all interlinked. That's why they are called our relations. Please, Please, Please protect them from explosives and sonar.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Scott Manning (Oral-Kauai)	All you talking back there, can you mellow out for a minute. Thank you. Everyone came to listen. I'm just going to follow up with Uncle Ed here with Section 106 regulation summary so everyone understands what that is. Who's interested in that? Anyone interested in that? All right, cool. For the record, Section 106 of the National Historical Preservation Act of 1966. NHPA requires federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. The historic preservation review process mandated by Section 106 is outlined in regulations issued by ACHP revised regulations, protection of historic properties, 36 CFR Part 800, became effective January 11, 2001, and are summarized below. Initiate Section 106 process: The responsible federal agency first determines whether it has an undertaking that is a type of activity that could affect historic properties. Historic properties are properties that are included in the National Register of Historic Places or that meet the criteria for the National Register. If so, it must identify the appropriate state historic preservation officer, tribal historic preservation officer, SHPO, THPO, to consult with during the process. It should also plan to involve the public and identify other potential consulting parties. If it determines it has no undertaking or that its undertaking is a type of activity that has no	As described in Section 3.10.1.2 (Identification, Evaluation, and Treatment of Cultural Resources) of the Draft EIS/OEIS, "Section 106 of the National Historic Preservation Act requires federal agencies to consider the effects of their actions on cultural resources listed in or eligible for inclusion in the National Register. The regulations implementing Section 106 (36 C.F.R. Part 800) specify a consultation process to assist in satisfying this requirement. Consultation with the appropriate State Historic Preservation Offices, the Advisory Council, Native American tribes and Native Hawaiian organizations, the public, and state and federal agencies is required by Section 106 of the National Historic Preservation Act. Scoping letters for this EIS/OEIS were sent to appropriate State Historic Preservation Offices and federally-recognized Native American tribes." The Navy will continue to comply with the National Historic Preservation Act.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	potential to affect historic properties, the agency has no further Section 106 obligations. Identify the historic properties: If the agency's undertaking could affect historic properties, the agency determines the scope of appropriate identification efforts and then proceeds to identify historic properties and the area of potential effects. The agency reviews background information, consults with the SHPO/THPO and others, seeks information from knowledgeable parties and conducts additional studies as necessary. Districts, sites, buildings, structures and objects listed in the national register are considered. Unlisted properties are evaluated against a National Park Service's published criteria and consultation with the SHPO/THPO and any Indian tribe or Native Hawaiian organization that may attach religious or cultural importance to them. So I know I just have a few seconds here. But public involvement is a key ingredient in successful Section 106 consultation, and the views of the public should be solicited and considered throughout the process. The regulations also place major emphasis on consultation with Indian tribes and Native Hawaiian organizations in keeping with the 1992 amendments.	
Marckx (Electronic)	There is much we don't know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return because of education and protection. We have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing. Sincerely, Risty Marckx	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Marie (Electronic)	Please reconsider the supposed 'necessity' of any kind of training or testing that will harm our marine life. It is unfair to assume that the security of our country can be aided by means that disregard the other life that we share this planet with. The future consequences of destroying so many lives in our own environment cannot be accurately predicted. The cost outweighs any hoped-for benefits. It is a totally unnecessary lie that	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	we humans, or we Americans have to choose between 'homeland security' and the lives of creatures that reside in the oceans that surround us. Again, I am begging that the Navy please reconsider this action.	maximum extent possible, mitigation measures during its training and testing activities.
Marigold (Electronic)	Please do not use Hawaii as a testing ground for explosives... We are in a very sacred land.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Marshall (Electronic)	Don't kill millions of creatures in the sea with sonar. That would be cruel and outrageous. Act responsibly.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
T. Martin-01 (Electronic)	I have heard that there are sonar experiments about to be conducted that will kill and injure whales and dolphins and other sea life. I ask you to please discontinue these harmful exercises. Our world's oceans and sea life are fragile and precious. Please have a heart and stop this today. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
V. Martin (Electronic)	Our oceans are under threat already, please dont let this happen	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Marvin (Electronic)	PLEASE don't do this. Our ocean is full of things that we don't even understand. The living beings in the ocean need as much protection as the living beings on land. I understand that the navy, government, and who ever has power, money, and voice to make these things stop and go doesn't really care about the citizens opinion, however please consider the beauty in the ocean, the importance it plays in all our lives, and please put those of us who cant come on land and speak their voice, some kinds of respect and rights! I appreciate the Navy and I thank all those who give us freedom, but the same freedom we savor, is the same freedom the ocean needs. We don't belong there. PLEASE hear the voice. Do what's right.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Matejcek-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Matejcek-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Matejcek-03	I support a robust Navy to protect US national security. But I believe it is imperative that this be achieved without sacrificing marine life essential to a healthy marine ecosystem on which all terrestrial life depends. According to its own Environmental Impact Statements, the US Navy estimates that the planned training exercises all along the U.S. East Coast and in the rich marine environment off the coast of California and Hawaii would involve the use of live explosives and high-intensity sonar. The casualties would be up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage, an additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. Marine mammals navigate, communicate and hunt by sound, which makes them extremely negatively affected by the high-intensity sonar and explosive detonations that currently are part of naval training exercises. Whales, dolphins, and porpoises have essential roles in maintaining marine biodiversity yet already face threats from global warming, ocean acidification, entanglement in fishing nets, loss of food to unregulated fishing, illegal killing. Losing thousands of them as the result of naval training exercises is unacceptable In the past, whales have stranded and	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar, including incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species dying in North Carolina in 2005. I urge you to implement the full range of steps to reduce the harmful impacts of these exercises to marine mammals that are recommended by the HSUS and other environmental and animal welfare groups . These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded few to no mortalities from sonar or explosives. Any prediction of marine mammal takes is made by a model and is only an estimate.
Mattera (Electronic)	The USA Navy is proposing to conduct training exercises that would involve the use of live explosives and high-intensity sonar and would kill up to 2,000 marine mammals Please protect marine mammals from explosives and sonar We know that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. The HSUS is joining other environmental and animal welfare groups to ask the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. We are calling on the U.S. Navy to re-think its plans and to incorporate additional protective measures.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded few to no mortalities from sonar or explosives. Any prediction of marine mammal takes is made by a model and is only an estimate.
Mauthe (Electronic)	The war is over! We do not need this horrible playing "Army" in our oceans. Do you realize how many animals you are killing? How rewarding is it to you when you see and smell a dead Whale, Seal, etc on the beach after one of these test? Stop the killing and go play your Army Games somewhere else, we all own a part of Big Blue and I don't like	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	what you are doing to the life of the Ocean.	Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Maxey (Electronic)	Americans understand the necessity of conducting training exercises for our armed forces. However, we also understand that if the leaders of our armed forces use their intelligence and ingenuity, it is possible to protect innocent and vulnerable marine life from harm during such exercises. The oceans are the habitat for untold numbers of marine life. Just because we have the power to inflict harm on them, we have no moral right to do so. It is incumbent on the armed forces to demonstrate that they can fulfill their responsibilities without harming those forms of life who are the legitimate owners of the oceans.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
May (Electronic)	Dear U.S. Navy, Please re-think your plans and incorporate the additional protective measures below to reduce the harmful impacts to marine mammals. - Avoid the most harmful activities in areas used as calving grounds or migratory corriders. - Avoid seasonal high-use feeding areas. - Create a larger "safety zone" around the exercises - Use aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. We need a strong Navy to protect our country and we need to protect and ensure a healthy ocean environment for whales, dolphins, and porpoises to live in as it is their given birth right. Respect and protection of marine environments makes us a great nation. We need to ensure that we do not harm many whales, dolphins and other	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	marine creatures. The tradgedies of the past can be avoided significantly. Please remove the facade of having to choose between a strong Navy and national security or a healthy marine environment for ocean mammals by implementing the protective measures above. Sincerely and Respectfully,	
Mayer (Electronic)	I oppose the expansion of Navy sonar testing in the Pacific area around Hawaii and California due to the negative impact on whales and other marine mammals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Mayorga-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Mayorga-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Mc Keating-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Mc Keating-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	I hope to hear this testing is stopped since the damage to our oceans would be horrific.	detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
McCartney (Electronic)	I watched the Navy video on this page and I am happy to note the huge efforts being made toward responsible behavior such as recycling, using alternative energy, improving the logger-head shrike population, etc. Accomplishing Navy goals while respecting the lives of other Earth creatures is incredibly complicated I'm sure. Since we see ourselves as the beings with the most intelligence and with the most valid agendas we have an even larger responsibility of stewardship for our fellow creatures while pursuing our goals. Although the Navy says it's doing the best it can to respect the marine creatures I don't believe the proposed testing methods do respect those creatures. I understand the testing is expected to deafen thousands of cetaceans in the course of standard operations. Others will die outright. While it seems bad enough that we would ruin their sense of hearing we need to remember that hearing is their way of living, finding food, communicating with their family/pod. Our desire to test weaponry and defensive methods should NOT turn us (and our children) into the terrorists of these creatures. The lifeforms on our planet are intertwined and all are hugely important. We humans are not intrinsically more important or better than any of the others and we shouldn't subject them to our damage. They have no way to take a stand in this; they are just busy trying to live. I say we let them do that to the very best of our ingenious ability. Please, do not approve testing/training procedures that impose such a price tag on these peaceful creatures.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded few to no mortalities from sonar or explosives. Any prediction of marine mammal takes is made by a model and is only an estimate.
McDaniel (Electronic)	I do not feel safe in a country that chooses to annihilate innocent marine life. With thousands of marine animals that will lose their life in explosions with high intensity sonar, please reconsider. I worry for the thousands more that are not killed instantly, but become deaf and die slow, terrifying deaths as ear tissue is destroyed and sonar communication becomes impossible... effectively intelligent marine life like dolphins and whales die alone and afraid. I believe national security is important, but I also believe in the 21st century with the great amount of intelligence and creativity the finest in the US Navy offer, we can find a better way. Please include protective measures. I know the US Navy is designed to protect US citizens such as myself, but I do not feel protected if the wildlife I love is destroyed. These actions hurt the reputation of the military and country I respect and admire. It becomes more difficult to defend that the US Navy is a force for	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	good, when that force is used to harm. Please mitigate the harm these training actions will take and take protective measures supported by the Humane Society of the US as well as many environmental groups. Thank you so very much for your time and consideration!	with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Mcgovern (Electronic)	i am sorry i missed your public meeting and comment opportunity in may. i just recently became aware of the navy's plan to kill and deafen thousands of crustaceans and other marine life. i wonder how often these programs are evaluated for the impact on the environment and defenseless animals that are at the mercy of our gov't programs that are deemed necessary and fair but only further destroy and cause the decay of our planet. i hope there were other in the communities who care about the marine life of our planet who voiced similar concerns. thank you for the opportunity to express my concern. joan mcgovern	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
McGraw (Electronic)	The Navy's own estimates of sonar and bombs testing causing harm and mortality to so many marine mammals is evidence that the Navy needs to make significant changes to minimize this harm and deaths. I support the recent lawsuits against the Navy that call for scaling back your programs. I urge you to take all steps requested by marine biologists to minimize harm.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
McIndoo-01 (Electronic)	Hello Navy. As a military brat I understand the need for a secure world and I believe in the men and women who work to uphold it. But I have been watching the "progress" of your sonar technology since the early days of LFAS and, really, thank God for our environmental protection procedures and laws. You are messing with this technology simply for technology's sake. Unfortunately too many individuals in the military system are in deep denial about Sept. 11th. All the best technology in the world is not going to cover up the fact that this simple and brilliant plan was used so devastatingly against us by using our own everyday things. Box cutters. Planes. They didn't come at us in submarines and LFAS didn't protect us then. "They" won't now either. Because the game of war has changed. An underwater Maginot Line doesn't answer for our inability to think like the enemy! These military mistakes have happened over and over in human history. What makes you think you are any different? Your myopic belief in your newest strategy--this technology-- will finally make us invulnerable? It won't. Because you aren't thinking like them! A trained killer with a box cutter, if he goes swimming, will go around your sonar wall of death and get us from behind. And they will succeed. Again. Learn from history and stop repeating it. What you are doing is an abomination. It is an abomination to create, test and implement this weapon-- because that is exactly what your sonar acts like-- against another species in their home environment. An environment that we know very little about, and which they are dependant upon for their very survival. They cannot live on land. We cannot live in the ocean. It's not like they have somewhere else to go!	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	And your motives are not heroic. They are very dark indeed. Otherwise why do this in an environment in which we cannot see what you are doing and likewise see the actual true consequences?! It's not just the dolphins and whales, it's the very bottom of the ocean global food chain too! No doubt your weapon can blast apart the simple life forms upon which ALL OF US depend. You are engaging in an unprovoked act of aggression against innocents. There is no way you can rationalize this. HUMAN warfare against HUMAN INNOCENTS is unfortunately part of our human condition. But not the cetaceans and the millions of lives in the sea. And they have no means to defend themselves against us. What you are doing is fundamentally and profoundly wrong. Personally, I have been reeling through the shocks of the economic problems that are part of the history since LFAS, just as Sept 11th is part of that history. I find it so hard to believe that so many good and decent people are having such trouble paying their basic bills, and yet YOU have no issues with spending money on this weapon, this ultimately useless underwater Maginot line, the consultants salaries to convince us otherwise, the maps and diagrams, the list goes on and on. I have to budget a trip to the copy shop. One of your maps and diagrams would stretch that budget, so it wouldnt get done instead. And yet there you are, well fed and housed, on your military career tracks, self assured in your faith in your system. Good for you. Again, I've been there. But because I am reeling along with so many other good people does not mean that I am weak, or powerless, or that I cannot hold you to account. What you are doing is sick. Dangerous. Perverse. And you know it! This is not noble or heroic. It is not upholding any shining military virtues. It will not protect us. When the killer with the box cutter chooses to swim around you, it will prove once again that you failed to protect us. You failed in your duty. And in addition, you will have done so while desecrating whole communities of cetaceans and sea life. And you will be rewarded by adding their pain and suffering to the ghosts and demons that already haunt you. -*- Don't do this. Sincerely, Hilary McIndoo	
McIndoo-02	I just sent you my document but I couldn't get the cut and paste to work. Also my iPad does not have a printer port. So I want you to acknowledge that my comment was recieved and to please email me the entire copy of my comment. This is required of a document that is public record, such as being submitted to this EIS. Hilary	Your comment was received.
McIntyre (Electronic)	Please reconsider the explosive and sonar exercises. The military forces of the United States should be know to protect their people, but also protect their environment and animals within this environment. How can the people responsible sleep at night, knowing what they destroyed. This earth and many of the animal species have been here way before us and we should not take the liberty to destroy them!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. The Navy is committed to protecting the marine environment during

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		the conduct of its training and testing activities. As described in Chapter 5 of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
McKenna (Electronic)	To whom it may concern: It has come to my attention that the Navy plans to conduct training exercises along the California coast that could negatively affect marine wildlife. I am asking the Navy to instead consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Thank you for your consideration. Joan McKenna California resident	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
K. McNeil (Written)	Opposed. The Kingdom of Hawai'I remains sovereign although under prolonged belligerent illegal occupation by the U.S.A. and its military. Because no treaty of annexation could be ratified and because of the "executive agreement" between Queen Lili'uokalani and President Cleveland, which is still in effect to this day. Free Hawai'i!	Thank you for participating in the NEPA process.
T. McNeil (Written)	Opposed.	Thank you for participating in the NEPA process.
McNulty (Electronic)	I can barely express how horrified I felt when I saw the amount of devastation to be wrought by your projected training exercises. This is an abomination and must not take place. Damaging our planet and Her seas for any reason makes no sense. It seems more fitting that you should be protecting Her, in all aspects. The planet is our home, the only one we've got! Respectfully, Marnie McNulty	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
McNutt (Oral-Kauai)	I'm more organized than NOAA, which stands for No Organization At All. Sorry. My name is Lyn and my last name is McNutt, which has to be the best haole last name on the island, especially considering my daughter is the Kauai nut roaster. I just wanted to remind you guys, and this one thing that always comes back to me, you're working on tax dollars. Okay. These are my tax dollars. And this process needs much more	Your scoping comments were received, and along with all of the other scoping comments, were reviewed by the Navy to ensure the appropriate project issues were properly scoped in the Draft EIS/OEIS. The Navy appreciates your comments on this project and appreciates your desire to stay informed. In this particular case, the mailing

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	community input. I read the Federal Register, and that's how I found out about this meeting. I was at the last meeting. I received nothing back about my comments, not a thing, not any acknowledgement. I didn't get on any mailing list. I know I gave you all the information. I handed in seven pages of comments. I have a really strong background in writing EISs and marine policy. They were cogent comments, they were worth looking at and paying attention to. I felt really put out because I wasn't. And I also do the community calendar at Kauai Community Radio. We didn't get anything. Not a thing. People here don't all read the newspaper, and they certainly don't read the Federal Register. And by the way, at the end of this if anybody would like to be on my mailing list for the Federal Register, give me your email because I pull out all the things related to the ocean and land in Kauai and I send them out. As I look at your document right here, who do we call? Where is it written anywhere in here the timeline? Who do we contact? How do we get ahold of you guys? Because I know it's in the EIS, but it's buried in the EIS. And I'd like to come back to that comment the person made about data. I think it was Ken.	address provided was an old address, which is where meeting information and project updates were sent. This address has now been updated.
McRory (Electronic)	The HSUS is joining other environmental and animal welfare groups to ask the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. We are calling on the U.S. Navy to re-think its plans and to incorporate additional protective measures. Thank you, Kathy McRory	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Megan (Electronic)	Navy, NO, this is absolutely not acceptable. Sacrificing lives for tests is not an intelligent or sensitive decision. My entire American family does not support the decision to "sound" test! Absolutely not!! Sincerely, Megan , Gabriel & Frances	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Megles	As a senior citizen I have been aware of other times also when our scientists tested sonar and explosives where the whales, fish, etc. of our oceans were threatened and	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
(Electronic)	even harmed. Truly I am ashamed of how little respect we have for these creatures. Will we ever learn to respect them and find other ways to conduct these tests? Are they even all that necessary? Of course, people have always found ways to justify their cruelty to animals. 60 Minutes years ago profiled Dr. Michael Carey who shot 600 cats in the head for a wound study. Imagine this was approved. Either I am terribly abtuse or many people are.	analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Meima-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Meima-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Meister	As a US tax paying citizen, I find it totally unacceptable that the Navy would even consider doing any kind of testing that would do harm to whales and dolphins, not to mention other marine life. We are stewards of this planet, not destroyers. These animals are not only highly intelligent and beautiful creatures, they are also part of the web that we all belong to. I urge you to reconsider your position on this issue. I would venture to guess that if this were taken up for a vote, most every person in this country would vote in favor of the marine life. Thank you , Ann Meister	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Meltzer (Electronic)	I love the Navy but the potential catastophic effects of the proposed testing is unacceptable and inconsistent with the values we share. There must be another way to serve the Navy's needs while protecting our precious marine mammals. thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Merritt (Electronic)	I feel that the Navy is being very irresponsible for testing around 2 of the most beautiful states in the entire U.S. I have homes along the coast of California and on Kauai. The dolphins, whales, and other marine life are already affected by pollution. Now you are going to confuse them more with sonar. I think it speaks so poorly for those in planning and think some other sites should be considered. How about off of Mexico. I sometimes wonder how smart organizations headed by even smarter people can make such stupid choices. This to me is more important than who runs for president or Congress. Before retirement I worked for a government contractor and God help us if you have solicited contractors to perform your dirty work. I'm not sure I'm a proud American when decisions like this are made.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Mezzanatto (Electronic)	I find it reprehensible that as a country we would even consider doing this. Knowing how it affects the oceans beautiful mammals. We are SO much better than this! Have we not become less of a barbaric nation? Are we not supposed to be the example for others? Does anything go now, in the climate of lies and dishonesty, no integrity and whats in it for me..... the Navy has no intention of protecting the mammals in the ocean. They are intelligent beautiful creatures. Would you do this to your family and children? I sure hope not. Then act as if you have a heart and do what is right. Stop implementing something that you KNOW to be harmful. Please.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Micklo (Electronic)	Please refrain from sonar practices all together or at the very least make every attempt possible to protect and preserve all marine life at every level. We should strive to be a leader in the world in preserving and enriching life. We teach by example and thus we must take care of all of life.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Minton-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Minton-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		ship and aircraft and then provide “a crude estimate” of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, “(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching.” When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60’. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in “calm sea conditions” is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier’s and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the “one or two personnel” described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy’s reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
L. Miranda (Electronic)	Dear U.S. Navy, Please re-think your plans and incorporate the additional protective measures below to reduce the harmful impacts to marine mammals. - Avoid the most harmful activities in areas used as calving grounds or migratory corriders. - Avoid seasonal high-use feeding areas. - Create a larger "safety zone" around the exercises - Use aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. We need a strong Navy to protect our country and we need to protect and ensure a healthy ocean environment for whales, dolphins, and porpoises to live in as it is their given birth right. Respect and protection of marine environments makes us a great nation. We need to ensure that we do not harm many whales, dolphins and other marine creatures. The tradgedies of the past can be avoided significantly. Please remove the facade of having to choose between a strong Navy and national security or a healthy marine environment for ocean mammals by implementing the protective measures above. Sincerely and Respectfully,	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
S. Miranda (Electronic)	Dear U.S. Navy, Please re-think your plans and incorporate the additional protective measures below to reduce the harmful impacts to marine mammals. - Avoid the most harmful activities in areas used as calving grounds or migratory corriders. - Avoid seasonal high-use feeding areas. - Create a larger "safety zone" around the exercises - Use aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. We need a strong Navy to protect our country and we need to protect and ensure a healthy ocean environment for whales, dolphins, and porpoises to live in as it is their given birth right. Respect and protection of marine environments makes us a great nation. We need to ensure that we do not harm many whales, dolphins and other marine creatures. The tradgedies of the past can be avoided significantly. Please remove the facade of having to choose between a strong Navy and national security or a healthy marine environment for ocean mammals by implementing the protective measures above. Sincerely and Respectfully,	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Misseldine (Electronic)	I am deeply concerned that you are proposing to conduct training exercises that will involve the use of live explosives and high - intensity sonar. Your own estimates show that you will kill u to 2,000 marine and thousands more will suffer permanent damange such as deafness. Please do everything you can to reduce the harmful impacts to marine animals such as avoiding activities in calving grounds or along migratory corridors; avoiding high-use feeding areas and monitoring to determine if marine mammals are nearby. If you take these actions, your training can still go forward, but you'll minimize damage to these beautiful creatures. Thank you for your consideration.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	Carol Misseldine	actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. The Navy historically has recorded few to no mortalities caused from sonar or explosives. The estimated number of marine mammals sonar testing could affect is based on a scientific model, and it is only an estimate.
D. Mitchell (Electronic)	There is much we don't know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return because of education and protection. We have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing. Most sincerely, Deborah Mitchell	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
M. Mitchell (Electronic)	I strongly urge not proceeding with this testing as planned. I understand that it is not disuputed that this is harmful to marine animals, including very intelligent animals such as whales and dolphins, and perhaps gravely so. Of course this is measured against the importance of this testing to national security to a degree that perhaps the public cannot	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	fully know. I do not contest that we value human life over animal life, but of course that relative value cannot be an absolute argument allowing any harm to animals that might potentially be of any small benefit to our species. And in particular, with certain species, we see an almost universal desire to value their well being almost as much as we value our own. There have been many suggestions for modifications in the way the testing is done that would mitigate the suffering of these animals, and I cannot see not doing such things as we might, albeit at some expense. Thank you.	Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Moak (Electronic)	I am alarmed and appalled that the US Navy is planning to conduct underwater testing involving explosives and high intensity sonar in areas where dolphins and whales will be injured and killed. Surely there are other ways to conduct this sort of testing that will not endanger these beautiful animals. This type of testing in indefensible and wrong. We do not own this world; the United States needs to occupy the "high ground" in regard to its treatment of animals. There are many things that we need to do to accomplish this. Abandoning this current testing plan is one step that will move this process forward. Thank you for your consideration.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Mohan (Electronic)	"These exercises would involve the use of live explosives and high-intensity sonar. According to its own Environmental Impact Statements, the Navy estimates that the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises." This is not worth it. Please find other ways to practice or don't practice	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
D. Monasevitch (Written)	This is a letter opposing the Navy's use of deadly sonar in its war games practices. I challenge the validity of the current DEIS. The military and the government have lost most of its legitimacy in conducting science. Those of us that have been following this have been aware that environmental science has suffered since the 1980 Regan administration and especially since the "W" Bush era policy of firing scientists that do not agree with their politics. Unfortunately the Obama administration had done little or nothing to remedy this situation. The bulk of the science presented in the EIS is clearly the work of Ph.D.'s for hire. A Big slew of military hacks, regurgitating each other's papers and dancing around targeted science that substantiates the realities of the wanton murder and destruction of species and the environment. I support the need for a strong Defense. I pay my taxes. I question the bogus science condoning the militarization of the oceans and the planet at the expense of biodiversity. I view the present DEIS an example of pure greed and an utter lack of creativity and wisdom.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States. Active sonar is currently the most effective way to locate submerged enemy submarines before they are close enough to sink U.S. ships. To successfully defend against submarines and other underwater threats, such as mines, Sailors must train realistically with the latest technology, including both passive and active sonar
D. Monasevitch (Written)	I would like 5 Whale wheels. They will be shared in the schools on Kauai as I make my rounds as a substitute teacher. Free advertisement for the U.S. Navy!	The whale wheels were available for distribution at the public meetings.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
N. Monasevitch (Oral-Kauai)	Aloha. Thank you for the opportunity to be here. I appreciate your presence. My name is Nina Monasevitch. I'll give you my card. I'm the co-founder and chair of Kohola Leo, Kohola meaning whales, and Leo meaning voice. We started the group to be a voice for the whales. There's been a lot of discussion here about impacts to marine mammals, and I just want to say unequivocally sonar kills marine mammals. It tortures, it causes excruciable pain to all cetaceans and other marine life. I've done a lot of research. I've read all the scientific papers. The fact that the Navy is even continuing to consider decimating marine animals, particularly cetaceans with sonar is unconscionable. Especially within the Hawaiian Islands Humpback Whale National sanctuary where we're the only meeting and birthing grounds in the United States for these endangered whales. I have briefed some of the EIS. But, of course, it's very long. I haven't read it all. And I've given documentation throughout the years on several scientific papers that I'd like you to include, but I haven't checked whether or not you've included all of those. But the evidence is clear, scientifically sonar kills whales and other marine life.	The Navy shares your desire to preserve marine life. The Navy believes that the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years in this Study Area and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations.
N. Monasevitch (Written)	There are many serious problems and omissions to this DEIS. Here are a few of the problems: In my testimony dated September 12, 2010 I asked for the following to be included in the DEIS: In relation Sonar impact on cetaceans I pointed out that the likely cause of mass strandings arc panic, bubble formation and/or decompression sickness (based on real scientific published papers): 1) Sonar caused panic reactions leading to strandings followed by death 2) Sonar caused decompression sickness (the bends) followed by death 3) The bends caused by sonar even in the absence of panic These three points were either not included or not addressed in a scientifically relevant matter.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Monin (Electronic)	I am writing in protest of navy testing in southern California waters in defense of whales.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Monroe (Electronic)	I am big fan of whales, but I am not against your testing. I believe that you will be aware of possible damage and work to minimize it as much as possible. Some things are more	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	important that protecting wildlife and I hope that your training and testing will be beneficial.	
Montalbano (Electronic)	I do NOT support the use of US tax dollars to fund sonar testing of the type contemplated by the US Navy in the proposed program. There is no question that sonar tests of this nature cause damage to whale and dolphin species of every type, including endangered species. Some of these species have only just come back from the brink of extinction. Our Navy is one of the largest and most advanced in the world. While I understand that continuing to advance our naval technology is one of the ways in which we achieved and can maintain that status, I do not suport doing so at the expense of the lives of these creatures. We must approach these issues from the perspective that the worst case scenario will occur, because it often does, and in light of the Navy's own increased estimates of sonar contacts, this number is simply too high. Use the resources we have to develop even better technologies that will maintain our position in the world as a military leader, without harming these creatures. If we can send a man to the moon, I have no doubt you can accomplish this as well.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Sonar is the best means of locating small objects in the water. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
Moore (Electronic)	save the whales, don't kill them in the name of training exercises!	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Moorehead (Electronic)	Please consider the mission of the Navy, to protect us. You are not protecting our overall health and safety if you are simultaneously damaging our oceans. They are not empty space; they are active living ecosystems that need certain conditions to survive. The oceans are already under attack from overfishing, pollution, and ocean acidification. Wouldn't it be great to see our USA Navy become the true defenders of our oceans and put their efforts towards guarding against illegal poaching and complete destruction of all the worlds fish stocks. I'd love to send my tax dollars in for that. Be real heroes. Protect us from the real threat to Americans and everyone else. First do no harm. Protect our	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	oceans, USA. You can do it!! Go USA!!	
Moreland (Electronic)	While I believe that we need a strong Navy for protect national security reasons, I also strongly believe that we need to be respectful and protect marine mammals and the oceans. I do not think we have to choose between these two options; we can have both. Because we can have both, I am writing today to ask the Navy to use training methods that do not kill or damage marine mammals such as whales, dolphins and other marine creatures. I understand that from your own Environmental Impact statements you estimate the current planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. Damaging or killing these creatures is unacceptable and beneath us as a great country. A great country does not squander life of any kind when there are other ways to achieve what we need. We understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. I urge the Navy to protect marine mammals from explosives and sonar along the coasts of California and Hawaii. I urge the Navy to take steps to reduce the harmful impacts to marine mammals. Such steps to protect these magnificent creatures include: a) avoiding the most harmful activities in areas used as calving grounds or migratory corridors; b) avoiding seasonal high-use feeding areas; c) creating a larger “safety zone” around the exercises; and d) use aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Implementing these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Please do not go forward with activities that will maim or kill marine creatures without these mitigating steps to protect them. Thank you, Sandra Moreland	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. The Navy historically has recorded few to no mortalities caused from sonar or explosives. The estimated number of marine mammals sonar testing could affect is based on a scientific model, and it is only an estimate.
Mork (Electronic)	Please discontinue plans for the use of explosives that will, according to the Navy's own research, cause hearing loss in more than 1,600 marine mammals and potentially kill 200 more. The benefits of this project cannot possibly outweigh the negative effects of this program.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
E. Morris (Electronic)	Please do not move forward with the sound testing under consideration. There is much we don’t know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return because of education and protection. We	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing.	Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
J. Morris-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
J. Morris-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
K. Morris-01 (Electronic)	The Navy's DEIS is fatally flawed and fails to comply with the basic requirements of NEPA. The Navy's assessment of impacts is consistently undermined by its failure to meet these fundamental responsibilities of scientific integrity, methodology, investigation, and disclosure. The Navy must revise its acoustic impacts analysis, including its thresholds and risk function, to comply with NEPA.	The Navy complies with all applicable environmental laws, including NEPA, and has used the best available science in the development of this EIS/OEIS.
K. Morris-02	The Navy fails to properly analyze impacts on marine mammals. For example Sonar impacts on cetaceans that are the likely cause of mass strandings are panic, bubble formation and/or decompression sickness. The following must be included in the DEIS: 1) Sonar caused panic reactions leading to strandings followed by death 2) Sonar caused decompression sickness (the bends) followed by death 3) The bends caused by sonar even in the absence of panic The following scientific papers need to be included in the EIS: J. R. POTTER;, 'A Possible Mechanism for Acoustic Triggering of Decompression Sickness Symptoms in Deep-Diving Marine Mammals' Paper presented at the IEEE International Symposium on Underwater Technology 2004, Taipei Taiwan, April 2004. PARSONS, E. C. M.; SARAH J. DOLMAN; ANDREW J. WRIGHT; NAOMI A. ROSE and W. C. G. BURNS. MARINE POLLUTION BULLETIN 56(7):1248-1257. 2008. Navy sonar and cetaceans: Just how much does the gun need to smoke before we act? TYACK, PETER L. JOURNAL OF MAMMALOGY 89(32):549-558. 2008. Implications for marine mammals of large-scale changes in the marine acoustic environment. WRIGHT, A. J.; N. AGUILAR SOTO; A. BALDWIN; M. BATESON; C. BEALE; C. CLARK; T. DEAK; E. EDWARDS; A. FERNANDEZ; A. GODINHO; L. HATCH; A. KAKUSCHKE; D. LUSSEAU; D. MARTINEAU; L. ROMERO; L. WEILGART; B. WINTLE; G. NOTARBARTOLO DI SCIARA and V. MARTIN. INTERNATIONAL JOURNAL OF COMPARATIVE PSYCHOLOGY 20(2-3):274- 316. 2007. Do marine mammals experience stress related to anthropogenic noise? FAERBER, M .M., R. W. BAIRD. 2010. Does a lack of observed beaked whale strandings in military exercise areas mean no impacts have occurred? A comparison of stranding and detection probabilities in the Canary and main Hawaiian Islands. Marine Mammal Science DOI: 10.1111/j.1748-7692.2010.00370.x The DEIS fails to address the following: other impacts on marine mammals such as stress, indirect effects, cumulative impacts, effects of toxic chemicals, hazardous materials and waste oil spills. The Navy must adequately evaluate impacts and propose mitigation for each category of harm for all species marine life. Each individual potentially federal activity that is to have a significant environmental impact	Discussion of the general topics ("panic, bubble formation and/or decompression sickness") noted in the comment were thoroughly discussed in the Draft EIS/OEIS. In particular see Section 3.0.5.7.1.3 (Physiological Responses) for the presentation of the conceptual framework for analysis and Section 3.4.3.1.2.1 (Direct Injury). For a specific discussion of strandings, see Section 3.4.3.1.2.7 (Stranding) and note that a more detailed presentation was offered in a companion Cetacean Stranding Technical Report ("Marine Mammal Strandings Associated with U.S. Navy Sonar Activities") that is referenced in the DEIS/OEIS and available on the HSTT EIS/OEIS website (HSTTEIS.com). The three points raised ["1) Sonar caused panic reactions leading to strandings followed by death 2) Sonar caused decompression sickness (the bends) followed by death 3) The bends caused by sonar even in the absence of panic"], are covered within the material as described above. With regard to the references noted, while these particular five references were not cited, all were reviewed during preparation of the Draft EIS/OEIS except Potter (2004), which discusses a hypothesis covered in the Draft EIS/OEIS using the following more recent science and data from seven references: Dennison et al. (2011); Fahlman et al. (2006); Hooker et al. (2009); Moore et al. (2009); Southall et al (2007); Tyack et al. (2006); Zimmer and Tyack (2007). Finally, the EIS/OEIS has been created with National Marine Fisheries Service acting as a cooperating agency with input to both the Draft and Final versions. The team also includes a number of non-governmental scientists and subject matter experts.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	should have its own environmental analysis. For example, RIMPAC and DARPA each need separate EIS's. The Navy failed to analyze the impacts on fish and fisheries.	
L. Morris (Electronic)	Please STOP! If man continues to destroy the natural environment and it's creatures, our lives will not be safe or secure, no matter how many underwater warning systems are in place!	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Morrison (Electronic)	We understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. Please consider alternate means which will help protect these amazing animals. Thanks you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
Moses (Electronic)	I strenuously object to this testing on the grounds that it is harmful for our marine mammal species. We Americans who live on the Pacific Rim -- California and Hawaii -- value our marine environments and we also support the Navy as well. But we are asking the Navy to take protective measures and find a way to train that does not harm and kill	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	our marine wildlife. We have enough robust science by now to show that these training exercises are devastating for whales and dolphins. Please take steps to find training that eliminates the harm to our marine mammals.	Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Mueller (Electronic)	Please reconsider and do not conduct training exercises where there are so many sea animals to injure. There are ways to avoid harm by avoiding migratory routes, calving areas, using safety zones, and monitoring sea life activity in the area. We do not want to hear that whales, porpoises, or other animals are dying.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Mulholland (Electronic)	Please do everything in your power to ensure that whales and dolphins are not harmed in you testing of sonar! These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors;and avoid seasonal high-use feeding areas; and to create a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. I implore you to take these precautions into consideration!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Munoz (Electronic)	Hello. I'm writing to you today because I recently read that the Navy estimates up to 2,000 marine mammals, including a large number of animals from endangered species, could be killed due to exercises performed by the navy using live explosives and sonar.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. I understand the need to protect our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. I'm asking that you please protect marine mammals from explosives and sonar along the East Coast» and California/Hawaii! Thank you so much for your time. Samantha Munoz	Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Munzon-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Munzon-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	I hope to hear this testing is stopped since the damage to our oceans would be horrific.	detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Muzik (Written)	As an expert in Hawaiian Octocorallia, I ask that before your Training and Testing Activities, research be conducted by marine biologists on the effects of your proposed sonar and munitions testing, especially in the Papahanaumokuakea Marine National Monument, and also in the proposed zone from California to Hawaii. Certainly, these sessile invertebrates cannot move away from the proposed Navy Activities, yet, although they have been living there for hundreds or even. thousands of years, it is also quite likely they will not survive the impacts your testing will impose. I predict that their nervous and reproductive systems will be impaired, not to mention their feeding and growth, by your tests. Therefore, please cease your activities until you can prove they are not harmful to these important corals. There are over 100 new species, yet to be named, in deep waters of Oahu, and perhaps many more, over 200, in the Monument! (I know, I dived in the submarine Star II, off Makapuu, in the seventies, and observed them, even naming a new species! I was a Research Fellow at the Smithsonian Institution, and so received permission to dive, observe and collect them. My collection of Hawaiian Octocorallia is catalogued at the Natural History Museum, Smithsonian, Washington, DC.) These important animals form "Octocoral Forests" in the very deep sea, where not only the endangered monk seals graze for fish, but also these "octocorals" provide habit for myriads of other marine life, including both vertebrates (fish) and invertebrates (snails, bivalves, hydroids, sponges, worms, etc.), all creatures which are extremely important to maintain the balance of life there. I ask you to curtail your activities until you can prove you will not harm life in the sea. Without a living sea, we humans cannot survive either. Katherine Muzik, PhD	Refer to Section 3.8.3 (Environmental Consequences) where potential impacts to invertebrates are fully analyzed.
Nakamura (Electronic)	1) please, please, please publicize this site as an alternative to http://signon.org/sign/navy-under-water-sound?source=s.em.mt&r_by=2886317 2) A hard commitment to accelerated development of more capable (highly realistic and flexible) sonar training simulators that can be used in fleet training activities would be a good compromise - this could be a cooperative effort between academia, industry, and the military across RIMPAC nations. By hard commitment, I mean for example reducing the amount of live sonar time by 50% by the next exercise or next EIS period 3) Since there appears to be research showing that mammals will leave the area and return, a training/testing schedule that included a warning/chase activity using lower amplitude signals followed by the actual exercise focused to minimize duration, followed by a minimum waiting period before the next sequence, might be a relatively simple way to	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	minimize the effects at reasonable overall cost. 4) item 3) could be combined with item 2) so an extended exercise like RIMPAC could be conducted with a combination of simulated and live exercises with the additional benefit of using live data to calibrate/validate the simulations.	with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the EIS/OEIS, today's simulation technology does not permit effective training and testing. Sonar is the best means of locating small objects in the water. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
Naples (Written)	I am writing as the US Navy is moving full speed ahead with plans for sonar and explosives training that threaten to deafen, injure -- and even kill -- countless whales, dolphins and other marine mammals. Starting in 2014, I have be made aware that the Navy will harass, injure, or kill marine mammals more than 33 million times in both the Atlantic and Pacific Oceans during five years of testing and training with sonar and explosives. Those alarming numbers come from the Navy itself! These potential injuries include more than five million instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and more than 1,800 deaths. This letter is written to tell the US Navy that inflicting such far-reaching harm on marine mammals is simply unacceptable. The sheer scope of the Navy's proposed training and testing activities is staggering, potentially assaulting entire populations of marine wildlife off the East Coast, Southern California, Hawaii and the Gulf states. I understand that Navy ships will flood millions of square miles of ocean with high-intensity sonar, which is known to cause disorientation, hearing loss, stranding and death in whales. In addition, the Navy will be detonating high-powered explosives with the potential to fatally injure the lungs and other organs of marine mammals. The waters around Hawaii and Southern California -- including critical habitat for endangered blue and humpback whales -- would be among the hardest hit. The Navy predicts that more than 1,000 marine mammals would be killed in this area alone. The most significant threat to marine animals from the Navy sonar testing is potential injury or death to the North Atlantic right whale. Please be aware that fewer than 400 of these survivors now hover on the brink of extinction.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	I am urging the US Navy to reexamine and reevaluate their potential ocean sonar and explosive testing as this potential harm and destruction of our endangered marine wildlife will threaten their ability to survive and must be reevaluated. These actions are inhumane and unacceptable.	
Nekomoto (Oral-Kauai)	Hi, my name is Dave Nekomoto, and thank you for having me today and allowing me to speak. I'm speaking for PMRF. I represent myself, although I have been an over 20-year employee of the Niihau Ranch. I've been in touch with the Niihau Ranch people very closely all through those years, and I still am. You're name is Louis, right? And Vida. You were both here when the Niihau people gave testimony that they supported the early EISs that had to do with missile defense. When a lot of people were claiming, No, you can't, you know, screw the Hawaiians that way. Well, they came out and they said, Hey, listen, we can make our own decision, and they decided to support the PMRF. And I can say unequivocally that they still support you and the Robinsons, Keith and Bruce, who I work for, they both support you also and so do I. Wars today are won by technology. And one of the big reasons for improving our technology is to reduce the amount of casualties on our side. And I can say that they've been very successful at doing that. There's nobody here that's speaking for hundreds of thousands of people that Saddam killed or the hundreds of thousands of people that got killed in Korea for just objecting to the government. That's the kind of thing that causes the U.S. to get involved in these wars. Nobody wants to go to war. I spent my time in Vietnam, 426 combat missions in Vietnam on an attack helicopter and on ships. My ears ring today constantly because of the loud noises that I was subjected to. But that's something I just live with. The dues I have to pay. So I do support you. I do respect all of your opinions. And we do have those opinions because the guys were out there to fight for this nation. Thank you very much.	Thank you for participating in the NEPA process.
Nekomoto (Written)	Thank you for receiving my oral statement at the Public Meeting held last evening in Lihue. In three minutes of testimony a person can basically relay his/her support for the project or opposition to it, and not much more than a general reason for taking that position. For this reason, I am also submitting this written statement to be able to discuss in more detail important aspects of public sentiment and to share my experience in these important matters. I have participated in every major EIS which PMRF has been involved in over the course of the past twenty five years, and what I saw last evening was similar to public information meetings of the past. You have a pattern which includes those who support the whales, dolphins and turtles and don't want to do anything to hurt them; the ones who are against war no matter what; the native Hawaiians who are fighting for the rights to "their" land, and the few who support a strong national defense posture. There is a great silent majority of Kauaians that will support PMRF. They are those who see PMRF as a good neighbor, and friend in the community. They are also the ones who value the economic impact of PMRF's operations on our fragile island economy. There is a large population of those who are related to PMRF employees, who depend on	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	paychecks from the base; the local merchants that live off of the spending of that income; the visitor industry businesses, hotels, rental cars, airlines, restaurants and gift shops, all who witness significant spikes in their business when PMRF hosts large operations. All these folks and more will show up for public hearings when the chips are down, and more so if they feel a threat to their livelihood. They all know PMRF's worth to the community.	
Nelson (Electronic)	PLEASE take steps to reduce the harmful impacts of testing to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises, and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. PLEASE re-think training exercise and testing plans and incorporate additional protective measures. THANK YOU. Jill Nelson - Kansas City, KS	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Nesladek (Electronic)	Please stop any testing and let the ocean be free from this kind of cruelty to the enviorment.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Ness (Electronic)	Please do not move forward with your plans for training and testing in the waters around California and Hawaii. These marine mammals have enough threats and issues due to human choices and behaviors. They are entitled to live just as we are. They're safety and well-being is equally important to ours. Sincerely, Rebecca R. Ness	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Nevans (Electronic)	Please do not conduct military tests which harm marine wildlife.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Newhouse (Electronic)	Ladies and Gentlemen, We live in a busy world which is why jobs are created. These jobs are designed to allow citizens of the world time to do the job they are focusing on for the betterment of famly and global community with the comfort that the jobs they are paying for via taxes are representative and an extension of their own personal intergrity to life. With this system design we wish to be confident in our employees ie Navy, etc, as they expeditite protection for sustainable life not dominance over life. I support protection of life, thus support military personel. However, I do not condone morally wrong behavior toward what I consider an attack on conscious life through a murderous approach. It is obvious that cateceans have mind, body, emotions and social community. It is obvious that we have not enough knowledge to jeopardize the balance of this water planet by using EIS/OEIS pollution in the water upon a blue-water planet we are currently and bilogically calling home. I can feel the electromagnetic pollutions we have created on land and I caution additional stress we are implementing to the earth and her creatures for the sake of war, destruction, contol and science. We are ignoring and have imprisoned the basic wisdom of the indigenous keepers of the earth thus putting at risk Humanity's basic roots and human's basic desire to be kind. I do believe research and history has noted that we are in danger of extinction, thus I support protection for all life until which time war and death proves a more successful way to create peace and life. We have technology which is supportive; and less aggressive and primitive; by using a more compassionate approach that allows the evolution of Humanity to show dignity and sophistication toward the balance and harmony the Universe mathematically and scientifically has exhibited in the creation of the solar system, planetary interaction, to the tiniest living organism, which we are contantly putting at risk through our desire to manipulate and control that, which in the long run, we will ultimately discover were designed to dominiate life and remove the joy of living. Whomsoever participates in projects such as these will find accountability and shame following their heirs and heritage for years to come. To protect the future generations we must put a stop to	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	historic behavior of destruction, ignorance and unconsiousness. Education does not make a person smart, but wisdom does. Reflect on the logic and wisdom of EIS/OEIS and you, too, will find a lack of evolution in this process, unkindness, irrevocable ramifications and a danger to our future possibly leading to the extinction of humankind. Know the land and you shall know thyself. Treat the earth with respect and you shall reap respect on a level, I believe, has yet to be considered. Respectfully, Gayle Newhouse	
Newland (Oral-Hilo)	I have a pretty simple message, the one that I've brought here every time we've come to meet our partners in domestic harmony, the Navy, which is that there's so much energy all across the world every day about fighting, war, killing, hating, what are we going to do? And please don't make faces at me because I would listen to you with respect. But I've come, you know, again as always in the spirit of domestic harmony and in the spirit of aloha because there are lots of things that we have to give our attention to, like how we're getting along with each other. The people that we've met over the years here through Barking Sands and through Pearl Harbor have only been bright, kind-hearted to us, open-hearted, and willing to hear what we have to say and very thankful that someone showed up who is willing to hear and see what they had to say and meet them simply with an open heart. So we're all here because we love our life. We love our world. We love the sea life. We want to see the best done for it all. But maybe we can take a look at inside of ourselves to see what we can do to help generate a more harmonious world so that the day will come when the Navy is out there promoting harmony for all of us and working with navies of other nations because we know we have changes coming to this world. When I read the material that's up on their website or the newspapers or on the Internet and everything, what I'm seeing is partly what the navies are doing is they're establishing platforms where they are able to work together in harmony and knowing that when they call someone on that boat over there, someone knows how to answer, and all those systems are set up. The Navy's purpose is also a humanitarian purpose. They send their ships. They send their supplies. They send their resources to places where there has been devastation, and they have helped in many, many ways. Many people are thankful for the navies of the world. I'm asking that we could take a different kind of look at the situation and see how we can help change the world dynamic, help them do their work better so that we do have a world in harmony and that they're only there to help us when something really bad happens because rest assured things are going to be changing. We're going to be very thankful that they're able to go and address these issues all across the world whether it's tsunamis generated by meteors, whether there are earthquakes or any other catastrophic changes. I for one am very thankful that the Navy are my friends and my partners in domestic harmony, that they're willing to hear what we have to say. And everything I've ever seen and heard like from Tom Clements and all of them is about how they super-mitigate, how they're really careful, that they care. We have to understand these people care. They're just like us, working in the Navy	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	and for the Navy, but they care, and I know we'll have a better outcome when we just reach back with our caring. Thank you.	
Newland (Written)	We are the 100%... knowing Unity Consciousness. Every journey begins with a first step. Every writer begins with a first word. I've started my chapter for rose, dear rose. Rose asked me to relate how my relationship with Cetacea, whales and dolphins, has influenced my life and the lives around me. My podlet, including my island community on Hawaii Island, the Big Island. When the request for a chapter came out the country was occupied by Occupy groups. The focus was on the 99% or the 1%. You were one of 'us' or one of 'them'. From the beginning that troubled me. After all, unity consciousness is about we are all here together, we have more in common than anything, we are all earth humans, regardless of origin. How could the world come to balance so long as had a polarized people, us vs. them thinking? As I looked around for things to inspire and remind me, I came across this section in an interview about dolphins and birth a few years ago. Star Newland on Dolphin-consciousness. Ashley: So, tell me about this dolphin-consciousness and how it came to be so important in your life. Star Newland: Wow, that's a long story! Ashley: Okay, first tell me when you say dolphin-consciousness, what do you specifically mean, define that more for us. Star Newland: I would say the essence of the dolphin-consciousness is unity consciousness. Knowing that we are all part of everything, that we are connected to all of it, whether we are aware of that connection to consciousness, the reality is, we are still connected anyway. One of the things that happened in my own birth that took me quite a while to work out was what I call the myth of separation, which is what I thought my mom and I underwent. I was on the outside, we were separate and apart. And that was the consensus consciousness too. At that time there were very few people who really understood how long, extensive and deep the inner bonding is between mother and infant. And when I realized that, whether my mom thought we were separate or what, the reality was we were still connected. And when I put that together for myself, I was able to put that together within me, in my life. I was able to be part of it, and when I met the dolphins, physically, directly, for the first time in Florida, they came and showed me that we have much more in common than I had imagined, that we were much more alike than I knew. See 'Telepathy's Gift' on www.planetpuna.com. And it was the beginning of an exploration for me to find out who we are to each other and what is our common bond? What are our common bonds? And even prior to that when I met dolphins at another place in Florida I went and saw them after the show and I had a really strong telepathic experience with them. It took me a while to figure out what had happened. In hindsight I realized they reached into me, into that part where all of life is connected and said basically, we know who you are, we remember and recognize you. And this is a connection. I refer to it like the inside part connecting to the other inside part. The indwelling being, whether it's a dolphin or a human or tree or an ant or a grasshopper it hardly matters, everything that is alive especially has that indwelling component of life and we're all part of that life.	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	Ashely: That does change the way you live doesn't it, when you realize that, or when you open out to that. Star Newland: Completely, so that to me is the dolphin consciousness. And that life was meant to be more playful and more fun and more light-hearted and above all connected to ourselves and to our children. And up to this moment I've had remarkable telepathic rapport with my first son. Even last night I was about to text him something and got sidetracked on the text and he calls. And of course he'd call right when I'm in the midst of texting! It always works that way and we have so many examples of that. But when we allow ourselves to be close and remain close to our children, that's a large part of what makes a difference. Even though our life was pretty different than what I had anticipated, by this time I had learned to be centered with everything, and whatever we were experiencing my son took his cues from me, the primary figure in his life and in his world. To the extent that I was able to flow with it and make the most of all these challenges, he was able to do it and get it that way as well. INSPIRATION I was a close friend of Toni and John Lilly. Their life's work though the Human/Dolphin Foundation inspired me before we ever met. Reading Communications between Man and Dolphin' opened my mind to a new kind of life on Earth, a shared planet with our Cetacea kin. We say this as there is a fair amount of evidence showing specific marine mammal characteristics in humans. How do we come to have them? Hmm? How did they come about? What does it mean? Do we have companionship on our journey through life? A loving, intelligent, really fun relationship is possible when we let ourselves connect with dolphins or whales. As soon as I heard the words 'dolphins and birth' at the same time in 1982, from my new friend Josef, my world shifted. Suddenly I could see how that kind of birth would be so exciting! So amazing to birth in water and have dolphins around us. While it seemed so natural to me at the same time it blew my mind. While this kind of birth was then practiced in Russia and being introduced to the West, it had been a traditional birthing practice for many native cultures across the world over millennia. Fortunately, Hawaii is one of those places. Ultimately it was that which brought me to Hawaii. When I first saw newborns swimming I was touched to my core. OMG. That's what we were meant/designed to experience. Instead we were born hard into gravity, our world view limited to what we could see lying on our backs in a crib or in a carriage, occasionally in arms. Our mobility came about only when someone picked us up and moved us. After a while we could move our arms, legs, head and so on. In water though, we could move them all from the beginning of life. This same feeling showed up much later as I witnessed twin calves born in Arkansas. I am amazed to see them walk right away, have mobility from the beginning of life. Birth into water and the subsequent mobility buoyancy affords wires our brains very differently than when we are born onto land and the world of gravity. Our bodies wire differently from birth because all parts of it have mobility and buoyancy at once. Subtle structures of the brain gently protected in the womb have a chance now to mature in this aquatic environment. We have a center of buoyancy instead of a center of gravity. We have 360 degree perspective and have mobility under our own volition. We have the perspective of unity,	

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	we are part of the water, yet we feel it cross our skin. Like dolphins we move freely and easily carried by currents as well as our own efforts. Since we dwell upon the land we can retain this center of buoyancy by living joyfully. Why am I interested in these things? I wonder what human kind would be like were we to be able to express the kind of life and mindset that babies born like this would naturally have as a function of their birth and early water contact. I think about what we know of our human brain for example, coming from people who nearly all have lost various parts of their brain's natural capacity simply by virtue of how they were born. Nearly all of us are to some extent 'damaged' from the beginning due to the loss of the subtle structures of the brain that are lost when we birth into gravity. How would they live in a way between two worlds? This is part of our future that I have been exploring for these last 30 years plus and we at the Sirius Institute are creating step by step by step. Tiger was raised so very differently in many ways. His 'education' consisted of life and play first. He experienced life to be grounded in, to know many things based on direct experience and contact. He was allowed to be his own person, free to think for himself, to make choices through his mature decision making processes. He was free to play as much as he wanted for play is for children. Play is essential in their development in many areas, especially socialization and brain/body coordination. He chose his own hours, his food, eating schedule. I was known as the mom who said yes! Instead of the terrible twos, we had the terrific twos. We had so much fun living like this. We bypassed all the fighting about rules and schedules and homework, other peoples' ideas about what was right, or how it should be. We created what we call "the transmission of our culture'. A baby elephant is with its mom, side by side for 14 years, 24/7 to learn the ropes of how to be an elephant. If it takes that long to pass on elephant culture, how much do our children need to be good humans? How can we think that leaving our children on their own in many different ways would prepare them for life? Where and how are we transmitting our culture to them? WHAT DOES IT TAKE TO BE A HUMAN BEING OF A CERTAIN LEVEL OF FUNCTIONING AND SUCCESS? Rather than focus on readin', writin' and 'rithmatic, we focused on life and play first. Part of his cultural transmission consisted of having Mike, our research director as his personal tutor, play buddy and teacher of things biological along with the many pod people we met along the way, all with their books of wisdom, things they know and could pass on. Mike is a Ph.D neurobiologist and rocket scientist and child at heart. We played and stayed up all night as he wanted to, tumbling into bed as the dawn broke and the birds started their songs of the day. I missed that that the sights and sounds of the dark. I was always in bed at bedtime though still wakeful and keen to have more time awake and to play or learn. Perhaps this is why I'm a night owl. When we experience this kind of flow it helps us move through life more readily. Life is a flow – Zero a box of minutes and hours cut off from each other, scheduled to the max. Most parents, when I ask them why their child is in school reply, "so they can be with their friends". Hardly anyone said so that they could get a better education or get into college. It was so their children could play with other children. Then why I wondered did	

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	they go through so much school trauma when they just wanted a way for their child to be with other children. It is much easier than we know to educate our children. I keep reading about 'No Child Left Behind' and teaching to tests that are so secretive of their contents that it's a violation if the teacher even looks at the questions. What the heck? Who's behind all this? How does it happen that our lives and our children's lives are co-opted by school decisions that have almost zero to do with 'educating' our precious children. My son matured into a compassionate, competent, intelligent thoughtful productive member of the human race. He is the dolphin conscious child I'd worked so hard for, waited so long to hold in arms. By the time he was born I knew quite a lot about how to do better for him. I was mature enough to stand my ground in the face of much resistance on how to raise this new type of dolphin conscious child. He learned from me to follow his own path, to create his life around his interests and passions. He accompanied me as I went around creating community concerts and events then found his passion for creating shows for his cohorts, giving them a voice for their kind of music. He saw me speak out and work in areas that mean a lot to me and now is a leader in his own right on various issues. He motivates and inspires others, young and old alike. He introduced 'Zero' to an Occupy flyer. That made me laugh. With homes to share he made them available to his cohorts so they had safe place, sanctuary just like we did, when more than a few nights there were 12 to 17 adolescents with us who just wanted to be somewhere they felt warmth and security. And many nights we had them toasting marshmallows on candles in the living room, young people away from home for various reasons sharing the simple comforts of good mammalian contact. This is how closeness creates comfort, our theme for 2012's Domestic Harmony Awareness Action Initiative. One thing about this kind of relationship with our children is to remind us why we had them in the first place… to support them in being who they are and what they came to be. Each child is unique!!! Think about it- if every snowflake is unique and there are gazillions to the nth. Degree, how can we possibly think any two human living beings to be the 'same'? How can we 'educate' them to their potential since how would they have a chance to express themselves fully if they have to conform to a certain way of thinking, seeing, answering questions and so on? And we have them to raise them as best we can, to cherish and love and enjoy, to have fun together, to share our world and more. Due to so many pressures we often shunt them away, let the state and others take them over. I let go a more secure life by living simply and making 'mom' my work. I was a single mom who created a pod around us wherever we were. Remember where two or more are gathered, our have a pod (let). Out of this came the Pod Project. I should have seen it coming as I saw many aspects of how I thought our life was going o be turning out very differently, seemingly with a mind of its own. In my article, 'how to raise a dolphin conscious child', there were already signs of the traveling life we would live. We stayed in places beyond count across the country and in our home towns, brining 'pod people' to our friends, old and new. I saw how this type of experience and exposure to life enhances the development of feelings of connectivity, how living close and being	

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	with one another, and meeting other pod people gave us the feeling and experience that there are good people everywhere, and mom and child have changes to see others in diverse environments, stimulating pattern recognition and stimulating neural development through input. The image of the robot in the movie 'short circuit' came to mind often as our life led us to rich, stimulating, fun and challenging situations. We were creating his mind to be full of connections and as he got this my own wiring was being redone. Assuredly, this lifestyle is only appropriate for some. We chose to explore this kind of life through the circumstances we met. We have lots of ways we can raise and interact with our children. I talk story about us as we did things very uniquely. Above all, listen to the child… our inner child and our own child (ren). If a child is going to lead the way, we have to be willing to follow. The Pod Project brings us together in pod homes, islands of stability across the neighborhood across the state and already the world. Pod homes bring us together in places where there are good people, people we feel comfortable with even if they are really different. Good hearts abound we found everywhere, caring, connected, belonging, part of life and having a role to play in the life of the pod. WATCH PEOPLE IN HARMON Y TO SEE WHAT THEY DO… for many hours over the last few years I've been at 2 Step Beach with the Hawaiian uncles, like Herbert and Eddie, Norman, Rocky, Alika, Colburn, Louie, Albert who gather throughout the day and evening to talk story, play music. He Boats come and go too, and so I've been learning about fishing and hearing stories about how people used to live – close to the land for real. Few cars, zero electricity, roads or any stores close by and they had to walk a long ways to get to school. Everything was fresh from nearby. Enough was kept a hand of most things cause there was little if any ice or refrigeration. Foods had to be prepared a certain way and above all, people mostly took just what they needed. My friends knew how to do everything and would again should the boats stop coming. We are in the middle of the ocean farthest from landfall. Most of what is here is shipped. I'm there this night while my new pod daughter CJay plucks songs at the ukulele under the direction of Uncle Norm, and learns an integral part of Hawaiian Culture. She's a natural and they are delighted I brought her by. A big smile crosses my face as I watch my friend fit in so well. Music has a way to do that as the universal language. Melodic strains of Hawaiian songs fill the night air in the company of waves flapping at the shore just feet away. One by one over the years I've let them know that some of the most precious moments of my life have been here with them. I think about things like that… whatever I experience goes into eternity with me, it is part and parcel of my Earth time. Does it really matter if or how we have continuity of consciousness when we 'pop' out? For do we really 'die' so much as 'pop' out when we are done with our Earth time. Perhaps to 'pop' back in somehow, when we find the reentry code. I am mindful of what I'm experiencing, what I subject myself to. This started in earnest when I was carrying my son. I realized that everything I was now experiencing, witnessing, feeling, thinking was going into him. When scary things showed up like snakes or poisonous spiders in Arkansas I breathed deeply and sent calming thoughts out and trust in my wellbeing so	

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	we both knew snakes and spiders could be just snakes and spider something else in the world. This led to being more mindful of what I attract to myself, what I think, how are my interactions with 'others'. Harmonious? How am I feeling with what I watch or read, what actions I take, what I'm projecting 'out there'. For sure enough, all of this matters. Over our lifetime, moment by moment we are creating the pictures inside ourselves that we then put 'out there'. This is self-reflection, knowing ourselves and being true. Recently this was shared more with a group of parents and Keikis (children) here for my friend Connie's dolphin retreat. The words tumbled out as inspiration flowed …every action, every thought, feeling matters. The more conscious we are in any moment the more we set that energy into what is happening. When I'm being more mindful of what I eat, where it's from , is it clean and pristine, is it bee friendly, gmo and round up free and so on the more this adds to our collective consciousness that is functioning now from a place of knowing we all matter. These are aspects of life that are important on an island in the middle of the ocean, farthest away from landfall, where easily 40% local corps are bee pollinated. And we import 70% or better of our food. It matters that we start asking these questions and when we make better choices, more 'pono' choices everything will start reflecting our awakening. We have to be aware of many things now, of the interconnectedness of life and the global nature of 'we are here together on this world'. We are humans first. We have that common bond. We are connected. Everyone doing one small mindful thing any moment during the day, for example, adds up to a huge amount of new higher energy into the new matrix, the matrix of our choosing. You being the one person who tips a street musician enough to buy dinner that one time could be the one who helps s/he go on in their music career after being inspired/kept alive even by your kindness. You being the name on a petition to mandate clean water or land or dolphin free tuna, could be the one who tips the scale and yet One of many. Here in rural Hawaii water is especially precious, as it is becoming increasingly so across the globe, and much of it comes directly from rain into catchment tanks. Zero rain, water runs out. Yet by watching how water is used, conserving it even when there is lots, helps through taking good care o f the resources at hand. We can have more and/or we can do our utmost with what we have. This applies in big ways across the islands of Hawaii. Realizing that babies are mostly born well and sound we actively have to do things to create their various ailments. It is easier to keep children well than to get them better once they become ill. It is easier to keep them well by strengthening their immune systems by suckling as long as baby wants when possible, by keeping them in arms a great deal, close to us, for we are mammals who are designed to thrive when we are provided with the mammalian basics. Skin to skin contact helps develop protective immune factors to keep them well when they get a scratch outside. Are children born well and raised to be strong naturally going to succumb to the autism epidemic or any of the myriad of diseases afflicting our keikis? Ask around. How many autistics are there in this population? Nearly zero. By living life that considers what is best for this child now and answering that as they mature we will bring about a sea change for our kind. Much	

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	like being good to the land (aina) –keep it clean, build it up, put good food to it, tend with care. By bringing these factors and more into play in pod homes, we are strengthening our 'local field effect' (Book of Blonde Physics). We are creating a living energy field within and around us that spread from pod home/person to pod home/person anywhere in the world. As we move around we bring it with us for it is who we are, now living more in harmony within ourselves and generating it as we go through our lives. This is how one person makes a difference every moment as well as triggers others. Larger gatherings, what we call superpods' happen with us as well. One very special place in my heart is Kalapana, close to where I first landed in Puna, Hawaii, home to Madame Pele, volcano Goddes, birther of new land. Here, at Uncle Robert's Kava club, there are many gatherings throughout the year, week after week. The focus is to unite the guests who come from near and far to experience Aloha. True Aloha.	
Nickerson (Electronic)	Dear Navy People, PLEASE stop the testing of sonar weaponry in the waters of the Pacific, which are already contaminated with radioactivity from the Japanese meltdown. We still have so much to learn from the dolphins and whales, their methods of communication and language. These creatures are incredibly intelligent and an important part of the Hawaiian culture. People come here to swim with them and learn from them, and you want to knowingly attack them with your "testing" and "training" for war. How is it ok to wage war against other intelligent life forms and not be charged with murder? Where are the boundaries for the rules of war on this one? What kind of morality conversation was had in which it was decided that THOUSANDS of animals would be seriously injured and killed EVERY TIME you "test" your equipment. It's not too late. You can stop this. Let's stop killing ourselves, each other, our home planet. I really like the beaches here in Hawaii, let's not cover them with the carcasses of dead animals. Thank you for remembering your humanity.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Niklasson (Electronic)	I appreciate your willingness to hearing the public opinion on this important matter. Seeing the research that has been done on this and the dramatic effect previous test have had on marine life I am frankly chocked that you are even considering going ahead	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	with this. Please do not pursue this project I fear that it will have a very negative impact on marine life! It seems to me that there already is much research to support my stand point.	Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Normandin (Electronic)	Don't commit murder.	Thank you for participating in the NEPA process.
Novak (Electronic)	To whom it may concern, Please protect marine mammals from explosives and sonar along the coasts of California and Hawaii. I urge you to re-think the proposed plans for the use of sonar and explosives, and to incorporate additional protective measures. Thank you for your consideration, Samantha Novak	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Novello (Electronic)	Please do not continue with this testing program/exercise. There are numerous studies that show this is damaging to marine mammal life. We here in Hawaii and on the west coast depend on these animals and the tourist revenue they bring to us. By hurting them, you are hurting the welfare of thousands of Americans. Furthermore, you damage the global life web. The oceans account for 3/4 of the planet's surface. There is no way that you can cause damage to it without a ripple of effects spreading outward from it.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Nuccio (Electronic)	I opposed the use of sonar training and testing a few years ago at the Whidbey Island site here in Washington State. I am opposed to the use of this technology in the waters near Hawaii and California as well. These are the same whale populations! The Navy certainly has this information about the annual migration of these mammals for feeding and birthing all along the Pacific Coast of the U.S. I am also opposed to the use of sonar in the Gulf of Mexico, for similar reasons. In addition to the whale populations other mammals, such as dolphins, will be affected. Thank you for your time and attention.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Nunez (Electronic)	Please discontinue the exercises planned. They are harmful to our marine wildlife.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
O'Brien (Electronic)	The U.S. Navy is proposing to conduct training exercises that invole explosives and high intensity sonar all along the U.S. East Coast and in the rich marine environment off the coast of California and Hawaii. The planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. Please consider steps to reduce the harmful impacts to marine mammals. Please avoid the most harmful activities in areas used as calving grounds or migratory corridors. Avoid seasonal high-use feeding areas. Create a larger "safety zone" around the exercises. Use aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. These steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Whales, dolphins, and porpoises deserve to live and to have a healthy ocean environment. You can make this happen. Please take these steps to reduce the harmful impacts to marine mammals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
O'Bryan (Electronic)	As a California citizen (and an animal lover) I urge you to please rethink your SONAR plans to include protective measures to prevent killing or deafening marine mammals. Thank you in advance for considering incorporating compassion into practice. For the animals, Leigh O'Bryan Sherman Oaks, CA	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
O'Dowd (Electronic)	I understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. Please protect marine mammals from explosives and sonar.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ognjanovic (Electronic)	The Navy's use of sonar in the fragile Whale and dolphin habitats is an antagonist. It is driving the mammals away from their habitats, disrupting their families, and it is causing changes in all their habits, not least many of them are being driven to distraction and beaching themselves on purpose or accidentally. The sonar must respectfully stop in these fragile habitats, our natural resources are equally vital to our country's legacy and these mammals are sentient beings.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
O'Halloran (Electronic)	Please stop harming dolphins and whales. The Navy's work is important, but please find a way to protect our natural heritage. We should be stewards of the ocean.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
OKeeffe' (Electronic)	Do NOT do this. Do NOT do this. Do NOT do this.	Thank you for participating in the NEPA process.
Olson (Electronic)	I urge the Navy to not test your sonar or conduct war games in Hawaii or California territories because of the harm this will cause marine life. Our marine species are already under stress from all forms of pollution in the ocean. It's time to conduct ourselves in a way that supports a healthy marine environment rather than degradade it. Dominion means to take care of not dominate... so far most humans have done a very good job of dominating and causing harm to other species including ourselves. Now it is time to be caretakers of all our marvelous life forms. Humans need to stop thinking only about themselves. I have been interacting with Cetaceans for 23 years and know they are an intelligent aware social species that deserves to live in peace. They have much more to share with us than their blubber on a dinner table or to be in the way of target	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	practice for sonar guns. I have written a book, Messages From The Dolphins. It includes my insights on five subjects and what I would say to humans if I was a dolphin. Chapter four is about war. Please take the time to read it. Hopefully you will realize that for the sake of all our species not just humans we humans need to begin living peacefully with each other. It is available as an ebook at my website www.dolphinsmile.org Thank you for taking the time to read this comment. In Peace, Scott	been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Olson-tuma (Electronic)	Please protect our marine wildlife and do not conduct this testing, US Navy.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
O'Neil-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
O'Neil-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	I hope to hear this testing is stopped since the damage to our oceans would be horrific.	detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Oordenaar (Electronic)	I am very concerned about the effects of sonar on marine life, and especially Cetaceans (dolphins, whales). Here's why: Cetaceans' brain as a matter of fact contain spindle cells, the type of cell in humans responible for giving us complex speech, strong emotions and empathy. In whales and dolphins the concentration of these was even found to be 3x as high as humans. Above that, their brains are a lot bigger. (source: http://www.newscientist.com/article/dn10661-whales-boast-the-brain-cells-that-make-us-human.html) There is more than just anatomic evidence. Dolphins are also self aware; cetaceans are the only species apart from humans that can think about thinking, and possesing self-awareness. (source: http://news.discovery.com/animals/dolphins-smarter-brain-function.html) Luckily, people now try to decipher their languages, hoping to verbally communicate with them. (source: http://news.discovery.com/animals/dolphin-talk-communication-humans-110906.html) Other recent researches state cetaceans have cultures, their own names, accents, dialects, can teach each other, and deserve rights as non-human persons. All reasearch aimed at investigating the effects of sonar on marine mammals show the same conclusions: Significant damage to internal organs Severe hearing damage Known cause of cetacean mass strandings Please reconsider your navy testing policies and plans, now with scientific knowledge in mind. Thank you. J.T. Oordenaar	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Orr (Electronic)	Hello, I know we need defense, but it must not be at the expense of important marine life. The pain the creatures feel from these tests must be excruciating and a slow painful death. I believe we must evolve past this type of testing, can we not? Thank you, Michele Orr	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Ott (Electronic)	With all the research DARPA does, I sincerely believe that the Navy needs to work on a better solution than using sonar that damages more of our mammal marine life. It has taken 40 years for the humpback whale to make a comeback from near extinction to ONLY reach the designation of "endangered" species. There is research on the damage to dolphins and whales hearing and the disorientation leading to death and serious injury of mammal marine life due to the SONAR used by the Navy - in the U.S. and the U.K. Stranding, beachings, confusion and fear cause whales to stop feeding and subsequently die. The UK military has research from 2007 that clearly indicates there are issues with sonar in causing death to whales and that in 2011 additional research	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	conducted by a team of international scientists has confirmed the earlier research. We have some of the best scientists in the world working on these issues and still, this issue continues to plague us in finding a better solution. The NAVY should re-evaluate it's plans, establish a timeline and a plan for alternatives, expedite research on better tools than SONAR, and start to more fully balance the military need in the context of damage to the ocean environment. It is unconscionable that the U.S. Navy would expand the damage to the marine environment by simplistically justifying it's actions by creating fear in the public. It requires leadership to take a more thorough and thoughtful approach. I respectfully submit, having been a public servant, that there are always alternatives that can be examined, and in this case, should be considered to mitigate the loss of marine mammal life.	been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Currently, sonar is the best technology available that can help keep Sailors safe from mines and hostile submarines.
Overman (Electronic)	Dear Sirs: I have read through much of the EIS and will continue until I finish it, but I don't see any strong effort made to consider alternative testing and training methods that would not entail the assured death or deafness of marine mammals. I hope the choice you are making - the one that DOES assure death or deafness - is unquestionably the ONLY way to properly test and train, and not that it is simply the most expedient. Please consider providing an extension to your comment period as well. The size and technical aspects of the EIS require a great deal of time to read and review, especially for folks with more than one job and with other responsibilities who also have a strong interest in marine ecology. Thank you for your consideration.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Currently, sonar is the best technology available that can help keep Sailors safe from mines and hostile submarines.
Owen (Electronic)	What is this world coming to? Why do you have to destroy marine life, for someone's thought to "better" our security? It's sick.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Oyarzabal (Electronic)	Please do NOT conduct any training and testing that involves the deafening or harming of any marine life.Respect these magnificent ,sentient beings and conduct yourselves in a dignified way as is expected of the US Navy.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Padawer (Electronic)	The devistating impact on marine mammals of sonar testing must be stopped. How many creatures have to be maimed or killed before the navy takes its responsibilty to protect not destroy the oceans seriously?	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Pagano (Electronic)	I wish to encourage to US Navy to take further steps to protect marine mammals during sonar testing. Steps including avoiding migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed would all minimize death and injury to these mammals. Americans including myself prize our marine mammals and I cannot stress enough that no measure to protect them is unwarranted. Thank you for your consideration.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Painter (Electronic)	Please doi not test along the west coasts in such a way as to harm marine life. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Paleka (Written)	Opposed.	Thank you for participating in the NEPA process.
Pambianco (Electronic)	There's something REALLY wrong with this: If you haven't done so already, today is the deadline to comment on the U.S. Navy's Environmental Impact Statement for training and testing in the ocean around Hawaii and California during the next five years. You can easily comment at their online site: http://hstteis.com/GetInvolved/OnlineCommentForm.aspx The Navy's report states that the exercises could cause 1,600 marine mammals to suffer from hearing loss or other injury from its use of sonar and explosives each year for the next five years. The report also projects that 200 marine mammals will die each year. Please speak up on behalf of	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	whales and dolphins now. Do we civvies really need to comment about how awful this is? Come on yall..we all have to Live here together. Please stop this madness. FYI:I'm a former Navy brat so THANKS FOR YOUR SERVICE...but PLEASE PLEASE PLEASE don't do this!	whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Pap (Written)	I could like to see the Navy adhering to the HI state federal Consistency process (through the Coastal Zone Management Act). During the last permit approval process, the state objected to the decibel levels being used during the training exercises due to impacts on marine mammals and other coastal resources. They were overruled by the Secretary due to pressure from the Navy. This go around the Navy should take a hard look at its training exercises and whether they can be changed to meet the requirements of Hawaii's coastal zone management program.	In compliance with the Coastal Zone Management Act, the Navy has completed a Consistency Determination with both Hawaii and California. See Section 6.1.1 (Coastal Zone Management Act Compliance) in the Final EIS/OEIS for the complete discussion of Navy activities and compliance with the Coastal Zone Management Act.
Parr (Electronic)	I understand that the U.S. Navy is proposing to conduct training exercises all along the U.S. East Coast and in the rich marine environment off the coast of California and Hawaii. These exercises would involve the use of live explosives and high-intensity sonar. According to your own Environmental Impact Statements, the estimates show the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. I completely understand the need for protecting our country, but there is a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. There is evidence that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	very significant degree. Please consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Please re-think your plans and incorporate additional protective measures. Thank you.	
L. Parraga (Oral-Kauai)	Okay, my name is Lou Parraga, Jr. I'm 84 years old. I live in Kekaha. And during the Second World War I used to go into the base and pick up the garbage. My father raised a lot of hogs, maybe about 50 or more. So I seen planes coming and going, and some all shot up from the Midway battle. In fact, the worst one I seen was a gossier, I think, had the pilot and the copilot in the back, two cockpits. And I was going there, and I saw this plane coming and sputtering and backfiring and all the smoke coming out from the exhaust. And I took off, I wanted to see where he would land. When he landed, I was right there by the airport, and he landed the plane. And I saw the guy in the back was just hanging over like this, hanging over. He was dead. And the pilot just landed the plane and the plane hit the runway, and he veered off right into the sand. And the fire engine guys came, and when they got to the plane, the pilot himself was dead. So that's a terrible thing to see. I was a young boy at that time. But that's what military is all about and wars. So, okay, I'm a Korean War veteran, 1950, that's when I got the call to go into the Army for the Korean War. And of all things I got the notice on my birthday, and my birthday is trick-or-treat. So to be inducted November 5th. Maybe I should turn like this. So I got trick-or-treat from the government to be inducted November 5th. I spent three years in the Army, and I seen things that if you're not in the service you will never see or understand. A lot of people that protest about this, lot of people don't understand that have never been in the service what the service is all about and what the base do and good for us. How would most of you people feel if you have a guard in the front door instead of a criminal? And that's what the base is. They're like a guard for us. I hear a lot of things that somethings that cannot be proved. So I think without the base we'll be in big trouble. Thank you very much.	Thank you for participating in the NEPA process.
M. Parraga (Oral-Kauai)	I was born here on Kauai. I'm 85 years old. I've been very ill for a long time. I was known as the volunteer. I didn't never gave up on my country. They took good care of us. I seen war because we heard the bombs, we heard the airplanes going over to bomb Pearl Harbor. Our country didn't let us alone. Right away they came. All young men, very good soldiers. Why can't you people understand we need our father in heaven? We also need our country who gives us so much. We got to be thankful for that, not go against the country. Some do wrong in your country, right. But most do not. Our Navy do not. They helping us. Don't go against them, please. Please take care of our men. Why do they do that? Now you get good care. I see them with nice cars with money to feed their children.	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	I do not have anything like that, but I love my country so much. I wish I wasn't sick so I could help more. Thank you. Change your minds, be for your country. The country loves you and they love me. Thank you. I love to sing the Star Spangled Banner.	
Parrish (Electronic)	I am against your impending sonar research which may, by your own admission, deafen and kill potentially thousands of dolphins and whales off the coasts of California and Hawaii. I ask that you put an end to this inhumane and unconscionable Naval program and look for alternative, more humane ways of testing your sonar equipment.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
Patterson (Electronic)	PLEASE PLEASE protect marine life from explosives and sonar in Navy and all exercises. This is unnecessary.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Pendarvis (Electronic)	As a citizen, I am very concerned about Navy activities which might impact marine life, particularly dolphins and whales. HSUS is joining other environmental and animal welfare groups to ask the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Thanks, Richard Pendarvis, Ph.D. (Chemistry)	actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Pennington (Electronic)	to whom is going to read this, I do NOT see the true reason to do these excersises. To thoughtlessly KILL and Injure ALL those animals for practice... REALLY? i would one day like to have my daughter and her kids know what marine life is... doing such training excersises that will hurt and kill animals on the endanger spieces list will further hinder our oceans and our future generations from enjoying the rich life they support. the whalers around the world atleast kill to eat the poor animals... not just for the heck of it... i understand the Navy HAS TO do somethings but the wildlife in the oceans around the US are still trying to come back from the BP oil spill that was now 2 yrs ago. i doubt we need dead animals washing up on our shores AGAIN! This is NOT ok and i dont support these actions the US millitary are willing to take in order to just have drills... there are so many species in the ocean and if we as people are wreckless we will never even get to see and explore them. we only know 2% of what there is to know about our oceans. this is just wrong and as a millitary i will always support our troops BUT I DONT HAVE TO SUPPORT THE ACTIONS THE US GOVERNMENT MAKES THE TROOPS DO! I hope this reaches someone who can help stop this from happening. my daughter is 4. she started to cry as i read to her what the US NAVY wants to do. EVEN A 4 YR OLD KNOWS ITS WRONG! i am writting this as a plea from my heart and the heart of my daughter, PLEASE DONT DO IT! PLEASE HELP TO PROTECT THESE ANIMALS AND NOT DO THINGS SUCH AS TRAINING EXCERSISES THAT WILL ONLY FURTHER HURT THEM. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
G. Perez	I, Gale K. Perez, on this 9 day of July 2012, am in opposition for any Naval or Military training and testing in our Archipelago of Hawai'i, by land or ocean. My hand written comment: I am against all training and testing in our aina (land) and ocean. It is our Kuleaua (responsibility) to protect our ecosystem an dcreatures like the whales and dolphins and turtles who are our family. Stop!!	Thank you for participating in the NEPA process.
Mariana Perez (Electronic)	PLEASE protect marine mammals from explosives and sonar.. Protect our oceans and all living things. I have witnessed in person what the effects of submarine sonar testing has done to marine life and it's a horrible things to see and horrible that it is happening! PLEASE STOP and PROTECT OUR OCEANS AND MARINE LIFE. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Michelle Perez (Electronic)	I would like to ask the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. We know that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Perkins (Electronic)	To preserve our freedom is to preserve our planet and all the life it contains. This test is meaningless, murderous, and unnecessary. The idea that my military and my government would allow such a disastrous test makes me ashamed to be an American. There is no benefit that could possibly outweigh the cost – not only to the environment, but to the reputation of this country.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		maximum extent possible, mitigation measures during its training and testing activities.
Perry (Electronic)	Whales, dolphins, and porpoises deserve to live and to have a healthy ocean environment. The U.S. Navy is proposing to conduct training exercises all along the U.S. East Coast and in the rich marine environment off the coast of California and Hawaii. These exercises would involve the use of live explosives and high-intensity sonar. According to its own Environmental Impact Statements, the Navy estimates that the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. I understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. In the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. Consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Re-think plans and incorporate additional protective measures.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate.
Peter-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate,	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Peter-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
A. Peterson-01 (Electronic)	July 10, 2012 RE: U.S. Navy Hawaii-Southern CA Proposed Range Complex - Public Comment Perchlorate is a rocket fuel component and by-product of rocket and missile testing; it also can accumulate in leafy food crops and fruit irrigated by perchlorate-contaminated water and can find its way into food crops from air pollution sources. Perchlorate accumulates in the thyroid gland and can block iodide transfer into the thyroid, resulting in iodine deficiency. Adequate iodide is crucial for neurological development. A recent study found that all types of powdered baby formula (e.g., milk, soy) are contaminated with perchlorate. If perchlorate also is in tap water used to mix the formula, babies may be doubly dosed with the chemical. Long-term exposure to perchlorate has been shown to induce thyroid cancer in rats and mice. The U.S. Navy and the U.S. Air Force uses perchlorate as a fuel in rocket and missile testing in the proposed NWTT Range Complex. What impact will perchlorate from this type of testing have on human health, air pollution, sailors exposed to these chemicals, marine mammals, and the air quality on shoreline communities? Rocket and missile fuel emissions also contain aluminum oxide and particles of soot. What impact do these emissions have on the ocean environment, marine mammals, and general air pollution over these areas and on shoreline communities? When you combine Jet fuel emissions, rocket and missile emissions, warship emissions, laser test emissions all together how will all of them impact human health, ocean air quality, and shoreline community air	The Navy shares your concern for the fate and transport of potentially hazardous materials and water quality. All of the reasonably foreseeable effects from the fate and transport of potentially hazardous materials were analyzed in Chapter 3 (Section 3.1, Sediments and Water Quality) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	quality?	
A. Peterson-02	July 10, 2012 RE: U.S. Navy Hawaii-Southern California Range Public Comments: 1) If any hazardous materials wash ashore during the next 5 years the Navy should be responsible for cleanup and disposal of all materials at Navy expense. How much money has the U.S. Navy allocated for this type of clean up and disposal? 2) If disruptions in fishing, availability of fish, impact local fisherman the Navy should be required to reimburse the fishing fleet in the NWTRC, the Hawaii Range Complex, the Mariana Range Complex, the Southern CA Range Complex for their economic losses. (This would include the ocean tourism industry.) How much money has the U.S. Navy allocated for any economic losses from their 5-Year Warfare testing in these areas and the proposed NWTT and Hawaii-Southern CA Range complex expansions? 3) The Navy should be required to cleanup and restore ocean and shoreline areas where natural resources have been negatively impacted and also where regional wildlife have been affected by all NWTRC, NWTT, Mariana Islands, and the Southern CA warfare exercises. How much money has the U.S. Navy allocated for this purpose? How much additional funding will be needed for the Hawaii-Southern CA Range Expansion? 4) Military operations in the NWTRC 5-Year Warfare Testing Exercises include deployment of sonar which may impact marine mammals, fish, and other marine life. Effective mitigation measures (with 90% success in studies), should be used to locate marine mammal populations before deployment of sonar, toxic chemicals, bomb blasts, missile exercises, and new weapons testing. What mitigation measures are planned for the Hawaii-Southern CA Range Complex? 5) All maritime military training range complexes in the Pacific Ocean, especially the NWTRC, the Southern California Range Complex, and the Hawaii and Mariana Islands Range Complexes should have as a primary goal maintaining healthy oceans, marine, shoreline and beach environments that are economic fishing and tourism drivers. How much money is the U.S. Navy allocating for this purpose? Please advise on how many ranges have had this type of restoration work performed when military activities and toxic chemicals have damaged ocean or shoreline areas in the Pacific Ocean Range Complex Areas? What is the monetary allocation for yearly restoration work in the NWTT and the Hawaii-Southern CA Range Expansion areas?	The Navy shares your concern for the fate and transport of potentially hazardous materials and water quality. All of the reasonably foreseeable effects from the fate and transport of potentially hazardous materials were analyzed in Chapter 3 (Section 3.1, Sediments and Water Quality) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
A. Peterson-03	July 10, 2012 U.S. Navy NEPA Public Comment – for Hawaii-Southern CA Range Complex New U.S. Navy New Sonar Systems have been deployed and we don't know the marine mammal effects from those experiments. http://www.navy.mil/search/display.asp?story_id=48201 WASHINGTON (NNS) -- The U.S. Navy took delivery of the next generation of the AN/AQS-20A Minehunting Sonar and the AN/AQS-235 Airborne Mine Neutralization System (AMNS) from Raytheon Company at the company's facility in Tewksbury, Mass. Sept. 2, 2009. September 4, 2009: "...Scientists at the Naval Research Laboratory are developing a new technology for use in underwater acoustics. The new technology uses flashes of laser light to	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	remotely create underwater sound. The new acoustic source has the potential to expand and improve both Naval and commercial underwater acoustic applications, including undersea communications, navigation, and acoustic imaging. Dr. Ted Jones, a physicist in the Plasma Physics Division, is leading a team of researchers from the Plasma Physics, Acoustics, and Marine Geosciences Divisions in developing this acoustic source..." http://www.nrl.navy.mil/pao/pressRelease.php?Y=2009&R=63-09r We can expect that these new techniques will be or have been deployed and could have negative consequences on our marine mammals. There are inadequate or non-existent studies by NOAA (NMFS), service about the impacts of these new technologies and their impacts on fish and marine mammals. Thus, the deployment of these technologies in the NWRTC and other ranges should be prohibited. http://djcoregon.com/news/2010/05/13/wave-energy-device-would-steer-whales-away/ WAVE Energy Acoustic devices are also being deployed in the oceans which may have a similar impact on the health of our whales. According to this May 13, 2010, Oregon News article: "...Gray whales tend to stick close to shore to avoid predation by killer whales, which travel in deeper waters. So, gray whales will be traveling through prime real estate for the wave energy-generating buoys...Mate in December will place an acoustic device on a mooring near Newport. The device emits a low, one-second "whoop" sound three times a minute during a six-hour stretch each day. The hope is that the sound, which is about as noisy as a fisherman's fish radar device, would act as a whale deterrent. A $600,000 grant from the U.S. Department of Energy is funding the study..." May 13, 2010 They will be deployed in Oregon by the end of 2010. The problem is that this could disrupt the feeding and migration of our gray whales and also add to the acoustic problems in our oceans. And this device could be deployed along the California Coastline as well. Combined with the U.S. Navy planned expansion and use of sonar this could be a disaster for our gray whales and other marine mammals. The U.S. Navy should take into consideration in their proposed Hawaii-Southern CA Range Expansion other sources of sonar when used in conjunction with Navy Sonar in the NWTRC, the Gulf of Alaska, and the Mariana Range complexes, along with the proposed NWTT range. Acoustic Impacts on Marine Life Marsha L Green, PhD For references and citations contact info@oceanmammalinst.org "…In the past decade a dismaying sequence of marine mammal strandings has occurred in Greece (1996), the Bahamas (2000), Madeira (2000), Vieques (1998, 2002), the Canary Islands (2002, 2004), the northwest coast of the U.S. (2003) and Hawaii (2004). Each stranding has been correlated with the use of high intensity military sonar. These sonars – both low - frequency (LFAS) and mid - frequency can have a source level of 240 db, which is one trillion times louder than the sounds whales have been shown to avoid. One scientist analyzing underwater acoustic data reported that a single low frequency sonar signal deployed off the coast of California could be heard over the entire North Pacific Ocean. Necropsies performed on whales stranded in the Bahamas (2000) and the Canary Islands (2002) revealed hemorrhaging around the brain and in other organs most likely	whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	due to acoustic trauma from the use of high intensity sonar. It appears that the sonar exercise in the Bahamas in 2000 may have decimated the entire population of beaked whales in the area. In December 2004, 169 whales and dolphins died on beaches in Australia and New Zealand after reported military exercises and air gun use in the area. In January, 2005, 37 whales stranded on the U.S. coast of North Carolina after high intensity sonar was used in a naval exercise. In March, 2005 almost 80 dolphins stranded on the U.S. coast in Florida after the acknowledged use of naval sonar. Though still too recent to link definitively to sonar, these last three strandings have triggered official inquiries into the possible role played by sonar in these mortalities. Intense noise generated by commercial air guns used for oil and gas exploration and oceanographic experiments; underwater explosives; and shipping traffic also poses a threat to marine life. Air gun use was correlated with whale strandings in the Gulf of California and Brazil in 2002. The global magnitude of the problem has not even been determined, as many fatally injured animals are likely to sink in the deep ocean and not all injured whales strand. Thus, a growing body of evidence confirms that intense sound produced by human-generated noise in the marine environment can induce a range of adverse effects on marine mammals. These effects include death and serious injury caused by hemorrhages or other tissue trauma, strandings, temporary and permanent hearing loss or impairment, displacement from preferred habitat and disruption of feeding, breeding, nursing, communication, sensing and other behaviors vital to survival. High intensity sonars and air guns impact not only marine mammals but also have been shown to affect fish, giant squid and snow crabs. In a study by the British Defense Research Agency, exposure to sonar signals caused auditory damage, internal injuries, eye hemorrhaging and mortality in commercially caught fish. Air guns caused extensive damage to the inner ears of fish and lowered trawl catch rates 45 to 70% over a 2,000 square mile area of ocean (Norwegian Institute of Marine Research). Catch rates did not recover in the five days surveyed after air gun use stopped. This presents the possibility that increasing production of intense underwater noise can significantly and adversely impact food supply, employment and the economies of maritime countries. Recent studies show that ocean background noise levels have doubled every decade for the past six decades. As a result of the masking effects of human-produced ocean noise pollution, the possible communication range of blue whales has decreased from greater than 1,000 km to only 100 km in the noisy Northern Hemisphere. We don't know how this affects their ability to find food and mates. Thus, there are numerous indications that intense noise from sonars, air guns, shipping and other sources poses serious threats to cetaceans and the already depleted fish stocks in the world's oceans…" Marsha L Green, PhD For references and citations contact info@oceanmammalinst.org The above information should be taken into consideration by the U.S. Navy and NOAA should provide all additional recent studies on all weapons systems in your Final EIS/OEIS for the Hawaii-Southern CA Range Complex.	

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
A. Peterson-04	July 10, 2012 U.S. Navy Public Comment Hawaii-Southern CA Range Complex Proposed Expansion U.S. GAO 2002 Report: "…Unexploded ordnance are munitions that have been primed, fused, armed, or otherwise prepared for action, and have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material and remain unexploded either by malfunction, design or any other cause…" Munitions constituents consist of such things as propellants, explosives, pyrotechnics, chemical agents, metal parts, and other inert components that can pollute our oceans or cause harm to marine mammals, breeding habitats, migrating fish, whales, and other marine mammals. What precautions is the U.S. Navy taking to make sure that these unexploded ordnance are removed so that they don't pose a hazard to ocean and marine life and are not washed ashore onto beaches? If this type of unexploded ordnance is found in the Pacific Ocean or along any coastal beaches will the Navy pay for its safe removal? How much money has the U.S. Navy budgeted for this type of removal and clean up?	The Navy shares your concern for the fate and transport of potentially hazardous materials and water quality. All of the reasonably foreseeable effects from the fate and transport of potentially hazardous materials were analyzed in Chapter 3 (Section 3.1, Sediments and Water Quality) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
A. Peterson-05	U.S. NAVY PUBLIC COMMENTS & REQUESTS FOR INFORMATION July 10, 2012 It is almost totally impossible to be able to address a proposed Hawaii-Southern CA EIS/OEIS, without being able to consider a wide variety of classified documentation on the results of studies conducted by the U.S. Navy, NOAA, NMFS, independent studies, and other information on past, current, and proposed future weapons systems testing. The information which has been made public is limited and not readily available for public comment at this time under the proposed Hawaii-Southern CA EIS/OEIS. The U.S. Navy in their scoping Open House Sessions (in violation of NEPA), have refused to give any formal presentations, to take oral public comments (maybe a recorder available but hidden at most meetings), or provide information on new studies undertaken by the Navy or NOAA (also university studies). Therefore, we are requesting the following information in order to be able to make informed public comments on the proposed Hawaii-Southern CA Range Expansion. The U.S. Navy has been operating in 12+/- Five Year Warfare Testing Ranges since 2008-2012, including the NWTRC (part of the new NWTT Range). They have refused to provide the public with any information about their new weapons system testing in not only the NWTRC but in other range testing areas or studies on impacts to marine mammals, fish, biologically sensitive areas, migrating fish and whales, strandings, etc. Thus, this is a formal request for additional information about the U.S. Navy activities in the Pacific, Atlantic, and the Gulf of Mexico, where many of these new weapons systems, lasers, sonar, radar and other experimental tests have been or are currently being tested and their impact on all marine life and ecosystems. The Following is a List of Documents and studies requested so that the public and our elected officials can make informed public comments about the proposed NWTT: 1) September 10, 2010: U.S. Navy Final NWTRC EIS Volume II Page G113 Answer to public comment question: "…No, the Navy does not plan on suspending sonar operations during the gray whale migration seasons…" What is the justification for	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments." NEPA provides a forum for public involvement in federal decision

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	the Navy not suspending sonar operations during gray whale, turtle, and salmon migrations or protecting national marine sanctuaries, marine reserves, biologically sensitive areas, and breeding habitats? 2) The U.S. Navy has ongoing 5-Year Warfare Testing Programs in their Southern California and Hawaii Range Complexes. Does the Navy suspend sonar or bombing exercises during gray whale and other marine mammal or fish migrations which use the proposed NWTT and NWTRC corridor at various times of the year for these migrations as they move through breeding, feeding, and other biologically sensitive areas while nurturing their young? Will they suspend these activities in the proposed Hawaii-Southern CA Range? 6) The Navy states in their Final EIS and ROD (Record of Decision) that they will be testing new weapons systems in the NWTRC. What precautions will be taken by the Navy to protect marine mammals from the unknown impacts of these weapons systems? Will the Navy be testing these new systems and weapons in the proposed NWTT and the Hawaii-Southern CA Ranges? 7) What impacts will the new testing of electromagnetic weapons systems have on marine mammals and fish? We are formally requesting an online listing of studies undertaking since 2008, on weapons system testing on marine mammals and fish in the Pacific, Atlantic, and the Gulf of Mexico. In order to evaluate these U.S. Navy, NOAA, NMFS, and other university or independent testing…the Navy needs to provide this information to the public. Once the public can evaluate these study results public comments will be of value in determining future allowable Navy testing in the NWTT and the NWTRC and the proposed Hawaii-Southern CA Range. 8) Since NOAA has issued the Navy a permit and Letter of Authorization to allow the Navy to "take" marine mammals paving the way for full-scale warfare testing, which areas, in the proposed NWTT and the Hawaii-Southern CA Range, will the Navy avoid to protect the endangered salmon and whales populations when they are in migration patterns? 9) U.S. Congressman Thompson has noted that NOAA & U.S. Navy mitigation measures to protect marine mammals are effective only 9% of the time...will the U.S. Navy be using mitigation measures now that are proven effective more than 9% of the time? If so, what studies were conducted by NOAA or the U.S. Navy that were proven effective more than 9% of the time and will the Navy institute using these alternatives? 10) The proposed Hawaii-Southern CA, NWTT and the NWTRC ranges are in an area where the fishing and tourism industries make millions of dollars. Will the U.S. Navy be warning those who are operating such businesses of their activities in advance in order to protect our fishermen and tourists from the impacts of these bombing exercises or toxic chemical exposures (from aluminum coated fiberglass particulates which can stay airborne up to 20 hours or airborne toxics like red phosphorus, smoke, flakes, obscurants or other airborne toxic chemicals), in the future? 11) The U.S. Navy NWTRC Final Environmental Impact Statement lists many hazardous materials that are being used in the NWTRC and their dangers. The Navy lists the following habitats that may be impacted by hazardous materials: Open Ocean Habitat Surface & Subsurface Areas Bottom Dwelling Communities, Near Shore Habitat which includes bottom dwelling algaes, kelp forests,	making. Several opportunities have been provided including scoping meetings, public meetings, and opportunities to comment on the Draft EIS/OEIS. The Navy has engaged the regional fishery management councils. Comments received during the scoping period were considered in the development of the Draft EIS/OEIS. Information on the development of mitigation measures can be found in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the DEIS and FEIS. The mitigation measures listed in the Final EIS/OEIS and Record of Decision are the result of the consultation with NMFS and USFWS.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	and seagrass beds. Why doesn't the Navy restrict its testing to limit the impact on biological sensitive habitats in the proposed Hawaii-Southern CA and NWTT Ranges and the NWTRC? 12) In several U.S. Navy final environmental Impact statements the Navy notes that many hazardous materials will be Containerized for Shore Disposal. Where will these contaminants be stored onshore and at what Navy facility will proper disposal be conducted? 13) In the Final NWTRC Environmental Impact Statement there are many hazardous materials which will be discharged overboard. Please designate, on the proposed Hawaii-Southern CA, NWTT and the NWTRC, U.S. Navy Range map which areas in the Pacific are considered "safe" for these discharges? And list any studies conducted by the U.S. Navy, NOAA, university, or the NMFS, to show that these areas are “safe” for these types of “discharges”. 14) In the U.S. Navy NWTRC Final Environmental Impact Statement (Page G417) is found this information: "The Navy is not 'testing' new weapons within the NWTRC. All weapons and platforms coming to the NWTRC as a result of the proposed action have been tested in other training ranges." Why does the Navy need to conduct redundant testing in in both the proposed Hawaii-Southern CA Range and NWTT? (Said testing is currently being conducted in the Atlantic, Pacific (Hawaiian & Southern California & Mariana Range Complexes), and the Gulf of Mexico)? 15) There are fifteen or more U.S. Navy Ranges which have been approved for full-scale warfare testing in the Atlantic, Pacific, and the Gulf of Mexico. These final EIS/OEIS documents show that many weapons systems, bombs, sonar, and other Navy testing is redundant in each of these ranges. This redundancy along with the ever expanding and exponential growth of these ranges costs large sums of money. Many of the practice weapons are costly and older thus their capabilities (like the Hellfire Missile and many bombs, munitions, etc.,) are well known and studied…many having been used for ten to thirty years in various military actions around the world and in the U.S. What justification does the U.S. Navy use when considering practice with live fire practice rather than practice using bombs, etc., which won’t explode but which can be used for practice purposes? It is the contention of many that the U.S. Navy (and all other branches of the U.S. military), should be protecting our oceans and our natural resources not destroying them in the name of war and war practice. Our oceans are a valuable source of food for millions of people, recreation, and sheer beauty. We have enjoyed this bounty and beauty for hundreds of years and now the U.S. Navy and other branches of the military are engaged, without restrictions, in destroying them. What rationale does the U.S. Navy use for destroying our oceans for redundant war practice? Who authorized the U.S. Navy to engage in this type of destruction of our oceans and the marine life therein? And who has authorized the U.S. Navy to conduct atmospheric testing without the proper Environmental Impact Statements like the U.S. Navy CARE Experiments? Our oceans and our atmosphere provide for life here on Earth. If we destroy them in the name of war and experimentation what future will our children and grandchildren have long after we live in a wasteland of war practice destruction? How will Navy personnel explain to their children why the only marine mammals, like whales,	

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	that can only be seen are in old Navy warfare promotional movies due to the fact that our military destroyed them and their habitats in the name of perpetual war practice in the Atlantic, Pacific, and the Gulf of Mexico?	
A. Peterson-06	July 10, 2012 Public Comment: U.S. Navy Hawaii-Southern California Range Expansion To: U.S. Secretary of the Navy-Ray Mabus The Honorable President Barack Obama Naval Facilities Engineering Command, Southwest Attention: HSTT EIS/OEIS Project Manager – EV21.CS 1220 Pacific Highway, Building 1, Floor 3 San Diego, CA 92132-5190 I find myself, at the age of 97, having worked to establish many environmental protections for our oceans and our natural resources, wondering what the future will be for my children, grandson, and great grandchildren. In a short time the U.S. Navy and other branches of the military have begun destroying millions of marine mammals, ocean habitats, coral reefs...and so much more in the Pacific, Atlantic, and the Gulf of Mexico. The land and ocean world that our elected officials, the U.S. Department of Commerce, (NOAA & NMFS), and the various branches of our military, have elected to destroy with "shock and Awe" methods using military weapons of all kinds...including new weapons systems and atmospheric testing, is stunning in scope. There are no words to describe the carnage that already has been put into action...and worse yet...the carnage yet to come is almost incomprehensible. "Our military officers took an oath to uphold the U.S. Constitution which does not state that the military has the right to destroy the Earth in the name of war practice." And yet today, the sonarizing, bombing, new weapons and atmospheric testing by the military is destroying the Earth in the name of "conducting war practice" and physics experiments. Our military is conducting illegal satellite and drone surveillance on all of us...killing people with drones...stating that everyone is guilty until proven innocent of the charges, whether inside or outside of the United States, in violation of our U.S. Constitution and laws. It seems that if someone is now killed by a drone they still have to prove, while dead, to the U.S. that they were innocent whether American citizens or not...whether a child or an adult. This violates the principle that we have lived by, under the U.S. Constitution, laws, and our Bill of Rights, which states that everyone is innocent until proven guilty. The military and our elected officials have set themselves up to play "GOD", judge and jury. What happens when their next victim is you? When the police or homeland secruity, the military, shoots you down and later finds that you were innocent but now dead? No amount of guilt money can bring you back or reverse the decision. Now the U.S. Navy and other branches of our military have decided to play "GOD" with the Earth and its bounty of natural resources. Why? It is a good way to financially bankrupt the U.S. with perpetual war and war costs. (One day we will have to hire the U.S. Navy to repair our roads since their war practice is reducing domestic spending.) War practice is a good way to enrich those that produce weapons of war and keep the free enterprise market going through the U.S. selling war weapons to other countries making us less safe in the bargain. I once spoke to a sailor and I asked him if the U.S. decided that my trying to save 11.7 million marine mammals from war	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, “Today’s simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments.”

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	practice and weapons testing got me arrested by our U.S. government, for being outspoken, if he would rescue me for exercising my free speech rights under the U.S. Constitution and Bill of Rights? He stood mute... What will this sailor tell his family, his chidren and grandchildren in his later years about his role in this destruction? There is a question for all of us: What will you tell your family and children about why you stood mute and let this happen? The best that I can say is that I stand today against this war practice horror to be perpetuated against our oceans and the Earth. There is no reason or excuse for this destruction to be unleasesd against the Earth. The U.S. Navy can do better...they can protect our natural resources and protect those that have no voice...I stand here today as one voice for our oceans, as one voice who speaks for the whales and other marine life who have no voice, and as the Earth's voice to say "NO" more destruction in the name of war practice for perpetual wars. Sincerely, Ava Peterson	
D. Peterson-01 (Electronic)	Thank you for the opportunity to share my thoughts and concerns for our sea life. " According to its own Environmental Impact Statements, the Navy estimates that the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises." Why would the Navy want to intentionally cause this kind of damage to Sea Life?? I am asking that planned exercises are stopped immediatly, Without hesitation. The animals that are still living in the sea and haven't been destroyed by industrial fishing deserve protection not Bombs!!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate.
R. Peterson-01 (Electronic)	May 25, 2012 TO: The Honorable Secretary of the U.S. Navy, Ray Mabus RE: Formal Request & Action by the U.S. Navy in the Final HSTT EIS document. Dear Secretary Mabus: I am formally requesting, under the California Public Records Act, a hard copy and CD of the subsequent HSTT Final Environmental Impact Statement of the Hawaiian-Southern California Range Complex once prepared from your current draft HSTT EIS-OEIS document. I would also like notification of the dates when the final HSTT EIS/OEIS	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	public comments are noticed in the U.S. Federal Register so that comments may be made in a timely manner. The following information was release by U.S. Senator McCain and U.S. Senator Levin: http://startingpoint.blogs.cnn.com/2012/05/22/sen-carl-levin-counterfeit-military-parts-pose-significant-safety-risk/ CNN News & Video – May 22, 2012 Sen. Carl Levin: Counterfeit military parts pose 'significant safety risk' "…Because of a recent surge of counterfeit military parts– such as pieces of equipment used in aircrafts– the Senate Armed Services Committee has adopted new legislation to change the procedural laws for buying new or refurbished parts. Senator Carl Levin joins Starting Point this morning to explain the details of the new law, which he has been working on alongside Sen. John McCain. Levin explains that the news laws say that parts can only be bought from contracted, authorized distributors or certified suppliers and dictates that suppliers will be responsible for their own repairs. Regarding the threat posed by the counterfeit parts, Levin explains that the problem occurs almost exclusively with equipment produced in China, and poses a "significant" safety threat to the nation…" End The U.S. Navy is now conducting warfare testing in the Pacific, Atlantic, and the Gulf of Mexico. Nuclear submarines, aircraft, ships, missiles, drones, and a whole host of other warfare weapons are now being tested over land and ocean areas. What actions are you taking to address the issue of counterfeit and questionable refurbished parts being purchased by the U.S. Navy? These counterfeit and faulty parts not only cost the U.S. Navy money but they have the potential to cause injuries to our Naval personnel, civilians, and others when they subsequently fail. Secretary Mabus, I have seen you recently on television and on interview shows, speaking about the U.S. Navy, but never once demanding that action be taken to address the issue of counterfeit parts, especially from China. In addition, I didn't hear you state, for the record, that the Navy will refuse to use said parts, especially from China, in order to protect the sailors under your watch and the civilians that may be killed or injured when these counterfeit parts malfunction. It is time that military parts, software, and hardware be made in the United States where quality controls are in place. I expect that you will at the forefront in stopping the use of counterfeit parts from China and other foreign countries. I am looking forward to hearing from you in writing within the next few days on this critical issue and that you will require that those who prepare your final HSTT EIS/OEIS to address this critical issue in order to protect our troops and the U.S. civilian population. Sincerely, Rosalind Peterson	
R. Peterson-02	U.S. Navy Hawaii-Southern California Range Complex Expansion Public Comment on July 10, 2012 On May 17, 2012, news reports that "Mass dolphin deaths in Peru caused by acoustic trauma" were announced by "…Dr. Carlos Yaipen Llanos of ORCA in Peru informed Hardy Jones of Blue Voice that acoustical trauma is the cause of the Mass Mortality Event (MME) that killed an estimated one thousand dolphins along the coast of northern Peru in March 2012…" [28]. This is another reason to begin to limit sonar, laser, radar, and electromagnetic weapons testing in the Atlantic, Pacific, and the Gulf of Mexico. We believe that the U.S. Navy & NOAA should investigate and find out if the	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	U.S. Navy was involved in causing this acoustic trama in March 2012, just after the Final EIS for the Gulf of Mexico GOMEX 5-year Warfare Testing & Take was finalized and approved. With the U.S. Navy practicing in almost every square inch of the Pacific, Atlantic, and Gulf of Mexico, the potential for harm to marine mammals increases exponentially. Since your own mitigation measures to protect marine mammals are effective only 9% of the time what new actions will the Navy be taking to improve sonar and bomb blast mitigation measures to 80% effectiveness? Respectfully, Rosalind Peterson CC: U.S. Congressman Mike Thompson U.S. Senator Barbara Boxer U.S. Senator Dianne Feinstein	actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
R. Peterson-03	July 10, 2012 Public Comment- U.S. Navy Hawaii-Southern California Range Expansion U.S. Navy / NASA C.A.R.E. (Charged Aerosol Release Experiment), September 19, 2009 Aluminum Oxide Dust Cloud Released Over the East Coast of the United States using a NASA Brandt Rocket: http://www.nasa.gov/centers/wallops/CARE.html 17, U.S. Navy / NASA C.A.R.E. Experiment – "…CARE's principal investigator, Paul Bernhardt of the Naval Research Laboratory in Washington: "The CARE experiment could also pave the way for future launches that would use the uppermost part of Earth's atmosphere as a large physics laboratory for studying charged dust…Dusty plasmas, like those that will be created in the CARE (aluminum oxide dust cloud) experiment…" Will the U.S. Navy be conducting atmospheric testing (Like CARE Experiment Above), over the Pacific Ocean? Will the U.S. Navy be conducting any atmospheric experiments where toxic chemicals will be released that could pollute air, water, oceans, rivers, streams, and coastal regions? Will the U.S. Navy be conducting more CARE experiments over the Pacific or the Atlantic Oceans or land areas where you have range complexes? Rosalind Peterson CC: U.S. Congressman Mike Thompson U.S. Senator Boxer & Feinstein	The Navy shares your concern for the fate and transport of potentially hazardous materials and water quality. All of the reasonably foreseeable effects from the fate and transport of potentially hazardous materials were analyzed in Chapter 3 (Section 3.1, Sediments and Water Quality) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
R. Peterson-04	July 10, 2012 - Public Comment - Hawaii-Southern California Range Expansion Drone Weapons Testing & Surveillance over the United States & Pacific, Atlantic & Gulf of Mexico The U.S. Navy is now working to expand their drone operations over the United States. In Oregon, a new draft Navy Environmental Impact Statement is due out this summer for public comment. Drones carrying and testing bombs, new weapons systems, testing new types of drones, and surveillance over land and ocean areas are planned for our future. Compounding this issue, as reported by The Guardian.co.uk on April 2, 2012, "…American scientists have drawn up plans for a new generation of nuclear-powered drones capable of flying over remote regions of the world for months on end without refueling…". In addition, there is increasing drone surveillance leading to questions over public privacy in the U.S. Accidents are increasing as the U.S. Navy and police departments in Texas and other areas are increasing drone usage. The U.S. Navy is now purchasing aircraft and other parts from China which have the potential to be substandard according to Senator Levin and may cause increasing accidents from all types of aircraft. What action is the Navy taking to stop the purchase of defective aircraft and other parts from other countries? How many U.S. Navy land-base drone ranges will	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	be conducting warfare testing, testing new weapons systems in unmanned aerial vehicles or aircraft, using nuclear powered drones, and will be carrying surveillance or weapons over land and ocean areas? Who will be conducting surveillance activities over land areas (private contractor or U.S. Navy or other Branches of the U.S. military in conjunction with the U.S. Navy), on American citizens and what will happen to the information collected? Why are these U.S. Navy drone ranges considered on a separate basis from other ranges when they are working in conjunction with the other ocean based range complexes? Rosalind Peterson CC: U.S. Congressman Thompson U.S. Senators Boxer & Feinstein	
R. Peterson-05	July 10, 2012 U.S. Navy Public Comment: Hawaii-Southern California Range Expansion I just found this BBC News item about underwater listening stations. It appears the U.S. Navy has a way to tract marine mammals with these devices which would be a more effective mitigation measure than is being used by the U.S. Navy & NOAA. I am raising this issue with both the U.S. Navy and NOAA. The new NWTT Range Expansion Public Comment period is over but this might be a way to protect schools of fish and also marine mammals in their testing areas and also in the new Southern California-Hawaii Expansion Range. Sonar Heard Underwater - BBC NEWS January 13 2012 "...Listening stations on the seabed all over the world are streaming sound in real time to websites that anyone can access, allowing people to hear everything from male humpback whales singing off Hawaii, to last year's Japanese earthquake. Conscious of security, the US Navy has brokered a deal with scientists in the north Pacific which allows the navy to delete any sounds of US or Canadian military shipping before the audio is sent out across the internet. It now wants to do similar deals with other scientists around the world, but some experts say that is both improbable, and in this new age of internet accessibility, unreasonable. This is the sound of a sonar system in operation, best known for being used by submarines to determine the position, nature and speed of objects under the water..." Will the U.S. Navy look into this method and advise on how effective this method might be in protecting marine mammals, migrating fish and marine mammals, and other marine life? Rosalind Peterson	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
R. Peterson-06	July 10, 2012 Public Comment: U.S. Navy Hawaii-Southern California Range Expansion ScienceDaily (Dec. 16, 2010) — The Applied Bioacoustics Laboratory (LAB) of the Universitat Politècnica de Catalunya (UPC) has developed the first system equipped with hydrophones able to record sounds on the seafloor in real time over the Internet. The system detects the presence of cetaceans and makes it possible to analyze how noise caused by human activity can affect the natural habitat of these animals and the natural	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	balance of oceans. A new EU directive on the sea has ruled that all member states must comply with a set of indicators for measuring marine noise pollution before 2012. Will be the U.S. Navy and NOAA be participating in this EU directive to meausre marine noise pollution? Will the U.S. Navy entertain using this method to help protect marine mammals and other marine life from excessive noise pollution, sonar use, laser and radar technologies now being tested or developed in the near future? Electromagnetic weapons systems are being developed which will also impact marine mammals and other aquatic life. Will the Navy be using or testing these devices in the Pacific Ocean areas of the Mariana Island Range, the Hawaiian Range, the Gulf of Mexico Range, the Southern California Range (and new expansion), or in the NWTRC? What impact do all of these new weapons systems have on marine life? What studies have been conducted to understand these impacts by the Navy, NOAA or other independent agencies or universities? Rosalind Peterson CC: U.S. Congressman Thompson U.S. Senators Boxer & Feinstein	Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, “Today’s simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments.”
R. Peterson-07	July 10, 2012 Questions for U.S. Navy Hawaii-Southern CA Expansion: 1) U.S. GAO 2002 Report: “…Unexploded ordnance are munitions that have been primed, fused, armed, or otherwise prepared for action, and have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material and remain unexploded either by malfunction, design or any other cause. Munitions constituents consist of such things as propellants, explosives, pyrotechnics, chemical agents, metal parts, and other inert components that can pollute the soil and/or ground water…” A. Please list all of the unexploded ordnances and also what mitigation measures the Navy is using now in the NWTRC and the proposed NWTT range for this type of unexploded ordnance. (Please include the Hawaii-Southern CA Range Complex Expansion in your answer.) B. Also advise on what impacts this type of ordnance will have on marine mammals, fish, aquatic environments, and what action the Navy will take if they wash ashore. How much funding does the Navy have allocated to protect shorelines? 2) September 10, 2010: U.S. Navy Final EIS Volume II Page G113 Answer to public comment question: "…No, the Navy does not plan on suspending sonar operations during the gray whale migration seasons…” A. Why won't the Navy suspend sonar operations during gray whale and fish migration periods in the NWTRC or the proposed NWTT Range Expansion which includes the NWTRC? And will the Navy suspend sonar and bomb blast operations in the Hawaii-Southern CA Range Complex Expansion during marine mammal and fish migration periods? 3) The U.S. Navy has ongoing 5-Year Warfare Testing Programs in their Southern California, Panama, Mariana Island, Hawaii Range, and other range	The Navy shares your concern for the fate and transport of potentially hazardous materials and water quality. All of the reasonably foreseeable effects from the fate and transport of potentially hazardous materials were analyzed in Chapter 3 (Section 3.1, Sediments and Water Quality) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	complexes? A. Does the Navy suspend sonar or bombing exercises during gray whale and other marine mammal or fish migrations in any of their 5-Year Warfare Range Complexes in the Pacific, Atlantic and the Gulf of Mexico active ranges? B. The Navy states in their Final EIS and ROD (Record of Decision) that they will be testing new weapons systems in the NWTRC. Will this be true in the proposed NWTT Range and the Hawaii-Southern CA Range Expansion? C. What precautions will be taken by the Navy to protect marine mammals from the unknown impacts of these new weapons systems? D. What impacts will the new testing of electromagnetic weapons systems have on marine mammals and please list which recent studies, if any, have been conducted to determine their impact on marine mammals, fish and other aquatic life? 4) Since NOAA has issued the Navy a permit and Letter of Authorization to allow the Navy to "take" marine mammals paving the way for full-scale warfare testing, which areas in the NWTRC and the Hawaii-Southern CA Ranges prior to any new expansion. Will the Navy avoid protect the endangered salmon and whales populations when they are in migration or feeding patterns? What actions will the Navy take to protect biologically sensitive areas and breeding habitats in this new Hawaii-Southern CA Range expansion? 5) U.S. Congressman Thompson has noted that NOAA & U.S. Navy mitigation measures to protect marine mammals are effective only 9% of the time...will the U.S. Navy be using mitigation measures now that are proven effective more than 9% of the time? If so, what studies were conducted by NOAA or the U.S. Navy that were proven effective more than 9% of the time and could be used today in the proposed NWTT Range? 6) The NWTRC, Hawaii and Southern CA are areas where the fishing and tourism industries make millions of dollars. Will the U.S. Navy be warning those who are operating such businesses of their activities in advance in order to protect our fishermen and tourists from the impacts of these bombing exercises or toxic chemical exposure from aluminum coated fiberglass particulates (Chaff), which can stay airborne up to 20 hours or airborne toxics like red and white phosphorus in the proposed Hawaii-Southern CA Range expansion? 7) The U.S. Navy Final Environmental Impact Statement lists many hazardous materials that will be used in many areas… and the dangers from unexploded ordinances that then sink to the bottom of the ocean. The Navy lists the following habitats that may be impacted by hazardous materials: • Open Ocean Habitat and Surface & Subsurface Areas • Bottom Dwelling Communities - Near Shore Habitat which includes bottom dwelling algaes including kelp forests, and seagrass beds A. Why doesn't the Navy restrict its testing to limit the impact on biological sensitive habitats in the NWTRC and the proposed NWTT and Hawaii-Southern CA Range? 8) In the Final Environmental Impact Statement the Navy notes that many hazardous materials will be "Containerized for Shore Disposal". Where will these contaminants and containers be stored onshore and at what Navy facility? 9) In the Final Environmental Impact Statement there are many hazardous materials which will be discharged overboard. Please designate on the NWTRC and the proposed NWTT and the Hawaii-Southern CA Range map where these ocean areas considered "safe" are located for these discharges	

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	in the Pacific, Atlantic or the Gulf of Mexico? 10) In the U.S. Navy Final Environmental Impact Statement (Page G417) is found this information: "The Navy is not 'testing' new weapons within the NWTRC and other Pacific Navy Ranges. All weapons and platforms coming to the NWTRC as a result of the proposed action have been testing in other training ranges." A. Why does the Navy need to conduct redundant testing in the NWTRC and the proposed NWTT and Hawaii Southern CA Range? (Since said testing is currently being conducted in the Atlantic, Pacific (Hawaiian & Southern California Range Complexes), and the Gulf of Mexico.)	
R. Peterson-08	July 10, 2012 U.S. Navy Hawaii-Southern CA Range Expansion Public Comment – Scoping Under NEPA for Draft EIS There are a wide variety of chemicals used by the U.S. Navy in many warfare testing ranges. We are requesting that the following be addressed in the proposed U.S. Navy Draft EIS with respect to human health, ocean impacts, marine mammals and fish, servicemen in area of usage, air, ocean, and water pollution, also risks from airborne pollution to shoreline communities: U.S. Navy Chemicals Usage – Warfare Weapons Range Complexes in the United States. 1) *Titanium tetrachloride is a colorless to pale yellow liquid that has fumes with a strong odor. If it comes in contact with water, it rapidly forms hydrochloric acid, as well as titanium compounds. Titanium tetrachloride is not found naturally in the environment and is made from minerals that contain titanium. It is used to make titanium metal and other titanium-containing compounds, such as titanium dioxide, which is used as a white pigment in paints and other products and to produce other chemicals. Military use it as a component of spotting charges. Titanium tetrachloride is very irritating to the eyes, skin, mucous membranes, and the lungs. Breathing in large amounts can cause serious injury to the lungs. Contact with the liquid can burn the eyes and skin. HAZARDS: _ Explosive _ Red phosphorus or Titanium tetrachloride _ Smoke/incendiary 2) MK-20 Rockeye Description Physical Characteristics The MK-20 Rockeye is a free-fall, unguided cluster weapon designed to kill tanks and armored vehicles. The system consists of a clamshell dispenser, a mechanical MK-339 timed fuze, and 247 dual-purpose armor-piercing shaped-charge bomblets. The bomblet weighs 1.32 pounds and has a 0.4-pound shaped charge warhead of high explosives, which produces up to 250,000 psi at the point of impact, allowing penetration of approximately 7.5 inches of armor. Rockeye is most efficiently use against area targets requiring penetration to kill. Fielded in 1968, the Rockeye dispenser is also used in the Gator air delivered mine system. During Desert Storm US Marines used the weapon extensively, dropping 15,828 of the 27,987 total Rockeyes against armor, artillery, and antipersonnel targets. The remainder were dropped by Air Force (5,345) and Navy (6,814) aircraft. Filling: 247 bomblets 3) *Red Phosphorus may be harmful if absorbed through skin, ingested, or inhaled, and may cause irritation of the skin, eyes, upper respiratory tract, gastrointestinal tract, and mucous membranes. Inhalation of red phosphorus dust may cause bronchitis. Ingestion of red phosphorus may also cause stomach pains, vomiting, and diarrhea. Effects may	The Navy shares your concern for the fate and transport of potentially hazardous materials and water quality. All of the reasonably foreseeable effects from the fate and transport of potentially hazardous materials were analyzed in Chapter 3 (Section 3.1, Sediments and Water Quality) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	vary from mild irritation to severe destruction of tissue depending on the intensity and duration of exposure. Prolonged and/or repeated skin contact may result in dermatitis. Chronic exposure may cause kidney and liver damage, anemia, stomach pains, vomiting, diarrhea, blood disorders, and cardiovascular effects. Chronic ingestion or inhalation may induce systemic phosphorus poisoning. If red phosphorus is contaminated with white phosphorus, chronic ingestion may cause necrosis of the jaw bone ("phossy-jaw"). HAZARDS: Explosive; Red phosphorus or Titanium tetrachloride; Smoke/incendiary. 4) **Pyrotechnic and screening devices contain combustible chemicals which, when ignited, rapidly generate a flame of intense heat, flash, infrared radiation, smoke or sound display (or combinations of these effects) for a variety of purposes. Compared to other explosive substances, pyrotechnics are more adversely affected by moisture, temperature, and rough handling. Some compositions may become more sensitive, and even ignite, when exposed to moisture or air. Mixtures which contain chlorates and sulfur are susceptible to spontaneous combustion. Most pyrotechnics produce a very hot fire that is difficult to extinguish and most burn without serious explosions. Many chemicals used in pyrotechnics produce toxic effects when ignited. Other pyrotechnics, which contain propelling charges, create an extremely hazardous missile hazard if accidentally ignited. What types of precautions are used to protect U.S. Navy personnel to exposure when these and other toxic chemicals are being used in the NWTRC, the proposed NWTT, and the Hawaii-Southern California Range Expansion?	
R. Peterson-09	July 10, 2012 Public Comment: U.S. Navy Proposed Hawaii-Southern CA Draft EIS – NEPA The killer whales of the Salish Sea could be negatively impacted by both the Canadians and the U.S. Navy using sonar in their critical habitat. The proposed NWTT Draft EIS should consider that combined and individual Canadian and U.S. Navy Sonar usage will have a negative impact on marine mammals. Intense underwater noise like the "pings" from mid-frequency active sonar poses significant risks to killer whales and other migrating whales. All sources of sonar and acoustic noise should be considered in the proposed Draft NWTT EIS. On February 6, 2012, the Canadian Naval frigate HMCS Ottawa used its sonar system in critical habitat of the endangered Southern Resident Killer Whales during a training exercise east of Victoria, B.C. The calls of the Southern Residents' K and L pods were heard 18 hours later in Haro Strait, and sub-groups of K and L pods were identified 36 hours after the sonar use in Discovery Bay – a location where Southern Residents have never been sighted in 22 years of records. These observations are reminiscent of an incident in May, 2003, when the USS Shoup's sonar training exercise caused similar unusual nearshore surface milling behavior of Southern Residents in Haro Strait. New limits should be put on the use of mid-frequency active (MFA) sonar, particularly in the critical habitat of the Southern Residents. Killer whales are sensitive to the frequencies emitted by MFA sonar (2-10 kHz) and use the same frequency range to communicate with calls and whistles. Because MFA sonar is intense	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	(source levels ~220-235 underwater decibels), it could permanently or temporarily deafen whales that are unexpectedly nearby and thereby impact their ability to forage, navigate, and socialize. (There has been report of dolphins experiencing hearing losses in other areas.) Even temporary threshold shifts could be deleterious because the recovery of the Southern Residents hinges on their use of echolocation to find, identify, and acquire their primary prey, Pacific salmon. Since the NWTRC is being expanded to include Alaska Testing Ranges these issues should be studied and addressed in the Draft NWT EIS. Current procedures for mitigating underwater military noise are inadequate to protect either the resident or transient ecotypes. These procedures depend on the ability to detect whales within 1000 yards (U.S.) or 4000 yards (Canada), which neither passive acoustic listening nor visual surveillance can reliably accomplish. The unprecedented sighting of Southern Residents in Discovery Bay suggests that they may have been present during the pre-dawn sonar exercise on February 6, 2003, while remaining undetected by the Canadian Navy's marine mammal monitoring procedures. The 2003 Shoup incident and scientific literature that MFA sonar can disrupt marine mammal behavior well beyond the current mitigation distances, particularly in the sound propagation conditions of the Salish Sea. The U.S. Navy should investigate all recent scientific literature on sonar and not just rely on very old studies…many of which were not peer-reviewed. The U.S. Navy should restrict MFA sonar and other intense underwater sound sources in all training and testing conducted in the Salish Sea. We are interested in any sonar research on all whales and other marine mammals being included in the U.S. Navy draft NWTT EIS and the Hawaii-Southern CA draft EIS with regard to the ever-increasing amount and types of sounds that marine mammals and other aquatic organisms are being exposed to from military and non-military exercises and testing.	used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
R. Peterson-10	July 10, 2012 RE: U.S. Navy Hawaii-Southern CA Range Complex Expansion Public Comment Reducing Environmental Cancer Risk Annual Report NCI Presidential Cancer Panel Report April 2010: Reducing Environmental Cancer NCI – Presidential Cancer Panel 2008-2009 Report Released April 2010 See: Chapter 5 Exposure to Contaminants and Other Hazards from Military Sources Summary: "…The military is a major source of toxic occupational and environmental exposures that can increase cancer risk. Information is available about some military activities that have directly or indirectly exposed military and civilian personnel to carcinogens and contaminated soil and water in numerous locations in the United States and abroad..." "...Nearly 900 Superfund sites are abandoned military facilities or facilities that produced materials and products for or otherwise supported military needs. Some of these sites and the areas surrounding them became heavily contaminated due to improper storage and disposal of known or suspected carcinogens including solvents, machining oils, metalworking fluids, and metals. In some cases, these contaminants have spread far beyond their points of origin because they have been transported by wind currents or have leached into drinking	The Navy shares your concern for the fate and transport of potentially hazardous materials and water quality. All of the reasonably foreseeable effects from the fate and transport of potentially hazardous materials were analyzed in Chapter 3 (Section 3.1, Sediments and Water Quality) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	water supplies..." The U.S. Navy as a wide range of toxic materials that are used in all of their twelve 5-Year warfare testing ranges. In specific, please detail all of your plans for proper disposal of all toxic wastes, hazardous materials, and other waste in the new NWTT range and the new Hawaii-Southern CA Range Expansion, and also please detail where all of these hazardous wastes are disposed of properly that are used in the current NWTRC, the Hawaii Range, the Mariana Range, and the Southern CA Range. We oppose any ocean dumping of toxic wastes and materials in any of the Pacific Range Complexes. We request that all areas where the U.S. Navy dumps toxic chemicals in the ocean be designated on a map in the Hawaii-Southern CA Final EIS/OEIS. Please advise on all types of weapons testing that exposes U.S. Navy personnel and the public to environmental, health (carcinogens,etc.), or occupational hazards when training in the NWTRC, the proposed NWTT Range Complex or the Hawaii-Southern CA Range Proposed Expansion.	
R. Peterson-11	July 10, 2012 U.S. Navy Public Comment – Proposed Hawaii-Southern California Range Complex – NEPA Process to be addressed the Draft EIS: Exhibit 1) The U.S. Navy and NASA are also engaged in atmospheric test using aluminum oxide released by rockets (C.A.R.E.), which could have consequences if used in the NWTRC with ocean acidity and water pollution: http://www.nrl.navy.mil/pao/pressRelease.php?Y=2009&R=97-09r This test was conducted on September 19, 2009. Does the U.S. Navy plan additional upper atmospheric testing...possibly over the Pacific Ocean or the West Coast of California, Oregon, Washington, Alaska, Idaho or Hawaii? These dust clouds remain airborne and then the aluminum oxide returns to the Earth. The effects of these programs on our oceans and water supplies have not been investigated and may be have been used in the NWTRC testing range or will be used in the proposed NWTT or Hawaii-?Southern CA Range Complex Expansion. Will aluminum oxide dust clouds be released by the U.S. Navy over the NWTT or the Hawaii-Southern CA Range Complex? What studies have been conducted to determine the impact of these programs on marine mammals and ocean environment? Exhibit 2) New Types of Sonar that should be investigated and addressed in the new Hawaii-Southern CA EIS: 16A) http://www.navy.mil/search/display.asp?story_id=48201 Next Generation of Mine-hunting Sonar 2009 U.S. Navy – Impact on Marine mammals and fish in the NWTRC in 2011-2012 and also proposed for NWTT Range Complex? 16B) http://www.nrl.navy.mil/pao/pressRelease.php?Y=2009&R=63-09r 2009 - U.S. Navy Article We also don't know if this type of laser sonar has been used in the NWTRC or will be used in the proposed NWTT or Hawaii-Southern CA range complex and what impacts it will have on marine mammals and fish? Please advise. Exhibit 3) Also note use of U.S. Navy directed energy weapons systems 2009. U.S. Navy Thursday, October 01, 2009. Has the Navy used this technology in the NWTRC and will it be used in the proposed NWTT range? Naval Surface Warfare Center Dahlgren News New Energy Center to Impact Future Weapons for Naval and Joint Forces DAHLGREN, Va. (NNS) -- The Navy	The Navy shares your concern for the fate and transport of potentially hazardous materials and water quality. All of the reasonably foreseeable effects from the fate and transport of potentially hazardous materials were analyzed in Chapter 3 (Section 3.1, Sediments and Water Quality) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	demonstrated its commitment to "game-changing" directed energy technological programs at the Naval Directed Energy Center (NDEC) ribbon cutting ceremony held at Naval Surface Warfare Center Dahlgren Division (NSWCDD) Sept.17, 2009. What impact will this technology have on marine mammals and fish? What studies have been conducted by the Navy to determine impacts on marine life in the Pacific if this technology is used in either the NWTRC or the proposed NWTT and Hawaii-Southern CA range complexes? http://www.navy.mil/search/display.asp?story_id=48285 Exhibit 4) U.S. Navy Press Release June 26, 2010 http://www.nrl.navy.mil/pao/pressRelease.php?Y=2010&R=74-10r "…Complete with the ceremonious champagne christening, the USNS Howard O. Lorenzen (T-AGM 25) is the second ship in U.S. Navy history to honor an NRL scientist for contributions made to Naval and civilian scientific research. Operated by the Military Sealift Command the missile range instrumentation ship, equipped with a new dual band phased array radar system and other advanced mission technology, it will replace the USNS Observation Island launched in 1953…" Do we know what impact this new radar system will have on marine mammals and fish or other aquatic life? What studies have been conducted to determine said impacts? Exhibit 5) U.S. Navy Press Release February 12, 2010 http://www.nrl.navy.mil/pao/pressRelease.php?Y=2010&R=6-10r "…The new device, called the Swept Wavelength Optical resonant-Raman Device (SWOrRD), illuminates a sample with a sequence of as many as 100 laser wavelengths and measures the spectrum of light scattered from the sample at each laser wavelength…" This type of laser might have been used in the NWTRC and may be used in the proposed NWTT or Hawaii-Southern CA Range Complex. Will this device negatively impact marine life in either the NWTRC or proposed NWTT and Hawaii-Southern CA Ranges? Also what studies have been conducted (results), regarding its impact on marine mammals and fish? Exhibit 6) U.S. Navy Press Release September 4, 2009 "…Scientists at the Naval Research Laboratory are developing a new technology for use in underwater acoustics. The new technology uses flashes of laser light to remotely create underwater sound. The new acoustic source has the potential to expand and improve both Naval and commercial underwater acoustic applications, including undersea communications, navigation, and acoustic imaging…." This type of laser technology used in the NWTRC may negatively impact marine mammals and other marine life in the proposed NWTT and Hawaii-Southern CA Range Complexes. What studies have been conducted and what were the results of said studies on marine mammals, fish, and other aquatic organisms? Exhibit 7) There are 59 abstract studies regarding Acoustic Bubbles listed on this site some of which were conducted by the U.S. Navy-none of them involve sea life or marine mammal impacts: http://www.stormingmedia.us/search.html?q=acoustic+bubbles+ocean&search.x=13&search.y=7 What studies have been conducted to see if Acoustic Bubbles have impact on marine mammals and what were the results of those studies? Will the U.S. Navy be using this technology in the proposed NWTT and Hawaii-Southern CA Ranges? Has it	

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	been used in the NWTRC and what were the results of said tests on marine mammals? Exhibit 8) Oceans Studies are also showing that sound travels farther as the ocean becomes more acidic. http://www.mbari.org/news/news_releases/2008/co2-sound/co2-sound-release.html This could be problematic with ever-increasing sonar usage and the chemicals that Navy uses that would increase ocean acidification. The Navy E.I.S., does not address this issue nor do the NMFS proposed rules. Many studies indicate that our oceans are becoming more acidic. What studies have been conducted to determine the increasing sound distances caused by ocean acidity in the NWTRC and the proposed NWTT and Hawaii-Southern CA Ranges on marine mammals, fish, and other aquatic life? Please advise on study results. Exhibit 9) Oceans are 'too noisy' for whales – September 15, 2008 What recent studies has the Navy conducted in the past two years on the noise impact on marine mammals? Results? http://news.bbc.co.uk/2/hi/science/nature/7616283.stm Exhibit 10) California EPA Information - EPA Perchlorate Health Effects Report March 2008 http://www.swrcb.ca.gov/water_issues/programs/gama/docs/perchlorate_mar08_infosheet.pdf The toxic chemical listing by the Navy in their E.I.S., shows that many chemicals will be used during their NWTRC Warfare Testing Program Expansion. The California EPA lists the health hazards for most of these chemicals. Many of them are toxic to fish or accumulate in the food chain like Mercury. Thus, the toxicity of the chemicals used by the Navy should also be assessed by the Navy before use in proposed NWTT and Hawaii-Southern CA Range Complexes. Did the Navy conduct such testing in the NWTRC to determine the impacts of said chemicals used in the NWTRC range? What tests and what were the results of said tests? How many marine mammals were tested for toxic chemicals in the NWTRC, the Southern CA Range, the Mariana Range, and the Hawaii Range that are being used by the Navy at this time for warfare testing and experiments? Results?	
R. Peterson-12	July 10, 2012 U.S. Navy Hawaii-Southern CA Public Comment RE: NOAA Sonar Mitigation Measures – Permit for U.S. Navy to "TAKE" Marine Mammals NOAA Letter Dated January 19, 2010 – Regarding Sonar Mitigation Measures On January 19, 2010, NOAA sent a letter to Ms. Nancy Sutley, Chair, Council on Environmental Quality that states that a comprehensive review of mitigation measures was conducted and completed by the NMFS (NOAA). This NOAA letter also states: "…In the Environmental Assessments, NMFS (National Marine Fisheries Service-NOAA), also identified the relevant uncertainties regarding the impacts of the proposed training on marine mammals. Two are worth highlighting: • One involves lack of knowledge about the mechanism whereby some species of marine mammals…are adversely affected by mid-frequency sonar. • The other concerns the difficulties of limiting the impact of active sonar where the mitigation efforts depend on visual sighting of whales…" • These issues need to be resolved prior to the issuance of any more permits to the Navy for the "taking" of marine mammals in the proposed draft NWTT and proposed Hawaii-Southern CA	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	Range Complex Expansion EIS. It should alleged that NOAA is using biased Navy data from "after action reports" rather than having unbiased and professional marine biologists present during and after these military actions to determine impacts from the use of sonar, bomb blasts, use of toxic chemicals and other warfare exercises that will impact marine mammals and other sea life. It is unacceptable to accept the premise that sonar is the only impact that will be felt by marine mammals and other sea life during Navy warfare exercises. It is also unacceptable that the only mitigation measures planned are for sonar use. The Navy is unlikely to report negatives because they would have to alter their methods if any adverse information showed up...and they don't want to alter their activities in any manner at this time. The determination that sonar caused certain impacts on marine mammals cannot be separated from the impacts caused by other warfare weapon testing such as bomb blasts or use of toxic chemicals. (When the U.S. Navy uses only their own statistics on mitigation measures with regard to marine mammal impacts, without oversight (on-the-sea) independent monitoring of their activities, you have the fox guarding the chicken coop and reporting on the number of chickens left after each military exercise...not a good idea if you want any of the chickens to survive.) The U.S. Navy should be protecting our ocean marine mammals and other sea life. The proposed Hawaii-Southern CA Range Expansion should consider protection these natural resources instead of destroying them. Some day we may need them…once destroyed they can't be replaced. There is definitely a conflict of interest because the Navy and NOAA (NMFS) are cooperating agencies. We need oversight from independent non-cooperating agencies not dependent on Navy funding, who will uphold U.S. laws which protect endangered and threatened species and other environmental laws. We are speaking about the Navy being allowed to "take" more than 11.7 million or more marine mammals over the course of multiple 5-Year warfare testing in the Atlantic, Pacific and the Gulf of Mexico. This does not include protections for any other marine life, habitats, national marine sanctuaries, marine reserves, and other biologically sensitive areas. And there are no protections or mitigation measures for toxic chemical usage, bomb blasts, missile exercises and other classified types of warfare testing. The Navy proposed Hawaii-Southern CA Range Expansion should consider the total number of "takes" from all forms of military testing and chemicals used in all of the active and proposed ocean ranges and from all branches of the military operating in the Pacific. Independent agencies doing surveys involving independent marine and other biologists will produce the best results. Those that have military connections and funding have a built in bias. The Mineral Management Service (MMS), is not qualified to provide this type of work considering they have been working hand-and-glove with business interests for years and will protect the Navy interests over the environment and the safety of marine mammals. This is not a satisfactory solution or an entity that can be trusted at this time. The NOAA letter also states that the NMFS will conduct workshops on the individual and cumulative impacts of sonar and other noise that now are part of our ocean environment. This letter goes on to state: "…There are no baselines with	at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	which to measure the cumulative sound impacts…" Also the Navy has now started to replace older sonar methods with new ones which will also be tested during Navy warfare exercises. We have few studies and little if any research on the impact of these new methods on marine mammals or other sea life." The U.S. Navy should provide current research on new weapons systems and sonar usage in their proposed Hawaii-Southern CA Range Expansion in order to protect all ocean sea life? The U.S. Navy and the NMFS (NOAA), are alleged to be conducting workshops on these issues along with mitigation and monitoring measures as cooperating agencies. The NOAA letter states: "…Protecting important marine habitat is generally recognized to be the most effective mitigation measure currently available…" This leads to the question: Why isn't the Navy being required to protect national marine sanctuaries, marine reserves, breeding and feeding grounds, and biologically sensitive areas from direct warfare activities? The U.S. Navy and the NMFS, according to this letter, agreed to "…conduct a pre-workshop in 2010, to allow the public an opportunity to provide input and prepare for the 2011 workshop…" What were the results of this workshop? Will they be published in the Hawaii-Southern CA Range Expansion EIS? The NOAA letter also states: "…the NMFS has required that the Navy convene a workshop to review and modify, as appropriate, the monitoring measures included in the regulations. This workshop is scheduled for 2011…" The NOAA letter goes on to state: "…All of the planned workshops should lead to substantial new information related to improved mitigation strategies for military activities…" Will the U.S. Navy be taking into consideration the findings from these NOAA workshops to improve their mitigation strategies in your Hawaii-Southern CA Range Expansion EIS? The Navy NWTRC FEIS and the ROD do not spell out this new monitoring and mitigation program which was apparently initiated earlier this year…It should be noted that monitoring only by the Navy leads one to believe that it is not in their self-interest to accurately reporting their findings...and there should be immediate independent oversight in with regard to the ongoing Hawaiian, Mariana, NWTRC, and Southern California warfare range testing. Important issues that the U.S. Navy should address in their proposed Hawaii-Southern CA Range Expansion EIS: 1) The issue seems to be only sonar related with no mitigation measures planned for birds, fish, and other marine life. 2) What about the damage to the ocean and habitats from toxic chemicals, bomb blasts, missile exercises, and other classified warfare testing? None of these issues are discussed by anyone and they should be raised. 3) No protections for breeding habitats, national marine sanctuaries, marine reserves and other sensitive areas are planned by either NOAA or the U.S. Navy in most areas. This needs to be changed and we need built-in protection for these areas and for areas that are prime food sources for all sea life. 4) The U.S. EPA, California EPA, and the U.S. Department of Fish & Game have also been excluded from these workshops and oversight of Navy activities… and they should be included along with various university biologists and others working in the marine biology fields.	

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Pickard (Electronic)	[Expletive deleted] the U.S. Navy and their destructive little boy war games. Each separate war game activity needs independent environmental review. Perhaps, maybe some of them are innocuous. I doubt it. Since the U.S. Military is the biggest polluter in the world I don't expect much in the way of concern for the environment or species in it.	Thank you for participating in the NEPA process.
Pinnisi (Electronic)	Cetaceans have been described as "non human persons" by scientists. I find this incredibly distressing and disgusting to be considered by my country.	Thank you for participating in the NEPA process.
Pinto (Electronic)	Hopefully, there is a less costly and more humane way to go forward with this exercise. Thank you for your consideration.	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
Pohl (Electronic)	I hope the Navy is engaging this EIS process with a sincere desire to learn, and that the results will strongly influence Navy policy. Too often the attitude to this process is that it is simply a required protocol - a procedural hoop through which we must jump. Given the precarious state of global environmental conditions, particularly in the oceans, we can no longer afford to threaten ecosystems. There should be zero tolerance for permanent damage to sea mammals. The potential for secondary harm is too extreme to justify the risk.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Pollman (Electronic)	Our Earth is beautiful fascinating, and human being's existence relies completely on that of our planet. The Earth's delicate ecosystem can only exist because of all integral components contained within it. All parts of the ecosystem are needed to maintain homeostasis, human existence will cease to exist if we do not stop destroying the world we live in. War isn't necessary for coexistence among men, or any other life form. Destroying and permanently maiming such an enormous population, regardless of the species or form is just ignorant, we too will die with our planet. Stop being idiots. Put your weapons away. Stop killing.., us, our children, and our future.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
B. Pollock (Oral-Kauai)	I want to address the piece in the paper about 1,600 instances of hearing loss and other injuries to marine mammals yearly. Speaking as one who is very hard of hearing, one of the first things you're asked when you take a hearing test is, Have you ever been exposed to a loud noise? All of God's creatures use sound for life. I invite you to be silent for five minutes. Don't hear the birds or the waves lapping on the shore. Don't hear it. What more can I say? I don't need to. Like the Indians said, the Indians said the white man, through his insensitivity to the way of nature, has desecrated the face of Mother Earth. The white man's advanced technological capacity has occurred as a result of his lack of regard for the spiritual path and for the way of all living things. The white man's desire for material possessions and power has blinded him to the pain that he caused Mother Earth for the quest for what he calls natural resources. And the path of the Great Spirit has become	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	difficult to see by almost all men, even by many Indians who have chosen instead to follow the path of the white man. Thank you very much.	
K. Pollock (Electronic)	I am asking that you think about life in all terms and that you stop your proposed testing as it affects us all. Thank You!!!	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Pometta-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Pometta-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		ship and aircraft and then provide “a crude estimate” of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, “(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching.” When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60’. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in “calm sea conditions” is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier’s and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the “one or two personnel” described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy’s reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Portman (Electronic)	I urge you, in the proposal to conduct training exercises along the U.S. East Coast and in the rich marine environment off the coast of California and Hawaii, to please incorporate additional protective measures to reduce the harmful impacts to marine mammals from the use of live explosives and high-intensity sonar. Please do the right thing. Sincerely, Rebecca Portman	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Pothof-Barlow (Electronic)	Since the early stages of testing Low Frequency Sonar equipment in Hawaii I have been extremely concerned about the effects of the Navy's activities on the health of the dolphin and whale populations. I have personally been involved in disentangling a dolphin from a fishing line in Hawaii and freeing humpback whales from fishing nets in Mexico and in both these encounters it was clear that I was working with sentient beings, highly evolved mammals who were actively cooperating and receptive to communication that allowed us to work on cutting the netting. The Navy's argument in the Environmental Impact Study that for most species the activities may cause harm and possibly death to individual animals but not affect the population as a whole to me is no more a reassurance as it would be to say that the activities of the Navy (in time of peace) may harm or kill individuals of a population of humans but not the population as a whole. It is UNACCEPTABLE to me that in the name of 'defense' we invade the living environment of cetaceans and pollute it with sound that effects their ability to 'hear', navigate, and can cause irreparable damage and death. In the EIS the Navy states they strive to be 'good neighbors', yet invading and polluting the environment of defenseless but highly intelligent and evolved marine mammals does not establish good neighbor manners at all. As a leading nation in the international whaling agreements we will completely loose our credibility if we are questioning other country's right to "take" whales and dolphins (read: Kill) for commercial, or "research" purposes, while we ourselves allow our Navy to harm and kill whales and dolphins. We as humans have a choice to not knowingly permeate the ocean, an environment that we share with other evolved mammals, with sounds that will harm and potentially kill them. I herewith express my sincere concern	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	and objection to deploying the testing as proposed in areas known to be frequently traveled by whales and dolphins or within effective range of whales and dolphins, unless it is a time of war with imminent threat. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing. Sincerely, Saskia A. Pothof	
Powe (Electronic)	While I am far from completely informed about the issue, I feel compelled to note that I think that it is vital that the Navy take its responsibilities to mitigate environmental effects from this work very seriously.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Prell (Electronic)	Please consider our precious environment and don't harm the ocean's inhabitants.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Price (Electronic)	The US Navy has updated their estimates on how much and how many whales and dolphins would be impacted by the use of sonar and explosives in the ocean between Hawaii and southern California. This is another unbelievable tragedy that doesn't have to happen: if you or I were stunned into blindness for 10 minutes while walking on a street, it's not so unlikely that we might be killed by a car. Why are we doing this to the dolphins? I don't see the benefit in harming these creatures who have proven to be both intelligent and peaceful. We are the ones responsible for the wise stewardship of this amazing and beautiful planet Earth we call home, since dolphins and opther creatures obviously cannot advocate for themselves. The damage already done and continuing to be done to our planet is making our "home" less habitable. Please consider changing this policy of using sonar and explosives in the Pacific Ocean. Fukishima has already	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	done enough damage.	with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, “Today’s simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments.”
Pringle (Electronic)	Do not continue to harm whales, dolphins, and other sea animals with your explosives. My tax dollars should not support harming innocent animals because you can get away with it. You should be ashamed of yourselves!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Printz (Electronic)	please dont do this	Thank you for participating in the NEPA process.
Pupo (Electronic)	I am saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. I would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. Cathy Pupo & Family	testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically Navy records have had few to no mortalities from sonar or explosives. Any model predicting takes is only an estimate.
Pusch (Electronic)	Do Not use Sonar in the Ocean. It is murderous, and much marine life is protected. This Sonar must stop now.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Puzzuoli (Electronic)	Please do not conduct further tests around Hawaii and her islands as well as California. It so tragic how you're military sonar and the like is affecting area marine life.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Quirk, MD (Electronic)	I am writing in reference to sonar. The new Navy report that reveals how millions of whales and dolphins may be harmed by sonar testing is very concerning. Here in Hawaii we are a whale birthing ground, and the whales and dolphins are protected by law. These beautiful creatures not only have an important place in the marine ecosystem, they also bring millions of tourist dollars into Hawaii. So please, for our sake as well as for their's, create a sonar free zone in Hawaii and find a way to test your equipment that will not harm any sea creatures. I also wanted to say thank you for all that you do in protecting America and Hawaii. You guys rock!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Of the millions of annual exposures resulting from the Navy's proposed training and testing activities, nearly all are expected to result in "Level B harassment," defined as harassment that, "disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behavioral patterns are abandoned or significantly altered." Only Level A harassment would have the potential to injure a marine mammal. As described in the Draft EIS/OEIS, marine mammals would potentially be exposed fewer than 1,000 times annually, throughout the entire Study Area, to sound levels that could result in Level A harassment. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities, designed to reduce marine mammal injury. As a result of these mitigation measures, the Navy expects no mortalities of marine mammals from training and testing activities, and impacts to marine mammals are not expected to decrease the overall fitness of any given population.
Raebeck (Oral-Kauai)	Aloha, I guess I'm last. So I just want to say that personally I'm not against anybody, and I know that all the people who work in the Navy are fine people and that living here on Kauai that you know as well as all of us what we have. So I just would like to suggest that in the position that you're in if you could instead of, you know, going back and going, Oh, well, we went there and we listened to all those people; to just take it to heart what the people have said and maybe see what you can do in your position to support the stuff that we all love about Kauai and to, you know, instead of just taking orders and going along. I've got to do this because this is my job. To see what maybe else can	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	happen that can bring us together. Like Puanani said, and that, you know, start focusing and working on a little bit more solution oriented. And also just I'd really like to see the testing be done maybe in-house somewhere. You know, if we can put people on the moon, if we can build all these aircrafts, we can certainly test in such a way that is not harming things, you know. And the last thing is, so the testing, are we preparing to have a war? And so then we're ready for war, so then what? We have a war here? So maybe, I don't know, I'd like us to work together towards something a lot more wholesome. And also, one last thing; sorry; is that I know that you Navy people are in a huge, great position to really know about the oceans. You know a lot more than a lot of us; me, for example. And I'd like to really, my real vision for the Navy is when we live in a world of peace, which we can do, is that our Navy is the absolute leader in everything ecological for the ocean and use the power that we have in the seas to clean the oceans and to preserve and protect the oceans. Thank you for having me.	
Rainwater (Electronic)	To Whom It May Concern, I'm writing to ask you to not harm our remaining sea mammals with Navy sonar and explosives. Just go to youtube, search for videos involving dolphins, whales and humans...esp when humans have stepped in to save whales that have been caught in fishing nets. There is an amazing communion between species that one wouldn't expect...in the past. They are amazing creatures. Dolphins have saved human beings as well. I'd like to think if I was ever in trouble at sea, assistance by dolphin would be possible. That could only happen if we protect them. Please find alternatives to your damaging sonar and explosives. Thanks, Gregg Rainwater	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ramakrishna (Electronic)	Please stop using sonar and explosives that kill dolphins and whales. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ramirez-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ramirez-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Rance (Electronic)	Please, the cost to marine life, the fragile eco systems and indeed our survival as a species is too great. These mad practices of war against each other and the degradation and destruction of our planet must cease and desist immediately. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Randazzo (Electronic)	Please consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Randolph (Electronic)	Now that we know and understand how intelligent and how sensitive these animals are, we can not in good conscience subject them to explosives or military training exercises that would impact their safety or well being. These animals have helped the Navy in the past. We owe it to them to be considerate of their lives and health. Now we must help them.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Raney (Written)	Aloha, my name is Dave Raney, and I am Team Leader of the Sierra Club's National Marine Action Team. The Sierra Club is soliciting comments from our affected Chapters and will submit written comments on this DEIS, and the Atlantic Fleet Training and Testing DEIS. This evening I will make a few preliminary comments. First, we recognize and appreciate the contributions of our armed services personnel, including the U.S. Navy, in providing for the security of our homeland under increasingly complex conditions. That includes the difficult task of seeking to balance the duties of providing such security while also fulfilling their responsibilities as environmental stewards. We value our freedom and security. As Pacific Islanders in particular, we also value our relationships with whales, dolphins, sea turtles, sea birds, and other creatures with which we share the Planet. They are more than just "natural resources" and we ask your help in protecting them from risks your training and testing activities may pose, as they also face increasing stresses in coming years from climate change impacts -- including rises in sea levels, and increases in sea temperatures and ocean acidification. You have invited our help in improving this DEIS. Here are two suggestions: 1. Use coastal and marine spatial planning tools, as promoted by the National Ocean Policy, to address the conflicts this DEIS attempts to address. NOAA and the Navy have a broad array of applicable tools, including a geographic information system data base showing the densities of marine mammal and sea turtle species found in specific areas. Avoiding areas of high population densities through the use of spatial planning, or zones, such as the National Marine Fisheries service proposed monk seal critical habitat, would be much more effective than the heavy reliance the DEIS currently places on the use of lookouts and limited area mitigation zones	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Ransom (Electronic)	Navy - Do not take. The world only works by giving. You give us nothing by taking what you propose. You take more than you will ever guess which is not your right. And you know it. Back off.	Thank you for participating in the NEPA process.
Rasmussen (Electronic)	Whales and dolphins communicate by sonar and your sonar can kill them. NO MORE SONAR TESTING!!! You kill whales and dolphins.STOP NOW!!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Reeve (Electronic)	Thank you for the opportunity to comment. I attended the session in Hilo, Hawai`i and was impressed by the willingness of the presenters to explain the Navy's. Setting up informational posters in a large room with the experts standing by to answer questions was very successful, and I would encourage the Navy to use it in the future. I cannot agree with the Navy's dismissal of the impacts that will inevitably affect the whales and dolphins due to the training exercises. I am grateful for the willingness of Naval commanders and personnel to take on difficult missions to protect our country, but the area is vast, the list of marine mammals is long, and the remoteness of the area means that the full impacts to animals are unlikely ever to be completely known. I would urge the more expansive application of the precautionary approach to increase the margin for error. Sound travels very far and very fast in the ocean, and many marine mammals live very cryptic lives. At the event in Hilo, I was assured that it is possible to know where the animals are during the Navy's exercises, but my experience as a cetacean biologist tells me otherwise. Even allowing for classified state-of-the-art equipment aboard Naval vessels, beaked whales are notoriously difficult to detect as they spend long periods at depth, very little time at the surface, and have low body profiles when they are at the surface. Look-outs aboard ship will simply miss seeing the great majority of beaked whales no matter how dedicated or well-trained the sailors are. 1. In footnote 1, I suggest that "explosive" and "high explosive" not be used interchangeably throughout the document, as they are not exactly the same thing. 2. In Table 3.4-1, regarding the last column denoting ESA/MMPA status for the included species, some changes would make the information clearer: a. As much of the training area is located in the high seas beyond national jurisdiction and the DEIS acknowledges this fact by using the designation OEIS, the status of each species according to the International Union for Conservation of Nature (IUCN) Red List could also be given. Most of the species have the same status under the ESA and the Red List, but this would give more credibility. b. The spaces for species that are "data deficient" according to IUCN are currently filled by a " – " with no indication of what this means. I suggest that this leads to the mistaken impression that the species with this designation are not endangered or threatened, when that is simply not the case. Not enough is known about these species to make a determination of their status, and this could be clarified. As data are scarce on these species, the precautionary approach could be applied to ensure a margin of error. 3. Also regarding Table 3.4-1, the higher uncertainty CV in the stock assessments could be highlighted to indicate the low confidence in the figures. As the CVs range from 0.07 to	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	1.43, it is obvious that not all stock assessments are of equal value to decision-makers or commenters, and this could be made clearer. 4. All cetaceans found within a group may not be alike in their contributions to the group. New research suggests that animals may take on specialized roles and that impact to these animals may be more detrimental to the group as a whole. While the Navy cannot tell by observation which animals fulfill which roles, this knowledge lends more support for use of the precautionary approach. 5. Overall, I am very impressed to see that the DEIS is excellently footnoted with references and explanations. This increases the credibility of the document in the eyes of the public, scientists, and skeptics, and I appreciate the effort. 6. It is important to make the point that the tests for odontocete temporary and permanent threshold shift were conducted on a very limited number of subjects, for instance one false killer whale. This violates the scientific method at its very basis and is further support for application of the precautionary approach. Two suggestions proceed from these circumstances: a. We must be skeptical of the results of biological studies with only one subject. The findings must be considered anecdotal evidence at best and applied with much precaution if at all. The argument that “this is all we have” may be the worst one possible, as it may prevent acknowledgement of the inadequacy of the research design and give decision-makers the false sense that they are basing decisions on sound science. The models of behavioral changes and other impacts are only as good as the data they are based upon. b. As the Navy is the major funder of marine mammal research, the Navy could shift the focus of research into marine mammal hearing capabilities away from captive cetaceans – which all too often is based on a very small number of animal – to populations in the wild. This would yield credible and usable scientific results for decision-makers.	
Reever (Electronic)	I have always been proud to be a NAVY family - please keepour faith in the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Reghetti (Oral-Hilo)	My name is Denise Reghetti, and I'm here for myself and the world that I live in, and I'm here for the marine life, the mammals, the animals, the air, water, land. All my uncles and my father fought in World War II for my freedom, and I respect, but also I was given the right to be here today. And what I want to say is my being here in Hawaii has shown me something that I have grown to learn throughout my life, but also it is something that the man before me spoke to you about. And I don't think that a lot of people understand what he's saying, and this is something that we all need to come to terms with and realize because when you go in the form of what we are in, as this body, and you understand the Hawaiian culture and a little of what they have tried to explain to you over, I'm sure, a long period of time, the spirit is something that you can't destroy. The spirit is something that is here. And when the government is doing the wrong things to this land and to the people that this land belongs to, the spirits will be there protecting it. You may be in this form, and you may think that you can see and you can destroy with your guns and your ammunition and your weapons, but you can't destroy the spirit, and they're here, and this is what you're up against. So it's not a threat. It's a warning. They're present. Thank you.	Thank you for participating in the NEPA process.
Reghetti (Written)	The United States Government needs to "step-up-to-the-plate" and STOP! I am asking a great deal but 2012, is the time to honor what is right for all, every, and now. What I am saying I say for many, I am certain you have heard it said many times before myself. Honor what is the right thing to do! Mahalo. Marine, mammal, animal, plant, water, all forms of life on the Big Island of Hawaii -- and world, waters, land, air, etc.	Thank you for participating in the NEPA process.
Reid (Electronic)	KILLING OR HARMING INNOCENT ANIMALS - OR ANYTHING FOR THAT MATTER - IS TOTALLY UNCONSCIONABLE AND WILL NOT BE TOLERATED!!!!! ALL ANIMALS NEED OUR PROTECTION. WILD ANIMALS SHOULD BE LEFT ALONE IN THE WILD WHERE THEY BELONG, NOT TOYED WITH BY HUMAN BEINGS. NAIVE HUMANS, WITH SHORT SIGHTED ACTIONS, WHO DO NOT KNOW THAT IT IS WRONG TO KILL ANY CREATURE NEEDLESSLY, MUST BE EDUCATED. SOLUTIONS MUST BE FOUND THAT ALLOW ALL CREATURES TO COEXIST. THE PLANET'S ECOSYSTEMS DEMAND THIS BALANCE.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Reier (Electronic)	Please reconsider your training tactics along Cali and Hawaii. Having worked very closely with the Spinner dolphins in Hawaii and the many other dolphins and whales that pass through those waters, I can't tell you enough how incredible they are. Their intelligence and beauty bring so much joy and awe to all that encounter them. The Spinners only have the Hawaiian island to call home. Should you train in the way you plan off the coast of Hawaii, those Spinners will have no where to escape to and no home to return to, should they survive at all. Please reconsider your training plans and take these incredible creatures into consideration. It has been proven that sonar, explosions and other Navy exercises seriously, and often fatally, harm the marine	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	mammals in the area. Thank you.	whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Retter (Electronic)	There must be alternatives to this training & testing that is horrific for our magnificent & precious ocean animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
J. Reynolds (Electronic)	My family has been involved in the military for many years, indeed we have ancestors who served on the Virginia Line in the Revolution. I fully understand the need to protect our waters, but that also means to be a proper steward of the bounty that God has afforded the world. While I can see that there is a need for limited testing of naval weaponry, to do so with a sense of impunity is flouting our responsibility of that stewardship and besmirches the record of the U. S. Navy. We can test, but to a limited degree, and in limited locales that have a minimal effect on cetacean life. The oceans are huge. Remember that the concept of shipping in convoys during World War 2 was developed by mathematicians who recognized counterintuitively that if many ships steamed together, there was that much more oceanic vastness that ships were not in, and were therefore safer from detection and attack. So think, this concept is possible to apply in a way to cetacean pretection. Find areas where whales and dolphins don't tend to congregate, breed, gestate, and give birth. Locate tracts of open sea that avoid their migratory routes. Add to the pride of our Naval Forces by instigating plans to protect our wildlife. Lead the world, not only in naval power, but in naval responsibility by showing how it can be done, and set an example for other countries, and for those who come after us. Set standards for ocean wildlife protection that speak to and enhance the heritage that John Paul Jones began. Stop it now.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
M. Reynolds (Electronic)	I am against the useless killing of marine mammals (or any other marine life) for the purpose of military testing and urge those that are able to stop this bararism at once.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
C. Rice (Electronic)	Since marine mammals cannot speak for themselves, it is up to those of us who deeply care about their welfare to do so. "The Navy's report states that the exercises could cause 1,600 marine mammals to suffer from hearing loss or other injury from its use of sonar and explosives each year for the next five years. The report also projects that 200 marine mammals will die each year." This, in effect, equates to the needless slaughter of those marine mammals. Either cease testing or find a means of testing that does not compromise the health and lives of these great creatures of the sea.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
R. Rice (Electronic)	No Authority on Earth has the right to tell others to commit crimes against wisdom. Doing anything that that is potentially harmful to the balance and well-being of Sea Life is such an act. We the people of this Earth ask all those with conscience to stand united in saying "No More" to anything that harms the Earth and all those who dwell here. The time is now and the support is there for all of us to realize a way of being on this Earth that honors all life. Only through this way of being, can we sustain our own. We are united in the circle of life. When we harm one, we harm the whole. We are all Sacred.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	Thank you	
Richards (Electronic)	I am a consulting mechanical engineer involved with the design and installation of HVAC systems in this area. I have become aware of some unique situations involving suspected electronic interference with some of our systems installed along the coastal region of San Diego. Specifically, remote controlled HVAC equipment (Daikin VRV systems) have a "mind of their own" at various times, often cycling on-off without being commanded by the local controller. Upon being cycled off, the unit promptly cycles on again and vice versa. The solution to the problem, in this case, was done by eliminating the remote control and going with a hard wired control. Based on other bizarre local observations with respect to garage door openers, the general consensus is that there are some unique electrical interference issues. It is unclear what the source of this interference is, however, I believe that you should be made aware of it and take steps to ensure that the proposed activities are sensitive to EMF issues for commercial and residential remotely controlled systems such as the ones discussed here. Should you have any questions, please email or call. Respectfully submitted, Mark E. Richards, P.E.	Thank you for participating in the NEPA process
Richardson (Electronic)	The use of your sonar and explosives will harm thousands of marine life, much more that you are estimating in your plans! Hawaii has 32 species of whale and dolphin year round, many of which are very rare and deep diving whales who depend upon their sonar for survival. Your sonar and explosive practice is going to harm and kill off many of the species we work so hard to protect here under the marine mammal protection act. You MUST find another way to practice your naval techniques without killing or harming animals and sea life that we NEED for our survival here on land. Do NOT use your sonar plans!!!!!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ridabock (Electronic)	Unthinkable. Shame on the people creating this.	Thank you for participating in the NEPA process.
Riedel (Electronic)	PLEASE do NOT do the ocean testing. You state in your video your mission is to provide freedom of the seas. Please understand this needs to apply to animals too - all life - not just to humans. Trying to bring peace through the suffering of others is not the answer. Being kind to all of life is. Please work together towards that objective in order to bring about peace. Warfare escalates killing and damaging more and more people, animals	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	and the earth itself. This is a fact. History proves it. The definition of insanity is doing the same thing over and over again and expecting a different result. Please let us open to new ways to live together in the world. Thank you for considering my comment.	a decade.
Riess (Electronic)	Please find another way to accomplish the testing and training necessary without a negative impact on the oceans ecosystem. Thank you.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Rillero (Electronic)	I am strongly opposed to the Navy's proposed testing in Hawaii and California due to the possible adverse impacts on whales and dolphins.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Rizzi (Electronic)	Please consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Roach (Electronic)	The Navy's report states that the exercises could cause 1,600 marine mammals to suffer from hearing loss or other injury from its use of sonar and explosives each year for the next five years. The report also projects that 200 marine mammals will die each year. Whales use their hearing to communicate with each other and their survival is dependent on their hearing. Please rethink ways of doing these tests!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. The Navy historically has recorded few to no mortalities caused from sonar or explosives. The estimated number of marine mammals sonar testing could affect is based on a scientific model, and it is only an estimate.
L. Roberts (Electronic)	Your testing will irrepairably harm ocean life. It's highly likely that the creatures who use and require echolocation for survival are not the only lifeforms who will be affected, whether it be mildly or terminally! Please stop these tests altogether! Please stop this destruction! PLEASE!!! We are supposed to be intelligent beings!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
M. Roberts (Electronic)	I support the efforts of the Humane Society of the US, who have joined other environmental and animal welfare groups to ask the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Please consider incorporating these additional measures in order to save marine life. Thank you, Martha Roberts	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Robertson (Electronic)	These tests that deafening large sea creatures is inhumane. Please stop the madness.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Robles (Electronic)	I understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. In the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. I ask the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Please do what is right. I am calling on the U.S. Navy to re-think its plans and to incorporate additional protective measures. Sincerely, Brenda Robles	Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
J. Rodriguez (Electronic)	Protect marine mammals from explosives and sonar along the East Coast» and California/Hawaii. I am opposed to all testing where animals can be harmed what is wrong with you people our food is becoming extnct our water and air is becoming poisoned. what do you think life will live on??????????	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
K. Rodriguez (Electronic)	The Navy's DEIS is fatally flawed and fails to comply with the basic requirements of NEPA. The Navy's assessment of impacts is consistently undermined by its failure to meet these fundamental responsibilities of scientific integrity, methodology, investigation, and disclosure. The Navy must revise its acoustic impacts analysis, including its thresholds and risk function, to comply with NEPA. The Navy fails to properly analyze impacts on marine mammals. For example Sonar impacts on cetaceans that are the likely cause of mass strandings are panic, bubble formation and/or decompression sickness. The following must be included in the DEIS: 1) Sonar caused panic reactions leading to strandings followed by death 2) Sonar caused decompression sickness (the bends) followed by death 3) The bends caused by sonar even in the absence of panic	Discussion of the general topics ("panic, bubble formation and/or decompression sickness") noted in the comment were thoroughly discussed in the Draft EIS/OEIS. In particular see Section 3.0.5.7.1.3 (Physiological Responses) for the presentation of the conceptual framework for analysis and Section 3.4.3.1.2.1 (Direct Injury). For a specific discussion of strandings, see Section 3.4.3.1.2.7 (Stranding) and note that a more detailed presentation was offered in a companion Cetacean Stranding Technical Report ("Marine Mammal Strandings Associated with U.S. Navy Sonar Activities") that is referenced in the DEIS/OEIS and available on the HSTT EIS/OEIS website (HSTTEIS.com). The three points raised ["1) Sonar caused panic

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	The following scientific papers need to be included in the EIS: J. R. POTTER;, 'A Possible Mechanism for Acoustic Triggering of Decompression Sickness Symptoms in Deep-Diving Marine Mammals' Paper presented at the IEEE International Symposium on Underwater Technology 2004, Taipei Taiwan, April 2004. PARSONS, E. C. M.; SARAH J. DOLMAN; ANDREW J. WRIGHT; NAOMI A. ROSE and W. C. G. BURNS. MARINE POLLUTION BULLETIN 56(7):1248-1257. 2008. Navy sonar and cetaceans: Just how much does the gun need to smoke before we act? TYACK, PETER L. JOURNAL OF MAMMALOGY 89(32):549-558. 2008. Implications for marine mammals of large-scale changes in the marine acoustic environment. WRIGHT, A. J.; N. AGUILAR SOTO; A. BALDWIN; M. BATESON; C. BEALE; C. CLARK; T. DEAK; E. EDWARDS; A. FERNANDEZ; A. GODINHO; L. HATCH; A. KAKUSCHKE; D. LUSSEAU; D. MARTINEAU; L. ROMERO; L. WEILGART; B. WINTLE; G. NOTARBARTOLO DI SCIARA and V. MARTIN. INTERNATIONAL JOURNAL OF COMPARATIVE PSYCHOLOGY 20(2-3):274- 316. 2007. Do marine mammals experience stress related to anthropogenic noise? FAERBER, M .M., R. W. BAIRD. 2010. Does a lack of observed beaked whale strandings in military exercise areas mean no impacts have occurred? A comparison of stranding and detection probabilities in the Canary and main Hawaiian Islands. Marine Mammal Science DOI: 10.1111/j.1748-7692.2010.00370.x The DEIS fails to address the following: other impacts on marine mammals such as stress, indirect effects, cumulative impacts, effects of toxic chemicals, hazardous materials and waste oil spills. The Navy must adequately evaluate impacts and propose mitigation for each category of harm for all species marine life. Each individual potentially federal activity that is to have a significant environmental impact should have its own environmental analysis. For example, RIMPAC and DARPA each need separate EIS's. The Navy failed to analyze the impacts on fish and fisheries. Om gum ganapatayei namaha	reactions leading to strandings followed by death 2) Sonar caused decompression sickness (the bends) followed by death 3) The bends caused by sonar even in the absence of panic"], are covered within the material as described above. With regard to the references noted, while these particular five references were not cited, all were reviewed during preparation of the Draft EIS/OEIS except Potter (2004), which discusses a hypothesis covered in the Draft EIS/OEIS using the following more recent science and data from seven references: Dennison et al. (2011); Fahlman et al. (2006); Hooker et al. (2009); Moore et al. (2009); Southall et al (2007); Tyack et al. (2006); Zimmer and Tyack (2007). Finally, the EIS/OEIS has been created with National Marine Fisheries Service acting as a cooperating agency with input to both the Draft and Final versions. The team also includes a number of non-governmental scientists and subject matter experts.
Rogers (Oral-Kauai)	Aloha mai kakou. Aloha. I invoke the presence of my ancestors as I stand here to speak before you. I pray that they will come and stand here with me so my words will be their words. And I say, Ku\`e i ka hewa ku\`e ku i ka pono ku, ku\`e i ka hewa ku\`e ku i ka pono ku. Protest and resist the wrongs but stand for the righteousness is what that meant. I'm a Kanaka Maoli. I'm a Hawaiian nationalist. My country is kahawaii kai ana. That is what we call our country. I stand in strong protest to this. I haven't had a chance either to read the EIS, which is an environmental impact statement. And I believe that if it were a true environmental impact statement then this project would not happen. Because it is impacting negatively and in a very drastic way our environment. And thinking in a Hawaiian way, it all encompasses everything; our water, our oceans, our marine life, our air, our space. Anything that sustains life is sacred in our thoughts. So I'm sorry. I hope that there could be a way that we, the people, can get together with you, the Navy, and come together with some kind of an agreement or, I don't know, some kind of compromise. Because I don't come here with any malice or hate for the Navy or the military, although there may be reasons why I could be. But I stand here with pain and	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	hurt to know that these things can happen to us and to our environment. And, you know, war is like a kill. And I can't believe the Niihau people are supporting this because I know they believe in God, and I know they believe that thou shalt not kill. So through that aspect I think they have been misled. Please protect our island. I've been to the Marshall Islands. We went to commemorate the bombing of Bikini Island. It was called Bravo Project, and I met people there that were suffering illnesses-- Okay. So mahalo to all the people that came tonight, and I totally support all of your testimonies.	
Rogers (Electronic)	HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING (HSTT) ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT (EIS/OEIS) Open House Public Meeting Comments from Lihue, Kauai, June 12, 2012 (This is an addition to my oral testimony given on June 12th) Aloha! My name is Puanani Rogers, and I was born and raised in the ahupua`a of Kealia on the island of Kauai. I am Kanaka maoli, a true native of Hawai`i. What you call the State of Hawaii is actually an illegal entity with no legal jurisdiction in Hawaii. Ko Hawaii Pae `Aina is the name of my country and it is still in existence. We are a neutral and peace-abiding country and therefore, we are outraged about your plans to train and test your war weapons in our country's surrounding ocean waters and deliberately cause harm to our planet and all living things that live upon it. I cannot understand why it has to be here or anywhere, for that matter; because you know deep down in your guts that it WILL cause harm to corals, whales and dolphins, natural resources, ocean minerals, and all living creatures in our archipelago, and most importantly, human life. WE STRONGLY OPPOSE THIS EIS AND ITS INTENT!! IT LACKS TRUTH AND IS A BAD IDEA! I hope you will respond to the question of whether you are in compliance with the mission of the Advisory Council on Historic Preservation (ACHP) and its Section 106 process. It is a federal mandate that you should be aware of. (See testimony from Ed Kaiwi.) I expect a response to this question, please. People in our communities are AGAINST FURTHER expansion of your presence in the Pacific and beg you to stay away from our islands and do your war deeds where there will be less harm to the environment. We already know for a fact that the U.S. military has proven to be the worse and most insidious POLLUTION dealers on our planet. Examples are, Kaho`olawe island, Makua Valley, Pohakuloa, etc. in Hawai`i; Vieques Island, in Puerto Rico; Bikini and Eniwetok islands in the Republic of the Marshall Islands. This show of military dictatorship needs to cease and desist. Instead we ask that moneys expended for this project be used in projects that insure peace, benefits and well being for our people. Please stop the destruction of a living planet, yours as well as ours. Be responsible, do what is righteous and protect not destroy. Puanani Rogers, Kanaka maoli Ho`okipa Network – Kauai Ko Hawai`I Pae `Aina	Thank you for participating in the NEPA process.
Rohmer	Please, do not do this. A deaf whale is a dead whale.I am outraged that the U.S. Navy	The Navy shares your concern for marine life. All of the reasonably

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
(Electronic)	would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Rome (Electronic)	I am imploring the U.S. Navy to re-think its plans to conduct training exercises all along the U.S. East Coast and off the coast of California and Hawaii and to incorporate additional protective measures. I know that the United States needs a strong Navy to protect our national security, but the exercises you are planning which involve the use of live explosives and high-intensity sonar are not the answer. I know that the Navy anticipates that these exercises would kill up to 2,000 marine mammals including a large number of endangered species and would include thousands of others that would suffer permanent lung damage and would permanently or temporarily deafen others. There is no reason that these mammals have to die or suffer this senseless damage to their bodies when you can lessen the impact of this damage by avoiding the most harmful activities in areas used as calving grounds or migratory corridors, avoiding seasonal high-use feeding areas,creating a large safety zone around these exercises and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. These simple steps would allow for your military training exercises to go on while minimizing the likelihood that whales, dolphins and porpoises might be harmed or killed. If you must conduct these exercises, please do it in a compassionate way for the sake of the health of these creatures. The whales, dolphins and porpoises deserve to	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	live and to have a healthy ocean environment. Please show some compassion to these creatures when conducting these exercises. It is the right thing to do.	
Romer (Electronic)	There is much we don't know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return because of education and protection. We have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Rook (Electronic)	Please do not use the ocean for military testing. Sonar and explosives have detrimental affect on ocean inhabitants. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Rosenwinkel (Electronic)	Please stop the use of sonar and explosives in our oceans! If we keep killing ocean life, we will not need the navy to protect people because we won't be here to protect!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Roth (Electronic)	As the daughter of a fighter pilot, I understand the need for protecting our country, but I am hoping that we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. For that reason, I am writing ask the Navy to re-think its plans and to incorporate additional protective measures as it conducts training exercises involving explosives/sonar along the U.S. East Coast and in the rich marine environment off the coast of California and Hawaii. According to its own Environmental Impact Statements, the Navy estimates that the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. The Navy historically has recorded few to no mortalities caused from sonar or explosives. The estimated number of marine mammals sonar testing could affect is based on a scientific model, and it is only an estimate.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Rouse (Electronic)	I am writing today to ask that the Navy protect marine mammals from explosives and sonar along the East Coast and California/Hawaii. We know that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. Please consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. I respectfully request that the Navy re-think its plans and to incorporate additional protective measures.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Royster (Electronic)	Please consider steps to reduce the harmful impacts to marine mammals when conducting your training activites on the Hawaiian coast and Western shores of the US. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. You can continue doing the invaluable work you do to protect our country AND protect animals as well. The two can coexist.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ruehle-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Ruehle-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Ruth (Electronic)	As a southern California resident, I am extremely concerned about the NAVY's new plans to increase the use of sonar at the expense of stressing / harming and killing marine mammals such as dolphins and whales. Although, I recognize the importance of having a strong military that uses the latest technology, this should not come at an increased risk to protected marine mammals. Whales and dolphins are already facing many direct and indirect threats to survival due to commercial fishing, pollution and global warming. Since these organisms depend so highly on sound for their survival, it is unacceptable to directly and intentionally harm them. Please consider alternatives that are less intrusive to the lifestyles of these highly social and intelligent cetaceans. Sincerely, Jayson Ruth	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Ryan (Electronic)	I appreciate that the Navy is continuing to look at the issue of long range sonar effects on marine mammals. I note a story using the Navy's own data recently appeared that raised the estimates of marine mammal deaths. The story is available here - Navy Study: Marine Mammals Harmed By Training Navy Calculates 200 Marine Mammals Could Die Each Year Due To Training POSTED: 5:40 pm PDT May 11, 2012 UPDATED: 5:45 pm PDT May 11, 2012 http://www.10news.com/news/31051399/detail.html I am sure with so many clever individuals you can figure out some better way to handle this issue. Let's face facts - your navy is the best in the world, and does not need this to remain so. If it happens that there is a wartime effort that arises that necessitates the use of this technology, I'm sure a case can be made to the public at that time to do so. But in peacetime (or at least, peacetime on the high seas) this is unneeded and actively harmful. Don't do it. Thanks, Patrick Ryan	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Sacksteder (Electronic)	According to the U.S. Navy's own estimates, the use of high-frequency underwater sound for testing in Hawaii, off the California and Atlantic Coasts, and in the Gulf of Mexico will deafen 15,900 whales and dolphins and kill 1,800 more over the next five years. Whales and dolphins depend on sound to navigate and live. I respectfully request that the Navy stop the process that has the potential to kill 1,800 whales and dolphins and the deafen 15,900 more by ceasing the operation of the Navy's underwater sound system in the Hawaiian Islands, the California and Atlantic Coasts, and the Gulf of Mexico. There has to be a better way to achieve the necessary work without this type of specific type of testing. We have brilliant scientists who I'm confident can find another way to achieve the stated goals in a more humane and thoughtful manner.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Sadarangani (Electronic)	Please stop with exercises. The Navy eill br responsible for 1,600 marine mammals to suffer from hearing loss or other injury. Specially avoid explosives.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Saez (Electronic)	Dear US NAVY, I am very upset about the practices taken to conduct training exercises in the US Navy. It does not matter that this is the "way you have always done it." In this day and age, there MUST be another way to practice you exercises without any injuries to our mammals. PLEASE, do not just FOLLOW PROTOCAL. Take action to make a CHANGE. We care and this really is upsetting to many people.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Salazar (Electronic)	To Whom It Concerns: I'm really against any type of testing that kills, maims and abuses marine life. With the potential outcome of deafness, you don't know what could happen	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	to the ecosystem. Don't mess it up. Please try to find another way to test these explosives. I can't believe in 2012 that that task would be impossible.	analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Sonar is the best means of locating small objects in the water. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
Salonek (Electronic)	Please stop the testing of sonar and explosives on marine life. These gentle creatures deserve to live a life of peace not be part of a barbaric Govt' test.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Salvo (Electronic)	Please stop the underwater testing in the Hawaii areas. These are beautiful creatures that God has given us to enjoy and you are endangering their well being. Future generations will no be able to enjoy them as we do. Please re-think this.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Salvo-Eaton (Electronic)	Please do not go through with actions that are "likely to adversely affect" an endangered species. I know it's the military, but how heartless can you be? You wouldn't kick an injured animal, so why would you "kick" a suffering population of animals? I think if the Navy proceeds with this course of action, I will lose faith in humanity altogether. Can't you find another test site? One that's far away from whale migration routes and breeding or feeding grounds? It's really asinine that I pay taxes and I have to explain the stupidity of this plan to you. Like explaining something simple to my toddler.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Sapiro-01 (Electronic)	Please cease & desist your destructive sonar testing. I have observed its consequences along with the US Navy's attempt to cover up the damage. Navy promotion of sonar testing is self-serving--for the good of the Navy, NOT for the good of the USA or what the USA treasures or stands for. Nobody on the face of the earth has reeked greater havoc in Hawaii than the U.S. Navy, bombing Kahoolawe and killing marine mammals--and causing more long term damage to Pearl Harbor than the Japanese attack. Anti-fouling bottom paint is mostly copper sulphate, rendering all reefs in the vicinity severely compromised or dead. The cold war is over. Stop your destructive testing. You should protect and defend the US from its enemies. You should be ashamed for this. You are wrong to think my assessment is isolated. Sonar testing has sullied the name & reputation of the U.S. Navy. Stop.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Sapiro-02	Please do not move forward with your plans to "test" underwater explosives in and around the Hawaiian Islands. Knowing that these explosions will be killing, maiming and injuring the whales, dolphins and many other creatures that inhabit these waters MUST cause you to rethink this concept. These waters have been safe haven for these, our fellow intelligent beings; where they come to have their babies and nurture them. How can the Navy, and the men and women who serve therein be so calculatingly cruel about these deaths and injuries? How can these inevitable deaths and injuries be considered ok on any level? I am horrified to know that this is how our government spends our money in the guise of "protecting" it's citizens.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Saunders (Electronic)	We are saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. We look forward to hearing from you with your views on the above, if you have any queries please do not hesitate to contact us, yours, V. Saunders	at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Saylor (Electronic)	Using sonar and explosives around this beautiful island of ours, just for the sake of game and practise, is UNACCEPTABLE. Openly stating that this will kill and or injure our ocenlife is just blatant disrespect. We need to appriciate how much a healthy Eco system does for us as humans as well as islanders. Our oceanlife.already have enough to deal with concerning radiation, pollution, poaching as well as just plain ignorance. Leave these UNnecessary tactics to warfare away from our vital foodsources and delicate ecosystems. Wake up people...these things are way more important than a govrnment written paycheck.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Schaeffer (Electronic)	Protect our whales and dolphins! Do not allow anything to interfere with this vital goal!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Schendel	Training exercises done in the Pacific region by the US Navy should be done with	The Navy shares your concern for marine life. All of the reasonably

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
(Electronic)	thought to the marine life dwelling in those regions. With planning compassion can be shown. Isn't that a quality that goes with greatness?	foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Schiess (Electronic)	Dear Sirs; Please do everything you can to save all the sea life when you conduct your tests in the oceans. We have already lost so many dolphins, whales and calves to sonar testing, fishing trawler lines and other environmental causes like plastics in the oceans. We should not have to choose between marine life and national security. Surely we can work together to minimize the impacts on these magnificent creatures. Thanks for your consideration. Joan Schiess	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Schoenacher (Electronic)	It is an outrage that the U.S. Navy would continue its plan to use sonar testing, testing that could kill and harm marine mammals 2.8 million times a year over a five year period. Proposed training and testing off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. Projected damage to whales and dolphins -- through your own impact statements -- is astounding and vastly increased over previous estimates of potential harm for the same regions. The far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. Your analysis does not include reasonable alternatives to reduce the unprecedented damage to marine animals. Stationing lookouts to detect whales and dolphins -- your sorry mitigation plan -- will not achieve a significant reduction in damage to marine life. These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance is likely to be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	Even if it were fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, rather than savage torturers, it must reduce significantly the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment.	NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate.
Schultz (Electronic)	It is everybody's job to protect the very little nature left on this planet before it's too late. Please consider safer alternatives.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Schunk (Electronic)	I am saddened by the thought that the Navy, knowing full well, what it's actions can do to whales, dolphins and other sea life, will continue on their path of destruction, by repeatedly broad-casting high-intensity sound waves into the ocean, (home) of these mammals. Yes, the ocean is their home. They cannot escape to save themselves from these horrible sounds. They cannot escape from the dizziness they must feel as it turns them upside down not knowing where to go. They need their sonar to communicate and to find food. But you'd be taking this away from them. They won't be able to feed themselves or their babies, because they will either be dead on impact or will drown, trying to escape the terrible, deafening noise. Imagine, if you will, having the worst case of dizziness you have ever had and not being able to get away from it. You know that old saying when your on board a ship and you get the worst case of sea sickness that you want to die...the saying goes that you're afraid that you WON"T die ! It's that bad. I can only imagine if I were the whales, that the sonar waves would effect me like dizziness. As a human that is the best analogy I can come up with. History has shown that the whales will do whatever they can to get away from these man made high density sounds...and that is to beach themselves, to get out of the water, which is a death sentence since they can't live out of the water. How can you live with your selves, knowing this ? Where are your hearts ? I read about a woman who attended a Kauai meeting, that the Navy people presented. She said they seemed nice, kind and even caring about the whales. But she came away with the stark reality that these people (the Navy personal) had turned away, turned off their hearts, in order to be part of the Navy. How can you be human and not have a heart? Please come back, come back from the reality that the mammals that die are simply "collateral". Please wake up from this. This is a lie. These are your fellow creatures that happen to live in the ocean, your neighbors, your friends even. Remember, as a child, drawing pictures of your friends the whales, dolphins, sea turtles and fish? Remember the rainbow you always drew as they jumped out of the water, in happiness ? You knew, as a child, that they were your friends. Don't	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	turn your back on them now that you are grown up. Be that child again, with all the important things you learned about taking care of our planet and the animals that live in it. Look down, you have a heart still..., it's beating, it has emotion, it has compassion. Please friends, remember you are a compassionate person. Don't allow this to happen. It's not to late. As with all things, there are alternatives. You are smart, please use your brain to come up with another way. Listen to the cry's of the animals. They need you to protect them. You don't want these animals to be SO dizzy that they want to die and will. Do you, would you ? You have a heart, follow it back to your child like self again. Do the RIGHT thing. The whales need you. Don't close your eyes. Please, listen to your heart, just like you use to. Will you ? Mahalo and Aloha.	
D. Scott-01 (Electronic)	The United States has regularly and publicly denounced Japan for harvesting whales. Why does the U.S. Navy deem it acceptable to take just as many whales as Norway, Iceland, and Japan combined? What underwater threats are so great to our country that the U.S. is willing to adversely affect endangered species on a such a large scale? It is hypocritical to decry Japan while at the same time causing such harm that it further endangers listed species and prevents the recovery of the species.	Thank you for participating in the NEPA process.
D. Scott-02	What percent of the whales' population (by species) is being impacted? The sonar/electromagnetic training will adversely impact whales, which will affect their ability to eat, breed, navigate, etc. These negative impacts will directly hurt the current populations which reduce their reproductive capabilities. Fewer young will be produced thus preventing the recovery of endangered species. Surely, the military can train in a less harmful manner that will still allow for them to be combat-ready. Have population models been developed to show how they will be affected by the training activities? Will the populations be resilient to the activities? Since whales take such a long time to reproduce, I doubt that they would be capable of rebounding from such a large long-term negative impact. I believe Texas A&M has conducted harvesting models on whales that may be useful in the environmental analysis.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate.
D. Scott-03	Please stop this horrible act!!!	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
N. Scott (Electronic)	Please consider not testing in ways that are likely cause hearing loss or damage to marine mammals. You're smart people. Surely you can think of a way to test without causing harm to marine life. I have faith in you. Please stop it.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Seligman (Electronic)	Dear Sirs, With all due respect, there is quite substantial evidence at this point, indicating the hazards facing marine life ,especially the hearing loss and navigation capabilities of whales and dolphins now as a result of not just sonar testing, but the level of attenutation being applied. Granted, if testing must be done for our nation's safety, it can be done farther from both where humans and marine life dwell in and out of the water. Sound frequencies do not stop at the water's edge, and what is known beyond a shadow of a doubt with no more research necessary, are the migrating and living hunting and dwelling patterns of these animals. that means the navy can test and go where they are not. They cannot live where food supply is not, but the testing can be done where they are not... It is not just economics. It is common sense and economics and good politics by this point. Thank you for your time.	The Navy thoroughly analyzed the potential for affecting hearing and navigation capabilities of marine mammals, as discussed in Section 3.4 (Marine Mammals). Regarding the locations where the Navy conducts it's training and testing activities; please refer to Section 2.5.1.1 (Alternate Training and Testing Locations) in the Draft EIS/OEIS. To summarize that discussion, the Navy's requirements dictate that much of the Navy's training and testing occur in locations proximate to shore-based facilities and infrastructure, near homeports, where instrumented ranges are located, and where environmental conditions maximize training realism and testing effectiveness. Those requirements preclude the Navy's training and testing in alternate locations.
Sesma (Electronic)	Please re-consider implementing these projects. They are harmful to all marine life... and by extension to all life. We are already harming ocean life in so many other ways....	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Shabad (Oral-Kauai)	Aloha, aloha. I live by that word. I've been a resident here 12 years on this island. I live in the Wailua Homesteads. And I was born in Richmond, Virginia. That was the original road to the White House. I come from the founding fathers of this country. And I didn't	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	plan to speak. I wanted to listen. I'm here to support my kupuna, my elders, and I'm here to witness all of us, you as career people who have taken the positions that you have taken because you believe in your country, you believe you're doing good. I'm saying we stand at a crossroads now. This crossroads is about fear. I love this country. I love everything about it. And since 2007 I have not paid my federal taxes and lived on $14,000 a year taking care of my ohana. And I'm a doctor's daughter. I know how to live well. I know how to contribute to people. And I'm not saying this to get you upset. I'm saying this to get you to move. Because there is a tidal wave that's happening right now, where we're all realizing we're not our careers and maybe the powers that be, the authority figures, the organizations that we've trusted do not have our best interests in mind. And maybe there will be more of us like me that say, I can't support something that doesn't support life. And I've suffered enough. I can't live like that anymore. I have to come back. I have to participate. I have to have life, food and sustenance to feed the future that's coming. I know our children that are being born now which I take care of and the generations that come up are going to do what our kupuna are laying out for us, the people that have lived here in Hawaii that lived in a peaceful way, a peaceful fashion where we had sections where everyone governed their section, and when there was something that was important for the whole island we got together. You are part of that. We are part of that. I want you to really think and understand who you were when you got into your career and your values and your beliefs. There's a change happening. And if we all invest our time, our effort, our resources and our money, which is a big voice, in what we believe, and if we back out and say, No, I can't support that. I want to come up with a better solution. I don't want to be a rebel rouser. I don't want to be angry. I've lived in fear for six years. What if the government finds out? Are they going to put me in an internment camp? I have been ashamed that I didn't have what it takes to participate and work and work and work and pay my federal income taxes and participate that way. And I want to honor everyone here that has. I'm asking you to wake up, feel the movement, let go of the fear. We have enough. We have created enough destruction. It's time to really listen from the heart and let the intuitive mind lead the way. Thank you.	
Shabsin (Electronic)	The planned testing in Hawaiian and California waters is dangerous for marine life and will undoubtedly result in unacceptedly high casualties. The sense of hearing is probably the most critical of senses for these animals. Deafening them or even injuring their sense of hearing will disorient them, prevent them from locating adequate food sources and affect location of others of their species. Reproduction will decline and survival on this planet for them may well cease These very animals you will harm by your testing are ones that have proven to help mankind. Do the right thing and skip the testing	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Shalat (Electronic)	The U.S. Navy is proposing to conduct training exercises all along the U.S. East Coast and in the rich marine environment off the coast of California and Hawaii. These exercises would involve the use of live explosives and high-intensity sonar. According to its own Environmental Impact Statements, the Navy estimates that the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. We understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. We know that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. The HSUS is joining other environmental and animal welfare groups to ask the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. We are calling on the U.S. Navy to re-think its plans and to incorporate additional protective measures.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate.
Sharan (Written)	Monk seals are endangered! And I speak for the seals as they cannot speak for themselves--Monk Seals have been tracked with monitors and the attachments have needed to be removed as they were found to interfere with normal healthy behavior--sonar--can disturb their feeding and reproductive life--even if 1 of the 1,100 that still exist are disturbed that is too many--any intervention should have to prove before they test--not after and count the dead. Killing individual Monk Seals or disturbing them in any way endangers the normal behavior and is endangering the whole population.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Impacts to Hawaiian monk seals are described in Section 3.4.3 (Environmental Consequences). Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Shepard (Electronic)	This is destructive and insane. We must protect the marine animals and your "testing" is just the opposite of that. You will harm/kill whales and other precious sea animals...for what???	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Sheridan (Electronic)	PLEASE protect our marine life. Do not allow the senseless injury to these gentle creatures that live in the sea!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Shooltz (Oral-Kauai)	Hi, thank you. It feels to me like what we're talking about is a lot bigger than what we're actually addressing right here. In the past couple of years our military has been enabled to be used against the citizens of the United States. We have assassination lists coming out of our White House. We can arrest people with no cause and throw them in prison forever and have no rights at all. Each of these things starts here. And I've gone around today and talked to a number of the representatives, and each one I was struck with and they acknowledged and I could sense the concern for the damage they're doing to the	The U.S. Department of the Navy (Navy) carries out training and testing activities to be able to protect the United States against its enemies, as well as to protect and defend the rights of the United States and its allies to move freely on the oceans, and in addition, to provide humanitarian assistance to failed states. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	sea life, the whales, the dolphins, and cetaceans of all kinds. And yet I also watched how they were able to somehow shut off that little voice in their heart that knows that that's wrong, that knows that it's wrong to take life. And it isn't just the sea life. Somehow our culture has made it justifiable to take all life. And it starts with the people working here, the Military Industrial Complex. Somehow you know in your hearts what's right, and you know that what's happening is wrong. You know that us spending five times more than the next 15 countries or whatever the numbers are is obscene. It's wrong. There's so much need in this world. And what's happening here can only keep happening if you keep shutting off that voice in your heart that knows it's wrong. You, Commander, and you, and all these representatives that are drawing a paycheck from supporting Military Industrial Complex know that supporting war, supporting death is wrong. And you know it in your heart. And it will continue until you listen to that heart and step away and stop supporting what's going on. Whatever lies you tell yourself to justify it is not true. Your heart knows the truth. It's time, really time, to listen to that now. Killing dolphin and whales is no different than killing people. It's all the same. It's all the same justifications. We're all in this together. This is way out of hand, and we don't have a lot of time to turn the boat around. We don't have a lot of time. And you're driving the boat, and we're just the voice of conscious here. It's time.	Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Sidenstecker-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Sidenstecker-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Sillanpaa (Electronic)	Hawaii - Southern California training is dreadful idea. It is very harmful to the Pacific marine life, and should not be carried out. There is no humanity with it, only pitiful unnecessary showing off, trying to make the army look important but does exactly the contrary. Makes it look useless and harmful.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
K. Silva (Electronic)	I ask that you reconsider you HSTT sonar testing. The repeated use of sonar is detrimental to the marine life in the area and your own analysis indicates that marine mammals in this area will be significantly impacted by your use of sonar. Your own casualty estimates grow as your methods of determining them improves. Your effective rate cannot be estimated to be better than 10 percent. Using lookouts is a crude, ineffective and inadequate mitigation measure and has serious limitations, particularly in foggy conditions. There must be better alternatives right around the corner. You have some highly intelligent people in the Navy. I request that you put those minds together and spend a bit more time developing a system that does not have such a grave impact on the marine mammals in the area.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Sonar is the best means of locating small objects in the water. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
N. Silva (Electronic)	Please stop hurting the animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
S. Silva (Electronic)	The incredible disregard for life continuously displayed by those supposedly engaged in the business of protecting life is breathtaking. May you get your ultimate wish, and find that there is no one left to play with but the Kochs and Waltons. I don't think there's enough alcohol on all of the planet to make that a fun day.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Simon (Electronic)	The life of a mammal is as important as any more worthless testing. Please do not undertake these life taking tests. Richard Simon	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Simonton (Electronic)	I am Military spouse and very proud to be one. I am also someone who finds that all life in all forms should be respected. I think the fallout from this project needs to be reevaluated. I know there are many things going on to protect us from enemies overseas and at home that are important, I just cannot see how the damage and destruction of life in this project can be justified. I am shocked at the Navy's estimates of the far-reaching harm that will be inflicted on marine mammals during proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard, and the Gulf states from 2014 to 2019, as stated in your Draft Environmental Impact Statements.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	The projected damage to whales and dolphins is staggering, with 33 million instances of "take" over five years, a vast increase over existing estimates of harm for the same regions. And I am appalled by the level of carnage reflected in these numbers: over 5 million instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. Your analysis fails to present and analyze reasonable alternatives that would significantly reduce the unprecedented level of harm to marine life. The mitigation scheme that the Navy principally relies on centered on the ability of lookouts to detect whales and dolphins will not result in an appreciable decrease in marine mammal injuries. Federal courts have found this same scheme inadequate and ineffective for good reason: it is largely useless in conditions (common at sea) that impair visual surveillance, it is unsuitable for detecting cryptic and deep-diving species that spend little time at the surface and, even if it were fully effective at detecting whales and dolphins, would only protect species from the most serious injuries. I call on the Navy to identify and set aside areas of high marine mammal density -- acknowledged to be the most effective means of reducing marine mammal injury. If the Navy wishes to be seen as an effective steward of the ocean environment, it simply must take steps to significantly reduce the level of harm that training and testing activities will inflict on marine life. Thank you for the opportunity to comment.	
Simpson (Electronic)	I appreciate that the NAVY has made an effort to study the potential and recognized impacts to marine mammals and other marine life. I further understand that casualties and collateral damages to the Maritime Environment are regrettable consequences to the security and defense of our Oceans. However, wouldn't it make more sense to test the sonars in environments where marine mammals, especially whales and porpoises, are at minimal numbers, such as under the Arctic Ice Sheets during winter, or in the Great Lakes, where there are no whales or porpoises? California and Hawaiian locations are teeming year-round with whales, porpoises, seals, and other marine wildlife that are dependent upon their hearing and sonar for survival. It does not seem logical to test sonars in regions with the highest densities of marine wildlife, especially marine mammals. Whale and Dolphin's natural sonar, for instance, seems to work quite well for echo location, without harming themselves or the environment. So, perhaps the key to perfection of NAVY sonar methods should look to these animal's Natural Sonar for better solutions. The success of our Nation's security also inherently includes preservation of our natural habitat and fisheries resources. More intelligent sonar options and opportunities are out there, if you will do the research. I sincerely appeal to the NAVY to seek alternative testing areas where the impacts to harm marine life, especially whales and porpoises, will be as minimal as possible. Respectfully, Garey L. Simpson, MS,PG	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Sonar is the best means of locating small objects in the water. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		technologies that will protect and defend the United States.
Siragusa-Ortman (Electronic)	I am saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Sisson (Electronic)	It is not OK to kill cetaceans and sea mammals with your testing. It will negatively impact the health and welfare of our Hawaiian citizens as well. You need to get an EIS before beginning testing. Our citizens are against this type of warfare, or any warfare, in our local waters. We ask that you respect our health and welfare, and the health and welfare of our seas and animals living in them. Thank you!	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Skye (Electronic)	As Americans we love to chastise other countries for their ridiculous atrocities like Japan's horrible whaling activities and Canada's bloody seal clubbing. Why would the US Navy want to add our name to the list by wanting to kill, injure, or even harass the the most majestic marine mammals? Dolphins and whales are the very masters of sonar that inspired the first Navy use of sonar. It's like learning from your grandfather's stories and when you'd like to write your own stories, you start by kicking him in the few teeth he has left. Please, have some respect and consideration.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
B. Smith (Electronic)	What if we set the standards at the level where no living things are damaged? What if we developed the technology to "hear" and "see" underwater so that it is accurate but harmless? That should be the goal. No damage to living things. No more poisoning and damaging the air, earth and sea. That should be our standard. If we made that commitment, we could make it happen. Is the Navy going to have trained veterinarians on hand to euthanize the tortured animals? It is not worth it. It has never been worth it, to poison our atmosphere and waters and lands, for war. And I mean the earth's atmosphere, waters and lands, not just the US. We need to be respectful of the planet. We CAN have it both ways. We just have to develop non-damaging technology. If the technology is not safe, and if it cannot be cleaned up quickly and completely, then it should not be used. We still don't know how to safely store nuclear waste. Is that smart?	Currently, sonar is the best technology available that can help keep Sailors safe from mines and hostile submarines. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
C.. Smith (Electronic)	Why murder sentient creatures except when there is a cler n present danger. Your actions are disgraceful and dishonorable. I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment. Copy and paste the above comment. Please add your own	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	comments to make it more effective. Thank you. Click here to comment.	
J. Smith (Electronic)	Dear Sirs, I am gravely concerned with your proposal to test with high-frequency sound waves to the extent that marine animals will be injured. We have not read the report in full, but have gathered at least this much information. If this is testing only, these Americans feel it is not worth the damage to be caused. The Manistee Peace Group claims this purpose: We advocate and educate for peace in the Manistee area, and therefore also advocate and educate for democracy, social justice, community and environmental sustainability. Please reconsider your plans so that such extreme damage will not be added to our collective consciences. With great respect for your service to our country and our world, Joy Smith, Josh and Nanci Swenson, Carol Voigts, Sister Joan Alflen, Jim Toczynski	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
K. Smith-01 (Electronic)	Please reconsider the testing you are planning which will bring irreparable harm to dolphins and whales. It's unconscionable.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
K. Smith-02	consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
S. Smith (Electronic)	Please stop this senseless killing and deafening of these helpess creatures.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Snowball (Electronic)	Please re-think its plans and to incorporate additional protective measures. Please consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. I believe it is also your job to not only protect people but all living creatures. Thank you, Susan Snowball	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Sokolowski-01 (Electronic)	Under kinetic energy weapon testing (table 2.8-3) HRC: PMRF is listed in both rows, should one of these locations be different from HRC: PMRF (possibly SOCAL)?	Thank you for your comment. The second row refers to activities conducted in the Southern California portion of the Study Area and has been corrected in the Final EIS/OEIS.
Sokolowski-02	The FAA representative for the Pacific reported having trouble submitting comments online. I am testing the comment functionality of the online commenting. Thank you for providing the FAA the opportunity to review the draft EIS/OEIS. At this time we have no comment regarding the proposed action. Please forward a copy of the final EIS when complete for additional review.	Thank you for participating in the NEPA process.
Solari (Electronic)	Kindly consider the negative impact that sonor has on marine life whose main communication between each other is sound. These creatures are a valuable part of the earth's ecosystem.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Spohrer (Electronic)	I DO NOT support this renewal. I did not realize that we are one of the most notorious and lethal of the "whaling" nations. ...So damn senseless. This has got to stop. These creatures are already facing serious environment degradation, their numbers in alarming decline. Stop adding to the misery. This is NOT the legacy I want for my children. ---James Spohrer	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
St Claire (Electronic)	My understanding is that the Navy itself has projected that it will make deaf 1600 whales and dolphins and kill 200 EACH YEAR IN A 7-YEAR PROGRAM in training exercises. This is only an estimate of the untold damage that will be caused to our precious and already fragile ocean environments on the planet. I ask that this not be allowed to happen. Thank you. Virginia St. Claire, M.Div.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Stack (Electronic)	It is distressing to me that whales and dolphins would be adversely impacted by these tests. The human family MUST be more aware of actions that are detrimental to the animal world. Our planet's health and human survival is related to the respect we have for our interconnectedness.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Steele (Electronic)	We understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. We know that in the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. Please re-think what and how this has to be done.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate.
Stephens (Electronic)	According to the Navy's own EIS, this program will have impacts on critically important marine mammals that, while the numbers maybe uncertain, are clearly on the scale of doing significant damage to the populations in question. Given the uncertainties of scale (i.e. damage may be greater than anticipated), coupled with the accepted fact that some amount of damage will be done to these important populations, the only rational conclusion is that the program not be allowed to proceed. Besides, this program is a waste of tax payer dollars, given that no potential enemies have submarines sophisticated enough to evade more standard types of detection, i.e. detection at home ports by our own submarines. This is another DoD boondoggle.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate.
Stevens (Electronic)	What gives the military the right to harm Dolphins and Whales? They won't even save any lives with these tests. Please don't hurt the wildlife.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Stidham (Electronic)	PLEASE do not conduct Naval testing in areas that could harm or torture marine life. I fully support our military and know that the need of protecting our nation is of great importance, and I immensely admire the dedication of our armed forces, but there has got to be a better way, one that we as a humane nation can feel proud- knowing we did not kill or harm these magnificent creatures God has given us. Lets not take the atrocities of mankind out on these sea creatures. If you do this, it will spread fast, citizens will find out, and you will lose support and respect of millions of Americans. This is our country, and we do not approve this type of vulgar and inhumane testing! Please listen up and do us proud. We are Americans for crying out loud, and you can find ways to do this without murdering God's creatures-who do we think we are to even think about doing this? Thank You, A very concerned Citizen of USA, California	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Stocker (Electronic)	I find it totally unacceptable and even hideous that man kind would knowingly harm another living creature. Please find another system. Develop different technology. There are no excuses for this.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Currently, sonar is the best technology available that can help keep Sailors safe from mines and hostile submarines.
Stokesbary (Electronic)	Aloha Navy, Please stop your sound testing in the ocean. This is wrong, what happens to the eardrums of the whales, dolphins, & seals. I ask that you stop this nonsense. Thank you for adhering to my request. Enjoy being in the navy our ocean. Please take care of it's inhabitants. Mei-jen Sun Stokesbary, L. Ac. Big. Island	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Stone (Written)	I can't understand how any human being can give any sound and thoughtful reason for killing or harming anything. Aggression and ardency in any form comes from ignorance of our own desire for understanding of our needs and meeting them in a way that respects others, honors their place in our world. We share planet earth and need to support and care for every living being on it. When over half of the U.S. budget is going to military budget with careless war as the seeming objective, isn't it time to find a better way to operate in the world than global occupation by the military? U.S. spends over $487 billion on War in Iraq which UN estimates less than half could provide clean water, adequate diet, sanitation services and basic education to every person on the planet. Paraphrase John Parkins author, "Confessions of an Economic Hit Man"	Thank you for participating in the NEPA process.
Stone (Oral-Kauai)	Hi, I'm Mary Stone, and I printed this out so I will remember everything. I can't understand how any human being can give away -- give any sound and thoughtful reason for killing or harming anything. Aggression and violence in any form comes from ignorance of our own desire for understanding of our needs and meeting them in a way that respects others, honors their place in our world. We share our planet Earth, and we need to support and care for every living thing on it. When over half of the U.S. debt budget is going to the military budget with an endless war as a seeming objective, isn't it time to find a better way to operate in the world than universal occupation by the military? The U.S. spends over -- or spent and is spending billions, specifically this man says 487 billion in the war in Iraq, which the U.N. estimates less than half of that could provide clean water, adequate diet, sanitation services and basic education to every person on the planet. So this was from a book by a man called John Perkins, title of which is Confessions of an Economic Hitman. So my point is that I just wonder why we need to militarize our Pacific. I don't feel that that's accomplishing the future that we want for ourselves and the rest of the living organisms on this planet. Thank you.	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Strang (Electronic)	Please consider the marine mammals that will be in danger during your tests. Consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Stratton (Electronic)	There is much we don’t know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return because of education and protection. We have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless these safeguards are in place, do not allow Navy sound testing.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Strom (Electronic)	Please re-think your upcoming training and testing during July and place into your procedures those standards which will protect or eleviate the damage to marine mammals populations in the areas you plan your activities. Thank you for your time.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	Rivka Strom	Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Suarez (Electronic)	Por favorrr......salvemos nuestro planetaa dont kill inocent animals just for money,power ,please we are humans	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Sumner (Electronic)	To Whom it May Concern: My comment was originally for the East Coast, if you could forward it along, it appears they've removed the comment section from that site. But just the same, my comments would also apply to the military games proposed for the West Coast as well, so please include them. While I have no doubt that these military training exercises are necessary and that every precaution would be taken to minimize the effect on marine wildlife in the areas, I believe the military is miscalculating the acceptable risk relating to the lives and well-being of the animals living within the proposed test area. These sonar and explosive tests WILL result in the needless injury and death of countless dolphins, whales and other marine mammals including some that are currently listed on the endangered species list. Any loss of life is unacceptable, and I would expect the Navy, which should have a deeper understanding of the global effects of the marine ecosystem, to know that. I'm sure that a lot of people have filed complaints about this, I know I'm not the first. I would like to, however, propose an alternative suggestion the military may not have considered yet. How about running these tests in waters that are closer to areas we are actively engaged in military combat. Sonar equipment or a torpedo with an active explosive may behave differently in our waters than they do in, say, the Arabian Sea. Conduct the proposed military tests there, destroy their fragile ecosystem, kill off their marine mammals. Besides, if you're going to have such an expensive [expletive deleted] contest, wouldn't it be better to do it in the other guy's	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	yard? Thank you for your time and consideration of my concerns involving the EIS/OEIS. Justin Sumner	
Sund (Electronic)	Please add my name to those opposing any more sonar testing in the ocean.	Thank you for participating in the NEPA process.
Suppers (Electronic)	Please do not proceed with these tests - killing innocent creatures is never acceptable, in the name of war or security. The price for this type of testing is too high a cost in lives lost and the effect it will have on the environment.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
A. Sutherland (Electronic)	National Security is important; that's a given, but at what cost to our environment and the majestic ocean creatures that help keep it diverse. If we keep disregarding the world we live in, what will be left to protect?	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
S. Sutherland (Electronic)	All life is to be respected, honored and protected if we are to survive as a species. This included the animals of the seas. Please honor yourself and others. It is my request that you stop this sound testing now. Some one has to turn the tide and you are in this position to make this happen. Thank you.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Sutton (Electronic)	Ladies and Gentlemen, I am a US citizen, and a frequent visitor to the Pacific region, especially Hawaii. I love and enjoy all the wildlife and ocean life there. I consider the whales, dolphins, seals and other marine creatures a tremendous national treasure to be preserved. Your plans are the opposite, by your own research --- to kill, wound, injure and even torture these animals in the name of national defense. This is a deeply misguided project and way of thinking, Please find some way of doing your job without disrupting our oceans and killing innocent creatures needed in the web of life. This is exactly the approach that has brought us to the edge of ecological disaster and species extinction in many cases. How will you explain this cruelty to your grandchildren? To my	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	grandchildren? Where is your humanity and respect? Please end this misguided testing and tactics, and place money where it is really needed and do some Good for the world. Thank you, david sutton	
Swanson (Electronic)	My comment is relatively simple and should be understood by anybody considering an operation that DOES NOT have to kill so many living beings. Compassion for animals is common among the good guys, but not among the bad ones. One of the surest signs that a biblical figure is a player in God's redemptive plan is the person's decency to the beasts of the field. Humane treatment of animals is seen here with Noah and will be repeated by Moses, Rebecca, Laban, and a host of others. It is not a coincidence that Christ is referred to as the 'Good Shepherd'. As St. Francis of Assisi said: "If you have men who will exclude any of God's creatures from the shelter of compassion and pity, you will have men who will deal likewise with their fellow men." Respectfully, Charles Swanson USAF Retired officer	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Swing (Electronic)	Please stop these tests. Our marine life is endangered as it is and cannot afford any more deaths.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Swingle (Electronic)	I am opposed to the proposed training exercises on the coast of California and Hawaii. I understand that these exercises would involve the use of live explosives and high-intensity sonar. According to your estimates, the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. I understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. Thank you for your time and consideration of this important matter.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate.
Switzer (Electronic)	Whales are the most magnificent creatures on the planet. I am proud of much of what the navy accomplishes and represents but I am concerned about the well being of our fellow creatures. Please do all you can to prevent harm to our environment. Especially the whales. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Szeker (Electronic)	please stop this testing!!!!!!!!	Thank you for participating in the NEPA process.
Tallman (Electronic)	Please protect the marine life and not harm them. We need them in our eco system. Please find another why for your project.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Tauger (Electronic)	The EIS/OEIS is OUTRAGEOUS AND ABUSIVE. Testing sonar at the risk of sea mammals is intolerable, and must not occur! Please STOP THIS!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
K. Taylor-01 (Oral-Kauai)	Types of impacts, all potential impacts of the project, both direct and ultimate or long term must be considered including cumulative and growth-inducing impacts. Indirect impacts, if social or economic changes can directly cause environmental effects. These effects must be considered. Mandatory findings of significance, impacts which will substantially degrade the quality of the environment, substantially reduce the habitat of the fish and wildlife species that cause fish or wildlife population to drop below self-sustaining levels threaten to eliminate a plant or an animal community, reduce the number of -- restrict the range of a rare or endangered plant or animal. The study needs to look at the normally significant impacts, which is in conflict with adopted community environmental goals, degrade or deplete the natural resources include the wildlife, rare plants, habitat, water, air quality or prime ag lands if they're included.	Chapter 3 of the Draft EIS/OEIS provides discussion of the affected environment and environmental consequences, including socioeconomic impacts. The cumulative impacts are analyzed in Chapter 4 of the EIS/OEIS.
K. Taylor-02	But whether or not it induces population growth or concentrations, substantially increased traffic or ambient noise, specify in detail a map showing the location and boundaries of the project, a statement of project, a statement of the project objectives, a description of the projects' technical, economic and environmental characteristics. Project alternatives must discuss both mitigation measures and alternatives to the proposed project. Obviously a no-project alternatives must be looked at and each alternative must be described in sufficient detail to permit comparison with the proposed project. Thank you.	Chapter 2 of the Draft EIS/OEIS provides a figure showing the location and boundaries of the Study Area. Chapter 1 of the Draft EIS/OEIS provides the Purpose and Need of the EIS/OEIS, the environmental planning process, and the scope and content of the EIS/OEIS. All of the alternatives are analyzed in Chapter 3 and the mitigation measures are described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS.
S. Taylor (Electronic)	By your own accounts, the current form of planned naval testing in the ocean would be devastating to an incredible number of marine mammals. Knowing this, I cannot even comprehend how you could think that this is acceptable, national security or not. If we survive at the cost of loosing site of the value of other forms of life besides human, then when we begin to feel the results of the loss of our delicate environmental balance - we should deserve every single misery that it creates. We are disrupting the earth's natural balance that has kept us alive for centuries. BEWARE. This disregard for it will bring your future children's generations nothing but strife and heartache. PLEASE REVISE YOUR PLANS TO OPTIMIZE CARE AND RESPECT OF OTHER LIVING AND PERHAPS MORE INTELLIGENT THAN US.....BEINGS!!!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Teixeira (Electronic)	killing lives and the planet just because of stupid navy exercises?? Please, are you people totally crazy????? do you want to destroy the all planet once and for all??? disgusting!!! its because of people like you that we still have all this wars,deaths and destruction in the world! cant you learn how to be good? how to share with others? how to live life peacefully and respect all kinds of life??? i´m sorry, but i need the planet to live, who tha [expletive deleted] do you think you are to take away my right??????????? FROM THE OTHER SIDE OF THE WORLD, PORTUGAL	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Terrell (Electronic)	There is much we don't know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return because of education and protection. We have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing. Most sincerely, Linda Terrell	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
A. Teubner (Electronic)	Unacceptable !!! We know better. The Navy needs to stop this now !	Thank you for participating in the NEPA process.
C. Teubner (Electronic)	Please please save our most important natural resources!!! Thank you. Chris.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		a decade.
Theis (Electronic)	Please find a way to conduct exercises that will not harm so much life.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Thelen (Electronic)	stop the navy experiments as long it kills our all sea life.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Thiruvengadam (Electronic)	Aloha! I live in Kona & have enjoyed the marine life here for many years. I was moved to share my humble opinion in the face of a situation that I do not know much about. I believe marine life is affected by sonar use & I feel if concerned citizens do not speak up for them then they have no voice. So I hope there can be precautions taken to prevent harm to the marine life and research done on the effects this sonar has on marine life. I am interested in balance and mindfulness when considering impacts on our Earth & if these comments from concerned people help to support & protect the life in our seas I feel that would add to balance in this world. Mahalo!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Tierney (Electronic)	Please actively take steps to reduce sonor and other technologies' harmful impacts to marine mammals. These steps include avoiding harmful activities in calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Timmerman-Thurstin (Written)	We understand that the Navy is moving ahead with plans for sonar and explosives training that threaten to deafen, injure and even kill countless whales, dolphins and other marine mammals. Starting in 2014, the Navy will harass, injure or kill marine mammals more than 33 million times in both the Atlantic and Pacific Oceans during its five years of testing and training with sonar and explosives. These alarming numbers come from the Navy itself. Inflicting such tremendous harm on marine mammals is simply unacceptable. Entire populations of marine mammals will be affected. Navy ships will flood millions of square miles of ocean with high intensity sonar, which is known to cause disorientation, hearing loss, stranding and death in whales. The Navy is supposed to be protecting people and mammals, not destroying them. Please stop the killing and harming of our animal and human populations, and stop destroying the environment that these are dependent upon for their survival. Thank you for your attention.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 (Affected Environment and Environmental Consequences) of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Tinch (Electronic)	This is impacting marine life in an alarming way that is totally unacceptable. Please stop these exercises.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Tisue (Electronic)	Dear U.S. Navy, Please protect marine mammals from explosives and sonar!!!!! We cannot do this! The negative environmental impact on marine life needs to be stopped!!!!!!! Protect our planet and its inhabitants!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Tomasini (Electronic)	While I do appreciate the United States Navy's mission to serve our national security interests, I strongly believe that we need to do all we can to ensure that we are not causing damage to the natural environment, especially intelligent and wonderful creatures like whales and dolphins. If this means it will cost the government more to operate in an enviormentally safe manner, then please use my tax dollars to protect our precious world for our future generations. Thanks for this forum. Read the Earth Charter Iniative, this document says it all.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Traina (Electronic)	Please find another way to do your testing that does not involved the harming and death of dolphins and whales. We cannot, as human beings, keep treating the planet with such disregard and expect to be able to continue to live here in peace. Thank you for being kind stewards of the water that we all love here. Diane Traina	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Trombly (Electronic)	Please do not do ANY sonar testing in our oceans! We, as humans, have a jump first, then look mentality. Protecting our oceans is as important as protected lands and I do not feel as if ALL of the harm that will be done to marine life has been taken into consideration. At this time, we have enormous ocean pollution, I am thinking of garbage specifically. More specifically, radiated garbage from Japan. This, too, will be affecting the ocean wildlife. As a suggestion, our Navy can be tasked with finding an environmentally friendly solution to this problem. Why are we spending taxpayer money to scramble ocean creatures' brains, hearing, causing more death and detrimentally impacting the oceans' food chain? My last point is that on land, we have noise pollution laws. It is time to set some rules about underwater noise pollution because that is what the Navy is planning to do. Sincerely,	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
L. Tucker (Electronic)	I cannot imagine any greater damage being done through unnecessary noise pollution to our very valued whale and dolphin species. I am in the hearing field. I see patients daily who have damaged hearing due to noise exposure. Please don't inflict this damage on unsuspecting innocent creatures.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
T. Tucker (Electronic)	Please think. This is sooooooooooooo simple. Please ask your children and grand children. They can figure it out.	Thank you for participating in the NEPA process.
Tumey (Electronic)	Those animals are our country and the worlds' resources. If we harm and probably kill them (since many use sonar to find food they won't be able to eat) kill them whole sale we are destroying delicate ecosystems that humans rely on for food - not just the United States but all of the countries that fish in the Pacific Ocean. This technology has the possibility of directly impacting the worlds' future food resources. By harming this many animals we will affect many food chains in the ocean. This is Russian roulette with the environment of the Pacific ocean which is already impacted by over fishing and global warming. Please do not proceed with this program. The Navy's highly scientific guesses as to what will be impacted are limited by our present understandings of the interactions of various species and their impacts on the ocean. It is extremely difficult to extrapolate the full effects of this technology on our environment. This isn't worth the severe harm that could be caused.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Turchek (Electronic)	As a concerned citizen, I am urging the U.S. Navy to reconsider it's use of explosives and sonar along the waters of Hawaii and California. Please consider the effects of this testing on the animals living in these waters and work to find better alternatives.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Tutt-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Tutt-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Tyson (Electronic)	The highest authority is life and love. To kill and deafen, one and the same to ocean mammals, is destruction and possible near extinction of helpless beings, deserving protection, not endangerment by military forces. Humanity has awakened to the realization that war is business for profit. Killing life for profit is inhumane and not required, unless the military is doing the dirty work for the elite. Come now, is destruction of life worth profit? How much more do you expect us to endure? Humans must turn this around now. If you have any awareness of your heart and love, inside of you, please end this plan. Wealthy war profiteers can find other ways to squeeze the final wealth from their contrived economy. Please, protect the ocean life from harm.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Uliana (Electronic)	In behalf of the valuable creatures of the ocean, please stop these horrible, horrific trials. No one wants to have their children deaf and if deaf to fend for themselves without being able to hear in a world that requires hearing for their survival. This is no different than the medical doctors doing exploratory surgery on humans during world war 11. We need to care for others not kill and harm them and that means other mamamals. Are we that inhumane to not recognize this horrific damage, They can practice and train on computers, not on life. That's what computers were made for. Real life training can be simulated. These sonar activities are absolutely, unquestionably wrong, unjust, unfair, criminal. Those involved in these trainings are indifferent and don't have the courage or guts to object. They follow orders mindlessly. Then they are no different than the SS soldiers sending lives into the gas chamber. This is absolutely wrong and needs to stop now. What more comment do you need. There is no justification for it especially when we have computers and simulators. No argument, money or rhetoric or sophistry justifies for these atrocities. Please stop. I'm one voice, but I speak for all those creatures who we all need to speak for. This is beyond criminal.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Valdez (Written)	Opposed. Our islands are in eminent danger of destruction by military forces and heavy development. We rely on the sustainability of our fishery. A'ole to any kind of sonar testing.	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Valentine (Written)	Opposed.	Thank you for participating in the NEPA process.
Valenzuela (Electronic)	Dolphins & all marine life belong in our oceans. We should appreciate the beauty they give to us by being themselves. We shouldn't invade their homes, just as we wouldn't want our own homes to be invaded. We need to protect them & not hurt them.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Valerio (Electronic)	Please look at what you can do to minimize the impact that your testing will have on marine life. I am shocked that by your own numbers, thousands of animals will be killed or harmed. This is simply cruel and unethical. You're a smart bunch of people; please use your intelligence to do a better job of protecting our fragile ecosystem and the animals that inhabit it. Thanks much.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Van de Bijl (Electronic)	We are saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. We look forward to hearing from you with your views on the above, if you have any queries please do not hesitate to contact us, yours, Maartje Van de Bijl	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Van Dinter	I'm writing to voice my opinion regarding Sonic research as it is currently done and that will be done in the future. If Boeing can build the 777 from the bottom up using	Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, "Today's simulation

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
(Electronic)	simulations why do we have to do so much damage to the sea? In more so why to we have to do it in places that are still worth going. There are whole islands of trash out there, can't you just blow up that? Or Jersey Shore?	technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Van Doren (Oral-Hilo)	My name is Mark Van Doren. I'm the state co-chair of the Green Party of Hawaii. I just have a couple of brief comments. I would like to bring up that KABC put a news release out that I believe you're aware of probably, maybe not, last month, May 11th, and they brought up the fact that last year -- and I met several of you at the meeting last year, the scoping meetings. The Navy analysis for 2009-2013 estimated injury or death to marine mammals to be about 100, of course unintentional. Now this year, one year later, they have revised that to say -- to calculate that explosives could potentially kill more than 200 marine mammals a year. So from 100 to 200 a year is about 100 percent off, and I'm just concerned about what might happen next year and, you know, if these figures are accurate at all. Now, I was inside, and they were showing me that this study area for Hawaii, the Hawaiian area, actually they told me that the sonar was actually done very close, in a much smaller area close to the islands, and which is exactly where the humpback whales spawn or -- spawn, I believe, or mate. Anyway, I was hoping that the Navy could possibly go elsewhere with the sonar on that. And I'm concerned about cumulative effects. I don't think -- I'm sure the Navy is very concerned about this, but we have fishermen impacting that area. We have illegal activities impacting that area, and just cumulatively I'm very concerned about marine mammals. So I hope you consider these comments. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Van Gampelaere (Electronic)	We are saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. We look forward to hearing from you with your views on the above, if you have any queries please do not hesitate to contact us, Tommy Van Gampelaere yours,	presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Van Hoepen (Electronic)	Please consider using alternative testing methods.The proposed training exercises all along the U.S. East Coast and in the rich marine environment off the coast of California and Hawaii,involving the use of live explosives and high-intensity sonar could kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. These tragedies can be avoided if alternative methods are considered.Our National Security is of utmost importance,however there has to be a way to be able to preserve our planets oceans and marine life while protecting the country. Please consider taking steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Please consider !! Thank you for reading and your consideration. From a very concerned citizen, Karen van Hoepen	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Van Dieren (Electronic)	Please cancel planned under-water explosives/sonar exercises along the Eastern Seaboard and California and Hawaiian coasts to avoid harming and killing marine mammals. These exercises can be modified to avoid such destruction, and proceed later. In the past whales stranded and died in the wake of major military sonar exercises, bleeding from the ears and additional tissue damage, for example: Beaked whales died in the Canary Islands following sonar exercises. Panicked orcas and porpoises fled off Washington State in 2003. Dozens of whales (including pregnant females) from several species died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. Please cancel the planned exercises and take steps to protect marine mammals, such as: Avoid the most harmful activities in areas used as calving grounds or migratory corridors and seasonal high-use feeding areas. Create a larger “safety zone” around the exercises using aerial or acoustic monitoring to determine whether marine mammals are nearby. Taking these steps would allow important military training	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Vasic (Electronic)	We understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. Stop using high intensity sonar testing and live explosions near important whale and dolphin habitat. This is ridiculous, please stop this before you start.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate.
Vecchione (Written)	The Coronado Shores newsletter said that the Navy was asking for comments on how your military training will effect the environment. As a US citizen and a condo owner at the shores I say DO WHAT YOU HAVE TO DO to maintain military superiority on the seas. Some people worry more about the environment than maintaining our freedom. If the environment has to suffer a little to keep our military strong, then __ _ the environment. What good is a "clean" environment if we lose our freedom. Do what is best to keep us strong; every red blooded American should back you on this 100%	Thank you for participating in the NEPA process.
Vele (Electronic)	Your testing of weapons in our oceans will destroy everything. Take care of our oceans and have some respect.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		to protect the marine environment while training and testing for nearly a decade.
Verde (Electronic)	I am opposed to the proposed training exercises involving explosives and sonar along the east coast and off the California and Hawaii coast. It is well known that these areas are rich in biodiversity and in particular as migratory routes, breeding grounds, and feeding areas for whales and dolphins. This is not a sound idea at all.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
VerVynck (Electronic)	Please re-think your plans in order to protect the marine life from explosives and sonar.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Vicente (Oral-Hilo)	My name is Dwight Vicente. I am representative of the Hawaiian Kingdom at this time, and I'm going to point out some of the history of this kingdom. In 1820 the United States dropped off a naval spy at Oahu. In 1825 a U.S. Naval officer signed the first treaty with the Hawaiian Kingdom, which is all illegal, and every treaty that the United States signed ever since violated the U.S. Constitution. So between the Hawaiian Kingdom and the United States government, there was no valid treaty. Even in 1887 the Reciprocity Treaty to have the U.S. Navy stationed at Pearl Harbor violated the U.S. Constitution Article I, Section 8, Clause 2 -- let me stand to correct myself -- Clause 1, Duties, Imposts, and Excises. They was trying to evade paying those taxes from a foreign country, importing stuff into the United States, and it violated Article I, Section 8, Clause 17, needful buildings, arsenals, dock yards, that are going to be purchased with the consent of the legislature of the state, and they only got 13 states. They cannot have them by treaty in a foreign country. What the United States has been doing since 1787, they have been using the Northwest Ordinance of 1787 to accomplish a lot of illegal	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	things which the Articles of Confederation prohibited and/or the U.S. Constitution prohibited. That's where they got the extra powers to do things. That actually is a violation of the Constitution. So you always got to be looking at which document are they speaking of, the Constitution or the Northwest Ordinance of 1787. A lot of the history the United States has is based on the Northwest Ordinance being that it only has 13 states and 37 are all unincorporated states under the Northwest Ordinance. And when you're going into other countries or even colonies, they've been using that ordinance. Most people refer to that as the Monroe Doctrine. That's how the United States has been taking its military way beyond what the constitutional authority gives them. The U.S. Navy is only the prosecuting (inaudible) on the high seas only. The Army is only in the United States, which is 13 states, and they have attached land forces with the Navy, which is illegal. They're separated in the Constitution, and there's a reason for that. It's because in the Declaration of Independence, they opposed the king's taking the standing army over to the 13 colonies, so that's why it's separated. The United States applied the Northwest Ordinance here to the kingdom in 1787 by first its businessmen here in Hawaii, Hawaiian Kingdom, brought over mercenaries from Europe, and that's how they accomplished the Bayonet Constitution. They wrote the 1887 Constitution for the Hawaiian Kingdom with a gun, and with that, it signed an illegal treaty, which is the Reciprocity Treaty. So the United States actually took over the kingdom in 1887. The only thing was left to do was to remove the queen in 1893 when she signed the lottery bill into law on the morning of January 13, and on the 14th, U.S. Minister Stevens landed an illegal standing army that was on board a Navy ship that was illegally stationed at Pearl Harbor, and that was how history started here with the takeover. So we've been under it ever since, the Northwest Ordinance, and that's why they have all the military bases here, which violates the U.S. Constitution. So I guess I'll end by reserving the rights of this kingdom under the Queen's Protest of January 17, 1893, against U.S. Minister Stevens. It has yet to make its way to the U.S. Supreme Court, Article III, Section 2, Clause 2, original jurisdiction but limited to U.S. ministers and consuls. Thank you.	
Vilello (Electronic)	PLEASE don't do it!! please don't harm the whales and dolphins	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Villasenor (Electronic)	The planet's cost of ocean sonar testing will be the lives of thousands of dophins and whales. The imminent vanishing of thousands is a known result. What are the long term effects? A planet devoid of these beautiful mammals? It is appalling and shocking to learn of the intended sonar testing in our oceans. My family, and surrounding community is horrified by the notion that our very own military is planning to pollute the oceans with sound so drastically as to committ mass homicide upon nature's creatures. Especially if this is an avoidable consequence. We would like to know that our honorable U.S. Military is seeking alternatives and will not proceed until all options are investigated and exhausted. Thank You. Concerned whale and dolphin watcher in San Jose, Calif.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Vincent (Electronic)	We are saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	current and future generations. We look forward to hearing from you with your views on the above, if you have any queries please do not hesitate to contact us, yours, ...	
Vlach-Lasher (Electronic)	I am asking you to please consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Vogelgesang (Electronic)	Don't screw up the marine mammals any further than everything else man is doing to the oceans already are. Please reconsider the explosives and sonar exercises that are being planned for military purposes--there's got to be a way you can conduct some of these exercises that doesn't impact wildlife to the extent that the current way does. I'm sure you're looking at this and other letters expressing similar concerns as a joke, but try not to laugh and actually consider what you're doing to the environment. I realize that you don't give much of a thought to the environment and view all conservationists & environmentalists as crack heads that you can sit back and laugh at, but please try to take this seriously. The animals are important too---it's not just humans who live on this planet, and some of the species that will be affected are endangered.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Vollmer (Electronic)	Please I ask you to protect the marine mammals from explosives and sonar, it is so very important.....have mercy on these wonderful animals, please, please, please!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Waggoner (Electronic)	Please incorporate greater protective measures for marine life into the proposed training exercises off the coast of California and Hawaii. According to the Navy's own Environmental Impact Statements, the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. The massive harm to marine life that these exercises will cause is unacceptable. Please incorporate protective measures such as: avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Such measures will still allow military training exercises to proceed, but will minimize the likelihood that whales, dolphins, and porpoises might be harmed or killed. It is well-documented that in the past, military sonar exercises have caused injuries, death, and terrible suffering in marine life. For example, whales have stranded and died in the wake of military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. Please do the only right thing, and incorporate additional protective measures including those outlined above. Thank you for your consideration.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate.
Wagner (Electronic)	We are saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. We look forward to hearing from you with your views on the above, if you have any queries please do not hesitate to contact us. Yours, Stacy Wagner & concerned animals of the ocean	Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Wagoner (Electronic)	There is much we don't know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return because of education and protection. We have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing. Most sincerely, Genesa Wagoner MD	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Wallace	Please consider placing safeguards in place during military exercises along the East coast and California and Hawaii for innocent marine wildlife. There are measures that	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
(Electronic)	can be put in place and still allow the exercises to take place. Thank you for your consideration.	analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Wallis (Electronic)	I am writing to ask you to stop the killing of 1,800 whales and dolphins and the deafening of 15,900 more by ceasing the operation of the Navy's underwater sound system in the Hawaiian Islands, the California and Atlantic Coasts, and the Gulf of Mexico. These numbers, from your own estimates, are uacceptable, and completely preventable. Whales and dolphins depend on sound to navigate and live, and our scientists and researchers are intelligent enough to offer humane alternatives.	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Walsh (Electronic)	PLEASE no testing. The Navy's report states that the exercises could cause 1,600 marine mammals to suffer from hearing loss or other injury from its use of sonar and explosives each year for the next five years. The report also projects that 200 marine mammals will die each year.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate.
Wargo (Electronic)	I would like to comment on the environmental impact statement that you are going to kill a astronomical amount of marine animals, including endangered species. I request first of all that you find alternative means to do this - and drastically reduce the amount of collateral damage to other beings who live in the sea. If you must conduct exercises they should be done far and away from important calving and feeding grounds. I really think its ridiculous in this day and age that the US Navy - the strongest and best Navy in the world cannot come up with an alternative solution. I respectively ask that you do everything possible to not kill marine animals. They have enough pressures without man adding needless ones.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
D. Wasson (Written)	The extensive EIS as prepared in this report violates the constitutional rights on international, national, and nature rights, and origin in regards to the extension of the continental land boundaries and nature spaces and all items in the sea. The extension of boundaries from the continental U.S. to and near the Hawaiian archipelago violates international which the U.S. government was a signator o the protection of nations to the 200 mile limit. The U.S. government must cease and desist breaking its own laws. Although I am a Hawaiian national my American citizenry was forced on Hawaiian nationals like myself. This proposal violates legal, judicial, international law of compliance and I have no choice but to oppose this EIS. The natural, physical, legal, political, and spiritual laws are violated in this report. The rights of native tenant rights such as fishing, water, gathering, and access will be violated.	Thank you for participating in the NEPA process. However this comment is outside the scope of this EIS/OEIS. Please see Chapters 1 (Purpose and Need) and 2 (Description of Proposed Action and Alternatives) of the Final EIS/OEIS for a clear definition of the scope of this project.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
M. Wasson (Electronic)	It's a sad state of affairs that our government in the name of almighty power systematically kills animals that cannot speak for themselves. Has our nation become so power hungry and uncaring that we don't care about the collateral damage. We are killing our planet. It's morally and ethically wrong. Permanently deafen????? How are these animals to survive without their hearing, that is, if they aren't killed first? The war machine is an evil creature created by man, wiping out anything good and beautiful in it's path.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
D. Watson (Electronic)	We the people and mother earth do not want your test there is no need for it the harm use people are doing to life and earth is sending us all to death we are the poeple when we come together as one you will not win do you people have kids and family of your own im sure you do. Do you not care about them and there future as thats what people like you are doing destroying there futures so sad to see things like you are on this planet	Thank you for participating in the NEPA process.
H. Watson-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
H. Watson-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
J. Watson (Oral-Kauai)	Thank you. My name is Joe Watson. I live in Kapahi. I'm here to read the words penned by a friend, Steve Backinoff of Kilauea, who had to leave. I am very concerned about the impact of sound and weapon testing on marine mammals and other sea life as well as humans. In the research I have done I have some documentation that some of the experts who have claimed that whales and dolphins are safe in relation to sonar testing are working under government grants or universities so they are biased by their funding resources. I am strongly for decreasing military expenditures and reallocating those funds to programs that will improve conditions for peaceful communication. Most people just want a safe home with food to eat, and that is much less expensive than high-tech weaponry and protective weaponry. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Regarding bias in the Navy's analysis, in conducting the analysis of impacts to marine mammals, the Navy uses hundreds of peer-reviewed scientific research studies.
P. Watson (Oral-Kauai)	I'm Peggy Watson, Kappa, Kauai. I am voicing our extreme concerns with the U.S. Navy plans to continue the sound testing in Hawaiian and California waters. The Navy has presented this program with an opportunity for the community to respond, and thank you for this compliance. I come as a voice for cetaceans as well as all of humanity which will be affected if this program ensues. I am here today to offer a bit of history that will show proof that the Navy has shown in the past that their beliefs in what they're testing brings to our future was not correct. Commander Robert L. Reaser served in the Navy in what they called Operation Crossroads. He served on the U.S.S. Burleson for the Bikini resurvey to assess the damage of the atomic bomb to warships, to equipment and to animals. He was given a commendation for this service. It was signed, if you want to check it out, by Executive Officer Captain Deaeder. As an older officer, my father volunteered to go to this duty because my twin and I were in high school and he and mom did not need more family. The Navy had promised its volunteers that they would be sterile for life if they went into that theater. Younger men did not want to volunteer. I have a kid brother who was born in 1954 which proved that the Navy had no way of knowing the effects of the testing on the future. The sterility wore off. Why should we believe our planet does not face a clear and present danger by these tests? The Navy projection that yearly 1,600 cetaceans will be deaf, which I understand, and 200 will die yearly in a program designed for seven years. Quick math spells 11,200 deaf cetaceans and 1,400 dead ones. Cetaceans do not live without sound. How dare they? You the Navy. How dare they design a program to kill any species that has gifted so much to our planet? How dare they use our government monies for this slaughter in the name of defense? Thank you, the Navy, for allowing us to feel this outrage and to respond with these	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	feelings. What will you do with our concerns? As spokesman for the cetaceans we ask that you use the funding more wisely to assist the cleaning up of our oceans to make a better world for our beloved peaceful cetacean community and to stop turning our beautiful Hawaiian Islands and California seas as a theater for war exploration. We ask that to remember, as the dolphins have said, we are here. Thank you.	
Watts (Electronic)	The Navy's training and testing will harm more than 50 species of whales and dolphins, including eight protected by the Endangered Species Act, such as the North Atlantic right whale (one of the most critically endangered whales), blue whale (the largest animal to have ever lived on the planet), and sperm whale (including populations harmed by the BP Deepwater Horizon disaster). Please reconsider these tests, and think about other species. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Webb (Electronic)	The negative impacts of sonar and seismic testing in ocean waters on marine mammals is well documented in numerous government and institutional studies. (One such reference was conducted by the U.S. Geological Survey for the National Science Foundation at http://www.nsf.gov/geo/oce/envcomp/usgs-nsf-marine-seismic-research/nsf-usgs-final-eis-oeis_3june2011.pdf). These impacts are far ranging and can be damaging and lethal to marine mammals, fisheries and other flora and fauna in the ocean. The benefits of this testing is far outweighed by the damage and destruction of the life in our oceans. The only responsible action is not to use this lethal technology.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Webber (Electronic)	Please discontinue any activity harmful to the whales.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Weed (Electronic)	Please do not go forward with your plans to conduct training exercises all along the U.S. East Coast <http://aftteis.com/GetInvolved/OnlineCommentForm.aspx> and in the rich marine environment off the coast of California and Hawaii <http://hstteis.com/GetInvolved/OnlineCommentForm.aspx> which would involve the use of live explosives and high-intensity sonar. Your estimates are that the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. That is devastating and irresponsible and something I find shocking that America would do. We need to stand tall and create an example for other countries. Please find an alternative for your tests. One that won't destroy life, precious resources and our oceans!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate.
Weiand	Don't harm the dolphins and their hearing. I know from personal experience to have a	The Navy shares your concern for marine life. All of the reasonably

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
(Electronic)	severe hearing loss. It is terrible and you are not able to relate to the real world. The dolphins are almost human like and need to relate to their world. Hearing is essential. Every day I want to die, because I can no longer hear. Every day is a torment to exist. By the way, I am a Navy brat. My father retired with the rank of Admiral. Please "hear" my voice and no harm to the dolphins.	foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Weiner-01 (Electronic)	Sonic testing in the ocean is dangerous to our life in the ocean. You need to re-think this and stop the testing, stop maiming and injuring our aquatic mammals plus so many other life forms in the ocean that whose morbidity and mortality are increased directly due to this poorly thought out testing.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Weiner-02	Please stop using my tax payer money to fund these deplorably destructive and dangerous tests. Our neighbors, aquatic mammals and other species, are part of life on this planet and infliction of morbidity and mortality is deplorable and needs to stop now. Figure something else out that isnt so harmful to other life forms with whom we share our planet.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Weinfurter-01 (Electronic)	Please refrain from using explosives and sonar near Hawaii and Southern California. The damage to the whales and dolphins in the area and for miles around would be catastrophIc. It would be the equivalent of blowing an airhorn within 10 ft of your head. Save the whales & dolphins!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Weinfurter-02	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Weinfurter-03	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel"

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Weinstein (Electronic)	I agree that we need a robust and strong Navy to protect national security. I also agree that whales, dolphins, and porpoises deserve to live and to have a healthy ocean environment. According to its own Environmental Impact Statements, the Navy estimates that the training exercises planned along the East Coast and in the rich marine environment off the coast of California and Hawaii involving live explosives and high-intensity sonar would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. I understand the need for protecting our country, but we can find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. In the past, whales have stranded and died in the wake of major military sonar exercises, with bleeding from the ears and other tissue damage attributed to sonar. These have included incidents of beaked whales dying in the Canary Islands following sonar exercises, the panicked flight of orcas and porpoises off Washington State in 2003, and dozens of whales (including pregnant females) from several species who died in North Carolina in 2005. These tragedies can be avoided to a very significant degree. I urge the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate.
Weiss (Electronic)	There is already soooo much working against our environment on which we depend. Please do not add to the problems! It's crucial for everyone to keep things in balance.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Weller (Electronic)	I grew up in the Norfolk, VA area where the Navy is a vital and respected part of the fabric of the community. I have also had the privilege of visiting the California coast and the enchanting Hawaiian Islands. In Hawaii, I was able to watch gray whales and their calves frolic and breach in their natural environment. The sea is critical to the U.S. Navy and our national security and is also critical to the very survival of the dolphins and whales that must share it with our ships. I implore the Navy to find ways to lessen the impact on these amazing animals that already face survival challenges from so many man-made objects (i.e. trash, etc.) Surely there are intelligent scientists/biologists that can help our officers at the Pentagon come up with a strategy to fulfill the Navy's mission AND protect our sea life. To do anything less would be an abdication of responsibility as U.S. citizens and as caretakers of our fellow creatures. Thank you for the opportunity to comment.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Wells (Electronic)	Hello, Please find a way to ensure national security without sacrificing such an extraordinary number of whales, dolphins, and many other marine creatures. According to its own Environmental Impact Statements, the Navy estimates that the planned exercises would kill up to 2,000 marine mammals, including a large number of animals from endangered species, such as right whales. Thousands of others would suffer permanent lung damage. An additional 16,000 would be permanently deafened and 5 million would be temporarily deafened by the exercises. Please consider steps to reduce the harmful impacts to marine mammals. These steps could include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger "safety zone" around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Thank you for your consideration.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Wesch (Electronic)	Please do not allow the taking of any marine mammals. Whales are intelligent mammals with complex social structures. Improved sighting methods need to be employed as whales often travel silently. Relying on the current sighting guidelines is inadequate. Sonar use needs to be restricted in every way possible: time allowed, strength, frequency . . . Use simulation methods for training and restrict open ocean testing.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
White-01 (Electronic)	I am appalled at the inevitable repercussions of this project. Applying sonar in areas known to be populated by marine mammals such as whales, who depend on sonar to survive is outrageous. We need to ensure the health of these creatures, and in effect of our oceans. The US Navy has the obligation to protect our country from harm--would that it does not harm our country in the process. This proposal seeks to gain the Navy the right to wreak destruction in our ocean--right off of our very coast. This is unacceptable. Those with direct power in this decision-making process have an absolute duty to look for less destructive alternatives to this project, and to deny this project completely as it is. We cannot afford to folly about with the health of something so vital as our ocean ecosystem. Regardless of how much we have sought to separate ourselves from nature, we are still very much dependent on it.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
White-02	I hope the fishermen are getting a word in about this, because their dependence is so direct and immediate. Please fulfill your duty to our country by rejecting this proposal.	Many Navy at-sea training and testing ranges are accessible to the public for recreational and commercial purposes. The Navy acknowledges that during specific exercises, its training and testing could briefly limit public access (usually lasting hours) to a very limited portion of coastal and ocean areas to ensure public safety. The Navy has conducted training in these operating areas regularly for approximately 60 years. Though the intensity of live training will increase, the events are of relatively short duration and therefore the Navy does not anticipate that fish will be affected as a result of the training exercises and testing activities. Fish may respond behaviorally to sound sources in their hearing range (most Navy sound sources are not in the hearing range for most fish species), but this reaction is only expected to be brief and not biologically significant. Most commercially important fish species are not believed to hear midand high-frequency sound sources which make up the majority of sound producing activities.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Whiteman-01 (Electronic)	Today is the last day that I can submit my comments regarding the US Navy's intent to conduct sonar testing and oceanic bombing in the South Pacific. I am adamantly against this because it will severely harm marine mammals. The arrogance of us as human beings to believe that it is acceptable is misguided and plain wrong. I implore those that have the Power and the conscience to stop this effort in its tracks. Proceeding In this project will be devastating to the thousands, if not, hundreds of thousands of marine animals. It is devastating to my heart to think this could really happen. For what? The sake of knowledge, study, practice or national security. What more can we	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Whiteman-02	Destroy that we have not tainted already. Perhaps my reasoning is naive, but I see no concrete purpose or good in these activities. I add my concerns, discontent, and disapproval of these activities to the list of ocean-loving, animal-friendly, and eco-conscious people that you stop this effort now. Thank you.	Thank you for participating in the NEPA process.
Whittaker (Electronic)	The Navy's planned exercise along both coasts of the US., cannot take so many thousands of marine animals lives. In good conscience, it is wrong. With all the technology available, something else needs to be done. Right now, what the Navy plans is unacceptable. AW	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. See the FEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		avoidance, to provide a more holistic approach to analysis. Historically the Navy has recorded of few to no mortalities from sonar and explosives. Any model used to predict impact is only an estimate. Sonar is the best means of locating small objects in the water. The Navy is constantly evaluating and funding research to assess improved technologies that will achieve Navy mission goals while protecting resources on land and at sea. Evaluation of these technologies continues to be a Navy focus as is research into all technologies that will protect and defend the United States.
Wicks (Electronic)	It is my considered opinion that our oceans/sea life are under considerable "attack" from everything and would very much like to see the military services, etc. do everything they can to avoid causing more trauma to ocean/sea life of all types. thank you for your consideration !	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Wilkerson (Electronic)	We are saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. Thank you for your time, The Wilkerson family	at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
R. Williams (Electronic)	As a conserned citizen of the united states. It is extremely disturbing to me that you do EIS testing. Are you aware of the harm that causes whales and dolphins. Please do not harm these wonderful animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Tracy Williams-01 (Electronic)	Please find an alternate method for testing that does damage the ecosystem or kill and disrupt the lives of dolphins, whales and other marine life. Such collateral damage is not acceptable to anyonea and should not be to our military who we support unconditionally. Thank you!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		development of alternatives.
Tracy Williams-02	The navy's blatant disregard for Sea mammals is Shameful. You make the U.S. look like a backward nation. Your lack of intelligence when it comes to aquatic species is mind boggling. I am ashamed to be an American nowdays. I understand why the world hates the US where once it was loved. I am saving my money to leave this BS Lie. Land of greed, land of idols and whores. YOU ARE KILLING WHAT IS LEFT OF THE SEAS! Moronic. Go for it. You will be held accountable. There is a G_d.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Trinidad Williams (Electronic)	I had commented on a Hawaii group blog that dismissed an EIS reporting meet; had previously signed a petition titled "... don't deafen the whales" ~ my interest generated by a news item of impending Naval Armada to conduct sonar research in Hawaiian waters' which I'd felt disturbing to the whales currently in the island channels raising young calves-possibly mating-feeding before traveling back to the West coastal waters. I am so pleased to find a link that has extensive research reports; I have a better understanding of purpose-have information to the ecological conditions-diverse lifeforms-marinelife protection measures. I am submitting comment of thank you for this available link to questions that I feel is an issue.	Thank you for participating in the NEPA process.
Williamson (Electronic)	The science is clear that the sonar equipment is harmful to whales and marine life. Don't use it and destroy many of the precious marine lives we are trying to preserve. For training it's unacceptable. I am sure there are alternative ways to stimulate the experience without causing death and destruction. As a health care provider we don't kill people and revive them to practice our skills! If we destroy our planet's diversity, air and water for security purposes we will have accomplished NOTHING.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
A. Wilson (Electronic)	There is much we don't know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return because of education and protection. We have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing. Most sincerely, Amanda Wilson	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
David Wilson (Oral-Hilo)	My name is David Wilson. Is this loud enough? Is that loud enough? Okay. I'm kind of paranoid because -- well, just because of the situation in the world now. I'm just going to say one thing first. Do we know that every 80 minutes, an American vet commits suicide? Now, these wars -- they can talk about the whales, the turtles, okay. But they're not going to just say, "Oh, we didn't know that. Thank you. We'll stop this now." Everything else goes on, but the turtles and the whales are safe? It's just part of the whole -- I'm just saying like we had this sign out there, the legality has replaced morality. You will not -- you will not tell me (inaudible). Anyway, when I think about the military, I'm sad. My dad was a career Air Force guy, World War II and Korea. He retired as a (inaudible) major. But I wanted to go to West Point as a kid, but I wasn't smart enough of course. So I know all this strategy. My dad taught me all these strategy ideas and all this stuff, and I realize how the military is being used. We think the American military is doing whatever they're ordered. We're all under orders, right? All the way back to who's in charge of the whole thing, we don't know their names. We're only being used basically to -- one of the things is to depopulate the Muslim world and at the same time kill and maim	Thank you for participating in the NEPA process.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	thousands and thousands of American troops and, you know, people get the post-traumatic syndrome and all this stuff like that. So I'm just saying the military is not to blame. They're being used, and it's just sad because we cannot get back to the core by talking to a few. (Inaudible) ask what your rank is? You're a captain. Okay. Captain, well, you have a lot of responsibility. But I mean even so, I don't even think you're going to say, "Oh, we didn't know that. We'll change it." So I'm just saying whatever. I don't know what I'm saying. It's just depressing to me to be in this position. Anyway, the idea that until we've seen the thing, by next winter, 10 to 20 million tons -- 10 to 20 million tons of debris is going to hit the Kona Coast. What are you going to do then? And it's in the air now. There's radiation in the milk in Pennsylvania, in Iowa, the West Coast. I mean this is what's happening, and you can't fight it. You can't shoot it down. You can't sonar it away. And in 30 seconds, I'll just say let's all rely on the Lord. That's what we've got to do because otherwise we (inaudible). Otherwise, what are you going to do? Fix it? Sonar ain't going to fix it. God bless you. AUDIENCE MEMBER: Thank you, David. The problem isn't that you weren't smart enough. You just wouldn't be brainwashed. You were too smart.	
Denise Wilson (Electronic)	The HSUS is joining other environmental and animal welfare groups to ask the Navy to consider steps to reduce the harmful impacts to marine mammals. These steps include avoiding the most harmful activities in areas used as calving grounds or migratory corridors; avoiding seasonal high-use feeding areas; creating a larger “safety zone” around the exercises; and using aerial or acoustic monitoring to determine whether marine mammals are nearby and may be harmed. Taking these steps would allow important military training exercises to go forward, while minimizing the likelihood that whales, dolphins, and porpoises might be harmed or killed. Along with the HSUS, I am calling on the U.S. Navy to re-think its plans and to incorporate additional protective measures. Mrs. Denise Wilson	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Donna Wilson (Electronic)	Please don't close your eyes to this. There is much we don’t know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	to return because of education and protection. We have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing.	testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
J. Wilson (Electronic)	There is much we don't know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return because of education and protection. We have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Z. Wilson (Electronic)	Please limit Navy sound testing! There is much we don't know about whales but we do know they are highly intelligent, social, highly evolved mammals. We know their brains have as much or more surface area than ours which suggests their intelligence may parallel ours though it may be a very different kind of intelligence. Many marine mammal species are endangered because of human impacts upon their environment or hunting. Some whale populations which were in the past endangered are just beginning to return	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
	because of education and protection. We have no right to knowingly permanently injure these living creatures who never purposefully injure humans unless first provoked. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. Unless the rights of these marine mammals are respected, I cannot condone Navy sound testing.	testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Wiltse (Electronic)	Please stop training and testing EIS/OEIS.it does terrible damage to wildlife.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Winterbottom (Electronic)	We are saddened to hear that the Navy is considering conducting exercises involving the use of live explosives and high-intensity sonar. Do you feel that it is really necessary to conduct this testing that will affect such a volume of marine life? It would be a great pity to see so much of the conservation work the USA has undertaken towards its marine environment over the last number of years being undermined by these proposed exercises. These conservation initiatives deserve to be applauded and have made the USA one of the leaders in marine conservation. To conduct these exercises flies in the face of all the good work and progress that has been achieved to date. There is also the issue of sound channels in the oceans that can carry sounds over vast distances, so not only local populations may be affected but also populations in areas seemingly far removed from the testing activities. As these activities could potentially affect endangered species on both the high seas and possibly in the territorial waters of other nations we believe that any other nations that could potentially be affected should be fully consulted, and the findings of any such consultations made public, prior to any decision being made on whether these activities should progress to the next stage. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Wiseman (Electronic)	PLEASE rework this plan to provide better protection for marine mammals! The current plan is predicted to cause deafness, stranding, and death to thousands of animals. I appreciate military protection, but not at the cost of killing any innocent animals just for training; please do not carry on exercises that would cause marine mammals to suffer and die. Instead, consider and adopt alternative suggestions that animal welfare organizations can recommend, and consider exercises that don't require the actual deployment of explosives and high intensity sonar that cause so much suffering. Thank you.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.
Wolf (Electronic)	Please, we must stop this training and testing. We are at risk of endangering many marine animals. With all of the knowledge we have there has to be a better way for testing. please stop.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Woo (Electronic)	I do not condone Navy sound testing which will negatively impact marine mammals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
K. Wood (Electronic)	Please do not continue or support the U.S. Navy's training activities in waters off the Pacific Coast. The Navy has admitted that the sonar tests will cause harm to whales and dolphins ranging from discomfort to disorientation to permanent deafness which would interfere with navigation, self defense and finding food thereby seriously impairing their ability to survive. Increased beaching and deaths of marine mammals have certainly been linked to previous Navy sound testing. Unless it is a time of war with imminent threat these tests should not be performed in areas known to be frequently passaged by whales and dolphins or within effective range of whales and dolphins. Please limit Navy sound testing to areas outside the known paths of migration, reproduction and feeding of whales and dolphins and other effected marine mammals. Please also require scanning for the presence of marine mammals within the disturbance zone prior to testing and delay testing until the marine mammals depart from the affected area. We are meant to be stewards of the earth, yet everywhere we here of inhumane treatment of the fellow creatures with which we share this beautiful planet. I want the U.S. Navy to protect all of life and not disregard the harm done to whales and dolphins in the name of human security. Protecting all of life enhances all of our security. THANK YOU!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
M. Wood (Electronic)	The navy is a very important part of our country and I support the men and women who serve in our navy. They have bravely fought on behalf of the United States in wars that most of us might not agree with, yet they have pledged to protect and serve against all cost. So I am outraged that the navy would put our ocean mammals at risk. We must protect them as well as our people. Please do not move forward with implementing this harmful technology. Remember what you stand for and your pledge to protect innocent lives.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Woodward (Electronic)	Stop. Stop stop stop. THINK. Explosives and sonar testing? Really? COME ON. We would ask you to give serious consideration to just how necessary these proposed exercises are and where the benefits of them lie versus the destruction of marine life that so many dedicated citizens have worked tirelessly to preserve and enhance for both current and future generations. Susan Woodward	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Woolley-01 (Electronic)	PLEASE CONDUCT YOUR EXPERIMENTS AWAY FROM ALL MAMMALS SO THEY ARE NOT AFFECTED BY THE LOUD NOISES AND EXPOSIVES...IT SURELY CAN BE DONE SOMEWHERE AWAY FROM ALL MAMMALS...WE DON'T NEED ANY OF THESE SPECIES TO BE ENDANGERED OR WORSE...THERE IS ALWAYS A BETTER OR OTHER CHOICES... THANK YOU... C.WOOLLEY	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Woolley-02	PLEASE RECONSIDER WHERE YOU WILL CONDUCT YOUR EERCISES SO THEY WILL NOT AFFECT THESE MAMMALS...IT SHOULD NOT BE NECESSARY TO DISTURB OR HARM THESE MAMMALS...THERE ARE ALTERNATIVE WAYS...PLEASE CHOICE AN ALTERNATIVE...THANK YOU.. COLETTE WOOLLEY	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Wright (Electronic)	Please consider how important the balance of the Ocean Environment is to our lives. These amazing intelligent mammals deserved not to be harmed	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Wyse (Electronic)	Plenty of people are already stating well thought out reasons why this is a poor choice. Let's be frank - stop it. Marauding all over the planet destroying cultures and species that can never be replaced is poor behaviour. We were all taught this as children. Please stop.	A Cultural resources analysis appears in Section 3.10 (Cultural Resources) of the EIS/OEIS which addresses cultural artifacts and shipwrecks. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. Regarding the use of simulation, as described in Section 2.5.1.4.1 (Simulated Training) of the Draft EIS/OEIS, “Today’s simulation technology does not permit anti-submarine warfare training with the degree of fidelity required to maintain proficiency. While simulators are

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		used for the basic training of sonar technicians, they are of limited utility beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments."
Xander (Electronic)	I am greatly concerned about the horrific impact of the mass use of sonar, sonar testing, and the auditory effects of explosions in waters which contain wildlife dependent upon hearing for navigation, calving, feeding, social interaction and development, and their entire existence. These mammals are highly intelligent; massive sonar blasts that inflict immense pain, disability and death are cruel, and will have a profoundly negative impact on entire social pod structures throughout the waters where this is used. If we, as a nation and military, are to use such methods in our arsenal, there MUST be safeguards in place to minimize negative impacts, and to protect the wildlife in the waters where we operate. Anything less is an exercise in animal cruelty and negligence unparalleled in human maritime existence. There is proof that intense mechanical sonar blasts can rupture the eardrums and cause life-threatening damage to dolphins and whales -- this is not only a fatal impact, but one which is extremely painful, causing these animals to die in agony. I believe there is no excuse whatsoever for the mass slaughter of our marine mammals on such an unimaginable scale, should this technology's use be widened and exercised with impunity throughout our national and international waters. Thank you for your consideration.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Yager Delagrang (Electronic)	Please do not kill marine life because of the explosive testing planned off the coasts of California and Hawaii.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from active sonar and explosives were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Youngs (Electronic)	Please Protect these mammals	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Yuen (Written)	Excellent presentation! Keep up the good work. Communicating with the public is where it is all at. Really surprised to see officers from Kauai at the function.	Thank you for participating in the NEPA process.
Yushin (Electronic)	Karma and compassion are universal concepts. Treat others as you'd like to be treated. We urge you to cease military action that would kill and disfigure life in the ocean and elsewhere. Sincerely, P. Yushin Honolulu, HI	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Zehel-01 (Electronic)	I am outraged that the U.S. Navy would go ahead with sonar testing that could kill and harm marine mammals 2.8 million times a year over a five year period. The proposed training and testing activities off the coasts of Hawaii, Southern California, the Atlantic seaboard and the Gulf States from 2014 to 2019 gives these figures in your Draft Environmental Impact Statements. The Navy's projected damage to whales and dolphins is astounding. It is a vast increase over previous estimates of potential harm for the same regions. The numbers for far-reaching harm that will be inflicted on marine mammals during these testing activities is staggering: over 5,000,000 instances of temporary hearing loss, 16,000 instances of permanent hearing loss, almost 9,000 lung injuries, and over 1,800 deaths. An estimated 11,200 whales and dolphins will be deafened. What is unstated is that whales and dolphins depend on sound to navigate, communicate and survive. What is not presented in your analysis are reasonable alternatives to reduce the unprecedented damage to marine animals.	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
Zehel-02	Your mitigation plan, based on the ability of lookouts to detect whales and dolphins, will not achieve a significant reduction in damage to marine life.These same plans have been found by Federal courts to be inadequate and ineffective. Visual surveillance may be impaired at sea and unsuitable for distinguishing deep-diving species that spend little time at the surface. If fully effective, it would only protect species from the most serious injuries. I call on the Navy to please identify and set aside areas of high marine mammal density which is acknowledged to be the most effective means of reducing marine mammal injury. If the United States and its Navy wish to be seen as a leader in saving marine life, it must significantly reduce the levels of death and injury to whales, dolphins and other marine life involved in these plans. Thank you for the opportunity to comment. I hope to hear this testing is stopped since the damage to our oceans would be horrific.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the “one or two personnel” described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy’s reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
Zelkovsky (Electronic)	Why is the ocean constantly being treated like some non-living non life supporting entity? Just because it is so large and pervasive and because human mistakes seem to disappear over time does not mean that the ocean is unaffected. The ocean supports life and food for people but somehow it is treated like a third class citizen. Recently on Kauai there was an electrical short in a sewage treatment plant. So automatically the partially treated sewage was dumped into the ocean, using it like a cesspool. I say no to using the ocean for any kind of testing.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Zorn (Electronic)	Please, just reconsider. Have we not done enough to harm our one frontier that is essential to the human race's continued preservation? Continuing efforts that harm more species is hardly moving forward, and for what cost? The cost is immeasurable, and potentially, irreversible. Please, just reconsider.	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Zuckert (Electronic)	I am opposed to Alternative 2. Any expansion of training would be detrimental to marine mammals and sea turtles. The Navy has adequate ocean area for training already and should not increase its footprint of disruption of natural processes and sea life. The EIS states the negative and unacceptable impacts quite succinctly: The aggregate impacts of past, present, and other reasonably foreseeable future actions are expected to result in significant impacts on marine mammal and sea turtle species.	The Alternatives carried forward meet the Navy's purpose and need to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and

Table E.3-4: Responses to Comments from Private Individuals (continued)

Commenter	Comment	Navy Response
		testing activities. Based on the analysis in the EIS and monitoring conducted during actual training events, the proposed training will not pose a risk to whales, fish, and other wildlife given that these same activities have been conducted for many years here and in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at: [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf].
Zullo (Electronic)	I am astounded at the lack of reguard for our marine wildlife by the Navy, yet another example of "Do what I say, not what I do" by a United States Government organization. What is the difference between those Japanese vessels killing and hauling mother whales and this, NOTHING....thats what!!!!! As a former U.S. Marine and loyal U.S Citizen that is decorated in defending this county, I am ashamed of our Navy and Governemnt, and it gets harder every day to call myself a proud American. Where are the environmentalist and other watchdog organizations that need to step up and protect us from our government.... HELP US HELP OURSELVES!	The Navy shares your concern for marine life. All of the reasonably foreseeable effects from Navy training and testing activities were analyzed in Chapter 3 of the Draft EIS/OEIS. Also, as described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Draft EIS/OEIS, the Navy implements, to the maximum extent possible, mitigation measures during its training and testing activities.
Name Withheld by Request (Written)	Unless we are Hawaiians, we are visitors to Hawaii. Visitors have an obligation to their hosts. I don’t believe that the Navy has satisfied their obligations as visitors to our island. Just as the rule in a hostel is, a visitor who leaves a place better than they found it. Action needs to be taken to clean up the supersite, the mess made by the military. By Hawaiian custom, lands belong to the people who care for them. Since the Navy has not in the past taken care of the seas, taken care of their harbors, taken care of our skies. Between munitions dumped, decaying housing, pollution in the harbors and on the lands and skies (from exhaust from airplanes), the Navy has no right to any lands here.	Thank you for participating in the NEPA process.

E.3.1 Form Letter

The Navy received a CD from the Natural Resources Defense Council containing approximately 76,000 versions of a letter from their members. Table E.3-5 provides the Navy's responses to the comments in the letter. Table E.3-6 provides the Navy's response to amendments to the basic letter. Responses to these comments were prepared and reviewed for scientific and technical accuracy and completeness.

Table E.3-5: Responses to Comments in the Form Letter from the Natural Resources Defense Council

Commenter	Comment	Navy Response
Natural Resources Defense Council (Form Letter)-01	Your analysis fails to present and analyze reasonable alternatives that would significantly reduce the unprecedented level of harm to marine life.	The Alternatives carried forward meet the Navy's purpose and need (see Section 1.4, Purpose and Need for Proposed Military Readiness Training and Testing Activities) to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. The Navy complied with NEPA requirements in the development and consideration of alternatives. This EIS/OEIS analyzes all alternatives in Section 2.5.2 (Alternatives Carried Forward) and explains why the Navy has eliminated other alternatives in Section 2.5.1 (Alternatives Eliminated from Further Consideration). The selection of an alternative by the decision-maker will be based on a review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
NRDC (Form Letter)-02	The mitigation scheme that the Navy principally relies on centered on the ability of lookouts to detect whales and dolphins will not result in an appreciable decrease in marine mammal injuries. Federal courts have found this same scheme inadequate and ineffective for good reason: it is largely useless in conditions (common at sea) that impair visual surveillance, it is unsuitable for detecting cryptic and deep-diving species that spend little time at the surface, and, even if it were fully effective at detecting whales and dolphins, would only protect species form the most serious injuries.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note

		are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.
NRDC (Form Letter)-03	I call on the Navy to identify and set aside areas of high marine mammal density acknowledged to be the most effective means of reducing marine mammal injury.	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of numerous potential mitigation measures. Section 5.3.1.2.4.1 (Detection Probabilities of Marine Mammals in the Study Area) has a detailed discussion of available literature on the sightability of marine mammals. Note that Navy does not employ only visual monitoring and makes use of passive acoustic detection when available and appropriate. Also note that not all beaked whale species are small and for example, Baird's beaked whale can reach in excess of 40 feet in length and generally have a detection rate g(0) in excess of 0.90 in the Pacific. More importantly, however, the characterization that visual detection rates for marine mammals, "generally approach only 5" is not accurate. Specifically in reference to the citation in the comment, Barlow and Gisiner (2006) provide a description of typical marine mammal survey methods from ship and aircraft and then provide "a crude estimate" of the difference in detection of beaked whales between trained marine mammal observers and seismic survey mitigation, which is not informative with regard to

		Navy mitigation procedures for the following reasons. The authors note that seismic survey differs from marine mammal surveys in that, "(1) seismic surveys are also conducted at night; (2) seismic surveys are not limited to calm sea conditions; (3) mitigation observers are primarily searching with unaided eyes and 7x binoculars; and (4) typically only one or possibly two observers are searching." When the Navy implements mitigation for which adjustments to modeling output were made, the four conditions Barlow and Gisiner (2006) note are not representative of Navy procedures nor necessarily a difference in marine mammal line-transect survey procedures. The Navy accounts for reduced visibility (i.e., activities which occur at night, etc.) by assigning a lower value to the mitigation effectiveness factor. On Navy ships, hand-held binoculars are always available and pedestal mounted binoculars, very similar to those used in marine mammal surveys, are generally available to Navy Lookouts on board vessels over 60'. Also like marine mammal observers, Navy Lookouts are trained to use a methodical combination of unaided eye and optics as they search the surface around a vessel. The implication that marine mammal surveys only occur in "calm sea conditions" is not accurate since the vast majority of marine mammal surveys occur and data is collected in conditions up to sea states of Beaufort 5. The specific g(0) values analyzed by Barlow and Gisiner (2006) were derived from survey data for Cuvier's and Mesoplodon beaked whale that were detected in sea states of Beaufort 0-2 during daylight hours. However, marine mammal surveys are not restricted to sea states of Beaufort 0-2, many species g(0) values are based on conditions up to and including Beaufort 5 and, therefore, the conclusions reached by Barlow and Gisiner (2006) regarding the effect of sea state conditions on sightability do not apply to other species. Finally, when Lookouts are present, there are always more than the "one or two personnel" described by Barlow and Gisiner (2006) observing the area ahead of a Navy vessel (additional bridge watch personnel are also observing the water around the vessel). Finally, Navy's reliance on visual mitigation has been demonstrated to be effective over the seven years of monitoring associated with Navy training and testing at sea in publically available reports submitted to NMFS since 2006 and accessible on the NMFS Office of Protected Resources website.

Individuals who submitted the form letter made their own amendments, additions, changes, and editorial remarks. Most expressed general opposition to the Proposed Action; others were related to the topics described below. The Navy has responded to these additional comments in Table E.3-6.

Table E.3-6: Responses to the Additions and Changes to the Form Letter as Submitted by the Natural Resources Defense Council

Comment Topic	Response
Concern for harm to marine mammals/marine life	The Navy is committed to protecting the marine environment during the conduct of its training and testing activities. As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the EIS/OEIS, the Navy has used extensive measures to protect the marine environment while training and testing for nearly a decade.
Requests or suggestions for different alternatives	The Alternatives carried forward meet the Navy's purpose and need (see Section 1.4, Purpose and Need for Proposed Military Readiness Training and Testing Activities) to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives. The Navy complied with NEPA requirements in the development and consideration of alternatives. This EIS/OEIS analyzes all alternatives in Section 2.5.2 (Alternatives Carried Forward) and explains why the Navy has eliminated other alternatives in Section 2.5.1 (Alternatives Eliminated from Further Consideration). The selection of an alternative by the decision-maker will be based on a review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
Requests or suggestions for additional or other mitigation	As described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the Final EIS/OEIS, the Navy evaluated the effectiveness and practicability of a number of potential mitigation measures. The Navy, in conjunction with NMFS, has determined what mitigation it can effectively use during its training and testing activities. Through careful exploration of all mitigation measures to determine which were the most effective (see Chapter 5, Standard Operating Procedures, Mitigation, and Monitoring]), the Navy has chosen the existing measures to mitigate harm to marine mammals while still being able to meet its operational needs to train for real-world conditions.
General misunderstanding for the need for the Proposed Action	The Alternatives carried forward meet the Navy's purpose and need (see Section 1.4, Purpose and Need for Proposed Military Readiness Training and Testing Activities) to ensure that it can fulfill its obligation under Title 10. See Section 2.5 (Alternatives Development) for more detailed information on the development of alternatives.

E.3.2 Petition

The Navy received a petition circulated by MoveOn.org containing approximately 477,000 signatures. Table E.3-7 provides the Navy's response to the petition itself. The response to the petition was prepared and reviewed for scientific and technical accuracy and completeness. Individuals who signed the petition added their own remarks. Most expressed general opposition to the Proposed Action; other additions were similar to the topics described above for the Natural Resources Defense Council form letter (see Table E.3-6).

Table E.3-7: Response to the Petition from MoveOn.Org

Comment	Navy Response
Stop the killing of 1,800 whales and dolphins and the deafening of 15,900 more by ceasing the operation of the Navy's underwater sound system in the Hawaiian Islands, the California and Atlantic Coasts, and the Gulf of Mexico.	Below is a summary of the facts and analyses related to the HSTT EIS/OEIS: • The Navy employs extensive mitigation measures during its training and testing activities, which the Navy believes significantly, minimizes the risk to marine mammals. • During several decades of training and testing with explosives, only four marine mammals are known to have died during one training accident. Following this incident and in accordance with standard operating procedures, the Navy has ceased all similar training, reviewed mitigation measures, worked with regulators, and have revised Navy mitigation measures. • There is evidence of fewer than 40 marine mammal stranding deaths worldwide connected to Navy sonar training, and no such incidents have occurred since 2006. By comparison, along the coasts of the continental United States, Alaska, and the U.S. Pacific Islands (including Hawaii) over a 9-year period (2001-2009), there were a total of 51,649 reported marine mammal strandings (12,545 cetaceans [average 1,394 per year] and 39,104 pinnipeds [average 4,345 per year]). There has never been a recorded marine mammal stranding in which Navy training or testing using sonar was a causal factor along the East Coast, West Coast, Gulf of Mexico, or Hawaii. • The Navy's modeling, which does not account for mitigation efforts, estimates there is a possibility marine mammals may be exposed to sound levels in certain frequencies that could result in a loss of hearing sensitivity. Using the mitigation measures, we expect the actual numbers of marine mammals affected by Navy training and testing to be much lower. See the Final EIS/OEIS for the refined analysis (refined in coordination with NMFS). The revised estimates now account for mitigation and avoidance, to provide a more holistic approach to analysis. Additionally, loss of hearing sensitivity at certain frequencies does not mean marine mammals will become deaf—they will still be able to hear, hunt for food, and perform other normal activities.

E.4 FINAL ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT

The public has the opportunity to review the Navy's responses to their comments in this Final EIS/OEIS. All public comments are considered by the decision-maker prior to making a decision.

Appendix F: Training and Testing Activities Matrices

APPENDIX F

TRAINING AND TESTING ACTIVITIES MATRICES

This Page Intentionally Left Blank

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

There are no figures in this section.

This Page Intentionally Left Blank

APPENDIX F TRAINING AND TESTING ACTIVITIES MATRICES

F.1 STRESSORS BY TRAINING ACTIVITY

Table F-1: Stressors by Training Activity

Hawaii-Southern California Training Activity	Biological Resources																Physical Resources						Human Resources							
	Acoustic Stressors							Energy Stressors		Physical Stressors				Entanglement Stressors		Ingestion Stressors	Air Quality Stressors		Sediment and Water Quality Stressors											
	Tactical Acoustic Sonar	Other Acoustic Devices	Underwater Explosives	In-air Explosives	Weapons Firing Noise	Aircraft Noise	Vessel and Simulated Vessel Noise	Electromagnetic Devices	Lasers	Aircraft and Aerial Target Strikes	Vessel and In-water Device Strikes	Military Expended Materials	Seafloor Devices	Fiber Optic Cables and Guidance Wires	Parachutes	Military Expended Materials	Criteria Air Pollutants	Hazardous Air Pollutants	Explosives	Metals	Chemicals	Other Materials	Acoustics [1, 4]	Physical Disturbance [1]	Accessibility [2]	Airborne Acoustics [2]	Physical Disturbance and Strikes [2]	Underwater Energy [3]	In-Air Energy [3]	Physical Interactions [3]
ANTI-AIR WARFARE (AAW)																														
Air Combat Maneuver (ACM)						✓				✓							✓	✓		✓			✓			✓	✓			
Air Defense Exercise (ADEX)						✓	✓			✓	✓						✓	✓								✓	✓			
Gunnery Exercise (Air-to-Air)					✓	✓				✓		✓				✓	✓	✓		✓				✓	✓	✓	✓			✓
Missile Exercise (Air-to-Air)				✓		✓				✓		✓			✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓
Gunnery Exercise (Surface-to-Air)				✓	✓	✓	✓			✓	✓	✓				✓	✓	✓	✓	✓				✓	✓	✓	✓			✓
Missile Exercise (Surface-to-Air)				✓	✓	✓	✓			✓	✓	✓				✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓
Missile Exercise – Man-portable Air Defense System				✓		✓				✓		✓				✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓
AMPHIBIOUS WARFARE (AMW)																														
Fire Support Exercise – Land-Based Target					✓		✓				✓						✓	✓							✓	✓				✓
Fire Support Exercise – At Sea			✓		✓		✓				✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓		✓
Amphibious Assault						✓	✓			✓	✓						✓	✓						✓	✓		✓			✓
Amphibious Assault – Battalion Landing							✓			✓	✓						✓	✓						✓	✓		✓			✓
Amphibious Raid						✓	✓				✓						✓	✓						✓	✓		✓			✓
Expeditionary Fires Exercise/Supporting Arms Coordination Exercise					✓	✓	✓				✓						✓	✓							✓	✓				✓
Humanitarian Assistance Operations						✓	✓			✓	✓						✓	✓						✓	✓		✓			✓
STRIKE WARFARE (STW)																														
Bombing Exercise (Air-to-Ground)						✓				✓		✓					✓	✓		✓			✓	✓		✓				
Gunnery Exercise (Air-to-Ground)						✓				✓		✓					✓	✓		✓			✓	✓		✓				

Table F-1: Stressors by Training Activity (continued)

Hawaii-Southern California Training Activity	Biological Resources																Physical Resources						Human Resources							
	Acoustic Stressors							Energy Stressors		Physical Stressors				Entanglement Stressors		Ingestion Stressors	Air Quality Stressors		Sediment and Water Quality Stressors											
	Tactical Acoustic Sonar	Other Acoustic Devices	Underwater Explosives	In-air Explosives	Weapons Firing Noise	Aircraft Noise	Vessel and Simulated Vessel Noise	Electromagnetic Devices	Lasers	Aircraft and Aerial Target Strikes	Vessel and In-water Device Strikes	Military Expended Materials	Seafloor Devices	Fiber Optic Cables and Guidance Wires	Parachutes	Military Expended Materials	Criteria Air Pollutants	Hazardous Air Pollutants	Explosives	Metals	Chemicals	Other Materials	Acoustics [1, 4]	Physical Disturbance [1]	Accessibility [2]	Airborne Acoustics [2]	Physical Disturbance and Strikes [2]	Underwater Energy [3]	In-Air Energy [3]	Physical Interactions [3]
ANTI-SURFACE WARFARE (ASUW)																														
Maritime Security Operations						✓	✓			✓	✓	✓				✓	✓	✓							✓	✓	✓			✓
Gunnery Exercise (Surface-to-Surface) Ship – Small-Caliber							✓				✓	✓				✓	✓	✓		✓					✓	✓	✓			✓
Gunnery Exercise (Surface-to-Surface) Ship – Medium and Large Caliber			✓		✓		✓				✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓		✓
Gunnery Exercise (Surface-to-Surface) Boat – Small-Caliber							✓				✓	✓				✓	✓	✓		✓				✓	✓	✓	✓			✓
Gunnery Exercise (Surface-to-Surface) Boat – Medium-Caliber			✓		✓		✓				✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓		✓
Missile Exercise (Surface-to-Surface)			✓		✓		✓				✓	✓				✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓
Gunnery Exercise (Air-to-Surface) – Small-Caliber						✓				✓		✓				✓	✓	✓		✓				✓	✓	✓	✓			✓
Gunnery Exercise (Air-to-Surface) – Medium-Caliber			✓			✓				✓	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓		✓
Missile Exercise (Air-to-Surface) Rocket			✓			✓				✓	✓	✓				✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Missile Exercise (Air-to-Surface)			✓			✓				✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Bombing Exercise (Air-to-Surface)			✓			✓				✓		✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓
Laser Targeting						✓	✓		✓	✓	✓						✓	✓							✓	✓	✓		✓	✓
Sinking Exercise (SINKEX)			✓		✓	✓	✓		✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓
ANTI-SUBMARINE WARFARE (ASW)																														
Tracking Exercise/Torpedo Exercise – Submarine	✓						✓			✓	✓	✓		✓						✓				✓			✓	✓		✓
Tracking Exercise/Torpedo Exercise – Surface	✓					✓	✓				✓	✓					✓	✓						✓	✓	✓	✓	✓		✓
Tracking Exercise/Torpedo Exercise – Helicopter	✓					✓	✓			✓	✓	✓			✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓		✓
Tracking Exercise/Torpedo Exercise – Maritime Patrol Aircraft	✓					✓	✓			✓	✓	✓			✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓		✓

Table F-1: Stressors by Training Activity (continued)

Hawaii-Southern California Training Activity	Biological Resources																Physical Resources						Human Resources							
	Acoustic Stressors							Energy Stressors		Physical Stressors				Entanglement Stressors		Ingestion Stressors	Air Quality Stressors		Sediment and Water Quality Stressors											
	Tactical Acoustic Sonar	Other Acoustic Devices	Underwater Explosives	In-air Explosives	Weapons Firing Noise	Aircraft Noise	Vessel and Simulated Vessel Noise	Electromagnetic Devices	Lasers	Aircraft and Aerial Target Strikes	Vessel and In-water Device Strikes	Military Expended Materials	Seafloor Devices	Fiber Optic Cables and Guidance Wires	Parachutes	Military Expended Materials	Criteria Air Pollutants	Hazardous Air Pollutants	Explosives	Metals	Chemicals	Other Materials	Acoustics [1, 4]	Physical Disturbance [1]	Accessibility [2]	Airborne Acoustics [2]	Physical Disturbance and Strikes [2]	Underwater Energy [3]	In-Air Energy [3]	Physical Interactions [3]
ANTI-SUBMARINE WARFARE (ASW) (Continued)																														
Tracking Exercise/Torpedo Exercise – Maritime Patrol Advanced Extended Echo Ranging Sonobuoys	✓		✓			✓				✓		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
KILO Dip-Helicopter	✓					✓				✓							✓	✓	✓					✓	✓	✓	✓	✓		✓
Submarine Command Course (SCC) Operations	✓	✓				✓	✓			✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓
ELECTRONIC WARFARE (EW)																														
Electronic Warfare Operations (EW Ops)						✓	✓			✓	✓						✓	✓							✓	✓	✓			✓
Counter Targeting Flare Exercise						✓				✓						✓	✓	✓		✓		✓		✓	✓	✓	✓			✓
Counter Targeting Chaff Exercise – Ship							✓				✓					✓	✓	✓				✓			✓					✓
Counter Targeting Chaff Exercise – Aircraft						✓				✓						✓	✓	✓				✓				✓				✓
MINE WARFARE (MIW)																														
Mine Countermeasure Exercise – Ship Sonar	✓						✓				✓		✓				✓	✓							✓			✓		✓
Mine Countermeasure Exercise – Surface (SMCMEX)	✓						✓				✓		✓				✓	✓							✓			✓		✓
Mine Neutralization – Explosive Ordnance Disposal (EOD)			✓			✓	✓			✓	✓	✓	✓			✓	✓	✓	✓				✓	✓	✓	✓	✓	✓		✓
Mine Countermeasure (MCM) – Towed Mine Neutralization						✓	✓	✓		✓	✓		✓				✓	✓						✓	✓	✓	✓	✓		✓
Mine Countermeasure (MCM) – Mine Detection	✓					✓	✓			✓	✓		✓				✓	✓						✓	✓	✓	✓	✓	✓	✓
Mine Countermeasure (MCM) – Mine Neutralization					✓	✓	✓			✓	✓	✓	✓			✓	✓	✓		✓				✓	✓	✓	✓		✓	✓
Mine Neutralization – Remotely Operated Vehicle			✓			✓	✓			✓	✓	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓		✓
Mine Laying**						✓				✓		✓					✓	✓		✓				✓	✓	✓	✓			✓

Table F-1: Stressors by Training Activity (continued)

Hawaii-Southern California Training Activity	Biological Resources																Physical Resources						Human Resources							
	Acoustic Stressors							Energy Stressors		Physical Stressors				Entanglement Stressors		Ingestion Stressors	Air Quality Stressors		Sediment and Water Quality Stressors											
	Tactical Acoustic Sonar	Other Acoustic Devices	Underwater Explosives	In-air Explosives	Weapons Firing Noise	Aircraft Noise	Vessel and Simulated Vessel Noise	Electromagnetic Devices	Lasers	Aircraft and Aerial Target Strikes	Vessel and In-water Device Strikes	Military Expended Materials	Seafloor Devices	Fiber Optic Cables and Guidance Wires	Parachutes	Military Expended Materials	Criteria Air Pollutants	Hazardous Air Pollutants	Explosives	Metals	Chemicals	Other Materials	Acoustics [1,4]	Physical Disturbance [1]	Accessibility [2]	Airborne Acoustics [2]	Physical Disturbance and Strikes [2]	Underwater Energy [3]	In-Air Energy [3]	Physical Interactions [3]
MINE WARFARE (MIW) (continued)																														
Marine Mammal System			✓														✓	✓	✓	✓				✓	✓	✓	✓	✓		✓
Shock Wave Action Generator			✓													✓				✓				✓	✓	✓	✓	✓		✓
Surf Zone Test Detachment/Equipment Test and Evaluation			✓																									✓		
Submarine Mine Exercise											✓	✓	✓															✓		✓
Civilian Port Defense	✓		✓			✓	✓	✓		✓	✓		✓				✓	✓	✓				✓	✓	✓	✓	✓	✓		✓
NAVAL SPECIAL WARFARE (NSW)																														
Personnel Insertion/Extraction – Submarine											✓																			
Personnel Insertion/Extraction – Non-submarine						✓				✓							✓	✓	✓											
Underwater Demo Multiple Charge – Mat Weave & Obstacle Loading			✓									✓	✓			✓	✓	✓	✓				✓	✓	✓	✓	✓	✓		✓
Underwater Demolition Qualification/Certification			✓									✓	✓			✓	✓	✓	✓				✓	✓	✓	✓	✓	✓		✓
MAJOR TRAINING EVENTS																														
ASW for Composite Training Unit Exercise (COMPTUEX)	✓	✓	✓			✓	✓			✓	✓	✓			✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓
ASW for Joint Task Force Exercise (JTFEX)/Sustainment Exercise (SUSTAINEX)	✓	✓	✓			✓	✓			✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓
Rim of the Pacific (RIMPAC) Exercise	✓	✓	✓			✓	✓			✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓
Multi-Strike Group Exercise	✓	✓	✓			✓	✓			✓	✓	✓			✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓
Integrated Anti-Submarine Warfare Course (IAC)	✓	✓				✓	✓			✓	✓	✓			✓	✓	✓	✓		✓	✓			✓	✓	✓	✓	✓		✓
Group Sail	✓	✓	✓			✓	✓			✓	✓	✓			✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓
Undersea Warfare Exercise (USWEX)	✓	✓	✓			✓	✓			✓	✓	✓			✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓

Table F-1: Stressors by Training Activity (continued)

Hawaii-Southern California Training Activity	Biological Resources																Physical Resources						Human Resources							
	Acoustic Stressors							Energy Stressors		Physical Stressors				Entanglement Stressors		Ingestion Stressors	Air Quality Stressors		Sediment and Water Quality Stressors											
	Tactical Acoustic Sonar	Other Acoustic Devices	Underwater Explosives	In-air Explosives	Weapons Firing Noise	Aircraft Noise	Vessel and Simulated Vessel Noise	Electromagnetic Devices	Lasers	Aircraft and Aerial Target Strikes	Vessel and In-water Device Strikes	Military Expended Materials	Seafloor Devices	Fiber Optic Cables and Guidance Wires	Parachutes	Military Expended Materials	Criteria Air Pollutants	Hazardous Air Pollutants	Explosives	Metals	Chemicals	Other Materials	Acoustics [1,4]	Physical Disturbance [1]	Accessibility [2]	Airborne Acoustics [2]	Physical Disturbance and Strikes [2]	Underwater Energy [3]	In-Air Energy [3]	Physical Interactions [3]
MAJOR TRAINING EVENTS (continued)																														
Ship ASW Readiness and Evaluation Measuring (SHAREM)	✓	✓	✓			✓	✓			✓	✓	✓			✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓
OTHER TRAINING EXERCISES																														
Precision Anchoring							✓				✓		✓				✓	✓						✓	✓		✓			✓
Small Boat Attack					✓		✓				✓					✓	✓	✓		✓										
Offshore Petroleum Discharge System (OPDS)																	✓	✓												
Elevated Causeway System (ELCAS)		✓																							✓			✓		
Submarine Navigation	✓										✓																✓	✓		✓
Submarine Under Ice Certification	✓										✓																✓	✓		✓
Salvage Operations													✓				✓	✓	✓					✓			✓			✓
Surface Ship Sonar Maintenance	✓						✓				✓																	✓		
Submarine Sonar Maintenance	✓										✓																	✓		

[1] Cultural resources stressor
[2] Socioeconomics stressor
[3] Public health and safety stressor
[4] Acoustics Stressor includes only underwater explosives and airborne sonic booms
** Alternative 1 and Alternative 2 only
Note: A check indicates events that take place for all alternatives.

F.2 STRESSORS BY TESTING ACTIVITY

Table F-2: Stressors by Testing Activity

Hawaii-Southern California Testing Activity	Biological Resources																Physical Resources						Human Resources							
	Acoustic Stressors							Energy Stressors		Physical Stressors				Entanglement Stressors		Ingestion Stressors	Air Quality Stressors		Sediment and Water Quality Stressors											
	Tactical Acoustic Sonar	Other Acoustic Devices	Underwater Explosives	In-air Explosives	Weapons Firing Noise	Aircraft Noise	Vessel and Simulated Vessel Noise	Electromagnetic Devices	Lasers	Aircraft and Aerial Target Strikes	Vessel and In-water Device Strikes	Military Expended Materials	Seafloor Devices	Fiber Optic Cables and Guidance Wires	Parachutes	Military Expended Materials	Criteria Air Pollutants	Hazardous Air Pollutants	Explosives	Metals	Chemicals	Other Materials	Acoustics [1, 4]	Physical Disturbance [1]	Accessibility [2]	Airborne Acoustics [2]	Physical Disturbance and Strikes [2]	Underwater Energy [3]	In-Air Energy [3]	Physical Interactions [3]
Naval Air Systems Command																														
ANTI-AIR WARFARE (AAW)																														
Air Combat Maneuver (ACM)						✓				✓							✓	✓								✓	✓			✓
Air Platform/Vehicle Test						✓				✓		✓					✓	✓		✓						✓	✓		✓	✓
Air Platform Weapons Integration Test						✓				✓		✓				✓	✓	✓	✓	✓					✓	✓	✓			✓
Intelligence, Surveillance, and Reconnaissance Test						✓				✓							✓	✓								✓	✓			✓
ANTI-SURFACE WARFARE (ASUW)																														
Air-to-Surface Missile Test			✓			✓				✓		✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓
Air-to-Surface Gunnery Test			✓		✓	✓				✓		✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓		✓
Rocket Test			✓			✓				✓		✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Laser Targeting Test						✓				✓							✓	✓								✓	✓		✓	✓
ELECTRONIC WARFARE (EW)																														
Electronic System Evaluation						✓				✓							✓	✓								✓	✓			✓
ANTI-SUBMARINE WARFARE (ASW)																														
Anti-Submarine Warfare Torpedo Test	✓					✓				✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓		✓
Kilo Dip	✓					✓				✓							✓	✓							✓	✓	✓	✓		✓
Sonobuoy Lot Acceptance Test	✓		✓			✓	✓			✓	✓	✓			✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓		✓
Anti-Submarine Warfare Tracking Test – Helicopter	✓		✓			✓				✓		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Anti-Submarine Warfare Tracking Test – Maritime Patrol Aircraft	✓		✓			✓				✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓

Table F-2: Stressors by Testing Activity (continued)

Hawaii-Southern California Testing Activity	Biological Resources																Physical Resources						Human Resources							
	Acoustic Stressors							Energy Stressors		Physical Stressors				Entanglement Stressors		Ingestion Stressors	Air Quality Stressors		Sediment and Water Quality Stressors											
	Tactical Acoustic Sonar	Other Acoustic Devices	Underwater Explosives	In-air Explosives	Weapons Firing Noise	Aircraft Noise	Vessel and Simulated Vessel Noise	Electromagnetic Devices	Lasers	Aircraft and Aerial Target Strikes	Vessel and In-water Device Strikes	Military Expended Materials	Seafloor Devices	Fiber Optic Cables and Guidance Wires	Parachutes	Military Expended Materials	Criteria Air Pollutants	Hazardous Air Pollutants	Explosives	Metals	Chemicals	Other Materials	Acoustics [1, 4]	Physical Disturbance [1]	Accessibility [2]	Airborne Acoustics [2]	Physical Disturbance and Strikes [2]	Underwater Energy [3]	In-Air Energy [3]	Physical Interactions [3]
MINE WARFARE (MIW)																														
Airborne Mine Neutralization Systems Test (AMNS)			✓			✓				✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Airborne Towed Minehunting Sonar System Test	✓					✓				✓	✓						✓	✓							✓	✓	✓	✓		✓
Airborne Towed Minesweeping System Test			✓			✓		✓		✓	✓		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Airborne Laser-Based Mine Detection System Test – ALMDS						✓				✓							✓	✓							✓	✓	✓		✓	✓
Airborne Projectile-based Mine Clearance System Test			✓			✓				✓		✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
OTHER TESTING ACTIVITIES																														
Test and Evaluation Catapult Launch						✓	✓			✓	✓						✓	✓							✓	✓	✓			✓
Air Platform Shipboard Integrate Test						✓				✓							✓	✓							✓	✓	✓			✓
Shipboard Electronic Systems Evaluation						✓				✓							✓	✓								✓	✓			✓
NAVAL SEA SYSTEMS COMMAND																														
NEW SHIP CONSTRUCTION																														
Surface Combatant Sea Trials: Pierside Sonar Testing**	✓	✓																										✓		
Surface Combatant Sea Trials: Propulsion Testing							✓				✓						✓	✓							✓		✓			✓
Surface Combatant Sea Trials: Gun Testing, Large-Caliber					✓		✓				✓	✓				✓	✓	✓		✓				✓	✓	✓	✓			✓
Surface Combatant Sea Trials: Missile Testing				✓	✓	✓	✓			✓	✓	✓				✓	✓	✓		✓				✓	✓	✓	✓			✓
Surface Combatant Sea Trials: Decoy Testing							✓				✓	✓				✓	✓	✓				✓			✓		✓			✓
Surface Combatant Sea Trials: Anti-Surface Warfare Testing					✓		✓				✓	✓					✓	✓		✓				✓	✓	✓	✓			✓
Surface Combatant Sea Trials: Anti-Submarine Warfare Testing	✓	✓					✓				✓						✓	✓		✓	✓	✓			✓		✓	✓		✓

Table F-2: Stressors by Testing Activity (continued)

Hawaii-Southern California Testing Activity		Biological Resources																Physical Resources						Human Resources							
		Acoustic Stressors							Energy Stressors		Physical Stressors				Entanglement Stressors		Ingestion Stressors	Air Quality Stressors		Sediment and Water Quality Stressors											
		Tactical Acoustic Sonar	Other Acoustic Devices	Underwater Explosives	In-air Explosives	Weapons Firing Noise	Aircraft Noise	Vessel and Simulated Vessel Noise	Electromagnetic Devices	Lasers	Aircraft and Aerial Target Strikes	Vessel and In-water Device Strikes	Military Expended Materials	Seafloor Devices	Fiber Optic Cables and Guidance Wires	Parachutes	Military Expended Materials	Criteria Air Pollutants	Hazardous Air Pollutants	Explosives	Metals	Chemicals	Other Materials	Acoustics [1,4]	Physical Disturbance [1]	Accessibility [2]	Airborne Acoustics [2]	Physical Disturbance and Strikes [2]	Underwater Energy [3]	In-Air Energy [3]	Physical Interactions [3]
NEW SHIP CONSTRUCTION (Continued)																															
Other Ship Class Sea Trials*	Propulsion Testing							✓				✓						✓	✓							✓		✓			✓
	Gun Testing – Small-Caliber							✓				✓	✓				✓	✓	✓							✓	✓	✓			✓
ASW Mission Package Testing		✓					✓	✓			✓	✓	✓			✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓		✓
ASUW Mission Package Testing	Gun Testing – Small-Caliber					✓		✓				✓	✓				✓	✓	✓		✓				✓	✓	✓	✓			✓
	Gun Testing – Medium-Caliber			✓	✓	✓		✓				✓	✓				✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓
	Gun Testing – Large-Caliber			✓	✓	✓		✓				✓	✓				✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓
	Missile/Rocket Testing			✓		✓	✓	✓			✓	✓	✓				✓	✓	✓	✓				✓	✓	✓	✓	✓	✓		✓
MCM Mission Package Testing**		✓		✓			✓	✓			✓	✓					✓	✓	✓		✓			✓	✓	✓	✓	✓	✓	✓	✓
Post-Homeporting Testing (All Classes)**								✓				✓						✓	✓							✓		✓			✓
LIFECYCLE ACTIVITIES																															
Ship Signature Testing**								✓				✓						✓	✓									✓			✓
Surface Ship Sonar Testing/Maintenance (in OPAREAs and Ports)**		✓	✓					✓				✓						✓	✓									✓	✓		✓
Submarine Sonar Testing/Maintenance (in OPAREAs and Ports)**		✓	✓									✓																✓	✓		✓
Combat System Ship Qualification Trial (CSSQT) – In-port Maintenance Period**		✓																											✓		
Combat System Ship Qualification Trial (CSSQT) – Air Defense**					✓	✓	✓	✓			✓	✓	✓				✓	✓	✓		✓		✓		✓		✓	✓			✓
Combat System Ship Qualification Trial (CSSQT) – Anti-Surface Warfare**					✓	✓		✓				✓	✓				✓	✓	✓		✓		✓		✓		✓	✓			✓
Combat System Ship Qualification Trial (CSSQT) – Undersea Warfare**		✓					✓	✓			✓	✓	✓			✓	✓	✓	✓		✓		✓		✓		✓	✓	✓		✓

Table F-2: Stressors by Testing Activity (continued)

Hawaii-Southern California Testing Activity	Biological Resources																Physical Resources						Human Resources							
	Acoustic Stressors							Energy Stressors		Physical Stressors				Entanglement Stressors		Ingestion Stressors	Air Quality Stressors		Sediment and Water Quality Stressors											
	Tactical Acoustic Sonar	Other Acoustic Devices	Underwater Explosives	In-air Explosives	Weapons Firing Noise	Aircraft Noise	Vessel and Simulated Vessel Noise	Electromagnetic Devices	Lasers	Aircraft and Aerial Target Strikes	Vessel and In-water Device Strikes	Military Expended Materials	Seafloor Devices	Fiber Optic Cables and Guidance Wires	Parachutes	Military Expended Materials	Criteria Air Pollutants	Hazardous Air Pollutants	Explosives	Metals	Chemicals	Other Materials	Acoustics [1,4]	Physical Disturbance [1]	Accessibility [2]	Airborne Acoustics [2]	Physical Disturbance and Strikes [2]	Underwater Energy [3]	In-Air Energy [3]	Physical Interactions [3]
ANTI-SURFACE WARFARE/ANTI-SUBMARINE WARFARE TESTING																														
Missile Testing**					✓		✓			✓	✓	✓					✓	✓	✓	✓	✓			✓	✓	✓	✓			✓
Kinetic Energy Weapon Testing**					✓		✓				✓	✓					✓	✓	✓	✓	✓			✓	✓	✓	✓			✓
Electronic Warfare Testing**											✓																✓			✓
Torpedo (Non-explosive) Testing	✓	✓				✓	✓			✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓
Torpedo (Explosive) Testing	✓		✓			✓	✓			✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Countermeasure Testing**	✓	✓					✓				✓						✓	✓						✓			✓	✓		✓
Pierside Sonar Testing**	✓																											✓		
At-sea Sonar Testing**	✓	✓					✓				✓	✓					✓	✓									✓	✓		✓
MINE WARFARE TESTING																														
Mine Detection and Classification Testing**	✓					✓	✓			✓	✓						✓	✓							✓	✓	✓	✓		✓
Mine Countermeasure/Neutralization Testing**	✓		✓			✓	✓	✓		✓	✓			✓		✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓		✓
Pierside Systems Health Checks**	✓	✓																												
SHIPBOARD PROTECTION SYSTEMS AND SWIMMER DEFENSE TESTING																														
Pierside Integrated Swimmer Defense	✓	✓											✓											✓		✓		✓		✓
Shipboard Protection Systems Testing**							✓				✓	✓				✓	✓	✓		✓						✓	✓	✓		✓
Chemical/Biological Simulant Testing**						✓	✓			✓	✓						✓	✓			✓	✓			✓	✓	✓			✓

Table F-2: Stressors by Testing Activity (continued)

Hawaii-Southern California Testing Activity	Biological Resources																Physical Resources						Human Resources							
	Acoustic Stressors							Energy Stressors		Physical Stressors				Entanglement Stressors		Ingestion Stressors	Air Quality Stressors		Sediment and Water Quality Stressors											
	Tactical Acoustic Sonar	Other Acoustic Devices	Underwater Explosives	In-air Explosives	Weapons Firing Noise	Aircraft Noise	Vessel and Simulated Vessel Noise	Electromagnetic Devices	Lasers	Aircraft and Aerial Target Strikes	Vessel and In-water Device Strikes	Military Expended Materials	Seafloor Devices	Fiber Optic Cables and Guidance Wires	Parachutes	Military Expended Materials	Criteria Air Pollutants	Hazardous Air Pollutants	Explosives	Metals	Chemicals	Other Materials	Acoustics 1, 4	Physical Disturbance 1	Accessibility 2	Airborne Acoustics 2	Physical Disturbance and Strikes 2	Underwater Energy 3	In-Air Energy 3	Physical Interactions 3
UNMANNED VEHICLE TESTING																														
Underwater Deployed Unmanned Aerial System Testing**						✓				✓	✓	✓								✓				✓	✓		✓			✓
Unmanned Vehicle Development and Payload Testing**	✓					✓	✓				✓		✓											✓	✓		✓	✓		✓
OTHER TESTING																														
Special Warfare	✓	✓					✓				✓																✓	✓		✓
Acoustic Communications Testing**							✓				✓																✓			✓
SPACE AND NAVAL WARFARE SYSTEMS COMMAND																														
Autonomous Undersea Vehicle (AUV) Anti-Terrorism/Force Protection (AT/FP) Mine Countermeasures		✓									✓																			
AUV Underwater Communications		✓									✓																			
Fixed System Underwater Communications		✓							✓		✓		✓	✓																
AUV Autonomous Oceanographic Research and Meteorology and Oceanography (METOC)		✓																												
Fixed Autonomous Oceanographic Research and METOC		✓											✓																	
Passive Mobile Intelligence, Surveillance, and Reconnaissance Sensor Systems		✓					✓				✓																			
Fixed Intelligence, Surveillance, and Reconnaissance Sensor Systems		✓					✓				✓		✓	✓																
Anti-Terrorism/Force Protection (AT/FP) Fixed Sensor Systems		✓																												
OFFICE OF NAVAL RESEARCH																														
Kauai Acoustic Communications Experiment (Coastal)																														

[1] Cultural resources stressor, [2] Socioeconomics stressor; [3] Public health and safety stressor, [4] Acoustics stressor includes only underwater explosives and airborne sonic booms, ** Alternative 1 and Alternative 2 only
Notes: (1) A check indicates events that take place for all alternatives; (2) * "Other Ships" indicates classes of vessels without hull-mounted sonar. Example ship classes include: LCS, MLP, and T-AKE.

F.3 STRESSORS BY RESOURCE

Table F-3: Stressors by Resource

Stressors vs. Resources		Biological Resources																Physical Resources						Human Resources							
		Acoustic Stressors							Energy Stressors		Physical Stressors				Entanglement Stressors		Ingestion Stressors	Air Quality Stressors		Sediment and Water Quality Stressors											
		Tactical Acoustic Sonar	Other Acoustic Devices	Underwater Explosives	In-air Explosives	Weapons Firing Noise	Aircraft Noise	Vessel and Simulated Vessel Noise	Electromagnetic Devices	Lasers	Aircraft and Aerial Target Strikes	Vessel and In-water Device Strikes	Military Expended Materials	Seafloor Devices	Fiber Optic Cables and Guidance Wires	Parachutes	Military Expended Materials	Criteria Air Pollutants	Hazardous Air Pollutants	Explosives and Explosive Byproducts	Metals	Chemicals Other than Explosives	Other Materials	Acoustics [1, 4]	Physical Disturbance [1]	Accessibility [2]	Airborne Acoustics [2]	Physical Disturbance and Strikes [2]	Underwater Energy [3]	In-Air Energy [3]	Physical Interactions [3]
Physical	Sediments and Water Quality																			✓	✓	✓	✓								
Physical	Air Quality																	✓	✓												
Biological	Marine Habitats			✓								✓	✓	✓																	
Biological	Marine Mammals	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓			✓	✓	✓	✓								
Biological	Sea Turtles	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓			✓	✓	✓	✓								
Biological	Birds	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓				✓	✓	✓												
Biological	Marine Vegetation			✓								✓	✓	✓						✓	✓	✓	✓								
Biological	Marine Invertebrates	✓	✓	✓					✓	✓		✓	✓	✓	✓	✓	✓			✓	✓	✓	✓								
Biological	Fish	✓	✓	✓		✓		✓	✓	✓		✓	✓	✓	✓	✓	✓			✓	✓	✓	✓								
Human	Cultural Resources			✓			✓						✓	✓										✓	✓						
Human	Socioeconomic Resources		✓	✓	✓	✓	✓	✓				✓	✓		✓	✓				✓	✓	✓	✓			✓	✓	✓			
Human	Public Health and Safety	✓	✓	✓	✓	✓				✓	✓	✓	✓																✓	✓	✓

[1] Cultural resources stressor, [2] Socioeconomics stressor, [3] Public health and safety stressor, [4] Acoustics stressor includes only underwater explosives and airborne sonic booms

This Page Intentionally Left Blank

Appendix G: Statistical Probability Analysis for Estimating Direct Strike Impact and Number of Potential Exposures

APPENDIX G

STATISTICAL PROBABILITY ANALYSIS FOR ESTIMATING DIRECT STRIKE IMPACT AND NUMBER OF POTENTIAL EXPOSURES

This Page Intentionally Left Blank

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

There are no figures in this section.

This Page Intentionally Left Blank

APPENDIX G STATISTICAL PROBABILITY ANALYSIS FOR ESTIMATING DIRECT STRIKE IMPACT AND NUMBER OF POTENTIAL EXPOSURES

This appendix discusses the methods and results for calculating the probability of a direct strike of an animal from any military items from the proposed training and testing activities falling toward (or directed at) the sea surface. For the purposes of this appendix, military items include non-explosive practice munitions (e.g., rounds from shipboard small-arms live-fire training), sonobuoys, acoustic countermeasures, and targets. Only marine mammals and sea turtles will be analyzed using these methods because animal densities are necessary to complete the calculations, and density estimates are currently only available for marine mammals and sea turtles within the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area). Furthermore, the analysis conducted here does not account for explosive munitions because impacts from explosives are analyzed within the United States (U.S.) Department of the Navy (Navy) Acoustic Effects Model.

G.1 DIRECT IMPACT ANALYSIS

A statistical probability was calculated to estimate the impact probability (P) and number of exposures (T) associated with direct impact of military items on marine animals on the sea surface within the specified training or testing area (R) in which the activities are occurring. The statistical probability analysis is based on probability theory and modified Venn diagrams with rectangular "footprint" areas for the individual animal (A) and total impact (I) inscribed inside the training or testing area (R). The analysis assumes: (1) that all animals would be at or near the surface 100 percent of the time, when in fact, marine mammals spend the majority of their time underwater, and (2) that the animals are stationary, which does not account for any movement or any potential avoidance of the training or testing activity.

1. A = length*width, where the individual animal's width (breadth) is assumed to be 20 percent of its length for marine mammals and 112 percent of its length for sea turtles. This product for A is multiplied by the number of animals N_a in the specified training or testing area (i.e., product of the highest average seasonal animal density [D] and training or testing area [R]: N_a = D*R) to obtain the total animal footprint area ($A*N_a$ = A*D*R) in the training or testing area. As a worst case scenario, the total animal footprint area is calculated for the species with the highest average seasonal density in the training or testing area with the highest use of military items within the entire Study Area.

2. I = N_{mun}*length*diameter, where N_{mun} = total annual number of military items for each type, and "length" and "diameter" refer to the individual military equipment dimensions. For each type, the individual impact footprint area is multiplied by the total annual number of military items to obtain the type-specific impact footprint area (I = N_{mun}*length*diameter). Each training or testing activity uses one or more different types of military items, each with a specific number and dimensions, and several training and testing activities occur in a given year. When integrating over the number of military items types for the given activity (and then over the number of activities in a year), these calculations are repeated (accounting for differences in dimensions and numbers) for all military items types used, to obtain the type-specific impact footprint area (I). These impact footprint areas are summed over all military items types for the given activity, and then summed (integrated) over all activities to obtain the total impact footprint area resulting from all activities occurring in the training or testing area in a given year.

As a worst case scenario, the total impact footprint area is calculated for the training or testing area with the highest use of military items within the entire Study Area.

Though marine mammals and sea turtles are not randomly distributed in the environment, a random point calculation was chosen due to the intensive data needs that would be required for a calculation that incorporated more detailed information on an animal's or military item's spatial occurrence.

The analysis is expected to provide an overestimation of the probability of a strike for the following reasons: (1) it calculates the probability of a single military item (of all the items expended over the course of the year) hitting a single animal at its species' highest seasonal density; (2) it does not take into account the possibility that an animal may avoid military activities; (3) it does not take into account the possibility that an animal may not be at the water surface; (4) it does not take into account that most projectiles fired during training and testing activities are fired at targets; and so only a very small portion of those projectiles that miss the target would hit the water with their maximum velocity and force; and (5) it does not quantitatively take into account the Navy avoiding animals that are sighted through the implementation of mitigation measures.

The likelihood of an impact is calculated as the probability (P) that the animal footprint (A) and the impact footprint (I) will intersect within the training or testing area (R). This is calculated as the area ratio A/R or I/R, respectively. Note that A (referring to an **individual** animal footprint) and I (referring to the impact footprint resulting from the **total** number of military items N_{mun}) are the relevant quantities used in the following calculations of single-animal impact probability [P], which is then multiplied by the number of animals to obtain the number of exposures (T). The probability that the random point in the training or testing area is within both types of footprints (i.e., A and I) depends on the degree of overlap of A and I. The probability that I overlaps A is calculated by adding a buffer distance around A based on one-half of the impact area (i.e., 0.5*I), such that an impact (center) occurring anywhere within the combined (overlapping) area would impact the animal. Thus, if L_i and W_i are the length and width of the impact footprint such that $L_i*W_i = 0.5*I$ and $W_i/L_i = L_a/W_a$ (i.e., similar geometry between the animal footprint and impact footprint), and if L_a and W_a are the length and width (breadth) of the individual animal such that $L_a*W_a = A$ (= individual animal footprint area), then, assuming a purely static, rectangular scenario (Scenario 1), the total area $A_{tot} = (L_a + 2*L_i)*(W_a + 2*W_i)$, and the buffer area $A_{buffer} = A_{tot} – L_a*W_a$.

Four scenarios were examined with respect to defining and setting up the overlapping combined areas of A and I:

1. **Scenario 1:** Purely static, rectangular scenario. Impact is assumed to be static (i.e., direct impact effects only; non-dynamic; no explosions or scattering of military items after the initial impact). Hence the impact footprint area (I) is assumed to be rectangular and given by the product of military items length and width (multiplied by the number of military items). $A_{tot} = (L_a + 2*L_i)*(W_a + 2*W_i)$ and $A_{buffer} = A_{tot} – L_a*W_a$.

2. **Scenario 2:** Dynamic scenario with end-on collision, in which the length of the impact footprint (Li) is enhanced by Rn = 5 military items lengths to reflect forward momentum. $A_{tot} = (L_a + (1 + R_n)*L_i)*(W_a + 2*W_i)$ and $A_{buffer} = A_{tot} – L_a*W_a$.

3. **Scenario 3:** Dynamic scenario with broadside collision, in which the width of the impact footprint (W_i) is enhanced by R_n = 5 military items lengths to reflect forward momentum. Atot = $(L_a + 2*W_i)*(W_a + (1 + R_n)*L_i)$ and $A_{buffer} = A_{tot} – L_a*W_a$.

4. **Scenario 4:** Purely static, radial scenario, in which the rectangular animal and impact footprints are replaced with circular footprints while conserving area. Define the radius (R_a) of the circular individual animal footprint such that $\pi * R_a^2 = L_a * W_a$, and define the radius (R_i) of the circular impact footprint such that $\pi * R_i^2 = 0.5 * L_i * W_i = 0.5 * I$. Then $A_{tot} = \pi * (R_a + R_i)^2$ and $A_{buffer} = A_{tot} - \pi * R_a^2$ (where $\pi = 3.1415927$).

Static impacts (Scenarios 1 and 4) assume no additional areal coverage effects of scattered military items beyond the initial impact. For dynamic impacts (Scenarios 2 and 3), the distance of any scattered military items must be considered by increasing the length (Scenario 2) or width (Scenario 3), depending on orientation (broadside versus end-on collision), of the impact footprint to account for the forward horizontal momentum of the falling object. Forward momentum typically accounts for five object lengths, resulting in a corresponding increase in impact area. Significantly different values may result from these two types of orientation. Both of these types of collision conditions can be calculated each with 50 percent likelihood (i.e., equal weighting between Scenarios 2 and 3, to average these potentially different values).

Impact probability P is the probability of impacting one animal with the given number, type, and dimensions of all military items used in training or testing activities occurring in the area per year, and is given by the ratio of total area (A_{tot}) to training or testing area (R): $P = A_{tot}/R$. Number of exposures is $T = N*P = N*A_{tot}/R$, where N = number of animals in the training or testing area per year (given as the product of the animal density [D] and range size [R]). Thus, $N = D*R$ and hence $T = N*P = N*A_{tot}/R = D*A_{tot}$. Using this procedure, P and T were calculated for each of the four scenarios, for Endangered Species Act (ESA)-listed marine mammals and the marine mammal and sea turtle species with the highest average seasonal density (used as the annual density value) and for each military item type. The scenario -specific P and T values were averaged over the four scenarios (using equal weighting) to obtain a single scenario -averaged annual estimate of P and T.

G.2 Parameters for Analysis

Impact probabilities (P) and number of exposures (T) were estimated by the analysis for the following parameters:

1. **Three proposed alternatives:** No Action Alternative, Alternative 1, and Alternative 2. Animal densities, animal dimensions, and military item dimensions are the same for the three alternatives.

2. **Two Training or Testing Areas:** Hawaii Range Complex (HRC) and Southern California (SOCAL) Operating Areas (OPAREA). Areas are 235,000 square nautical miles (nm^2) and 120,000 nm^2, respectively. These two training areas were chosen because they constitute the areas with the highest estimated numbers and concentrations of military expended materials for each alternative, and would, thus, provide a reasonable comparison for all other areas with fewer expended materials.

3. **The following types of munitions or other items:**

    a) **Small-caliber projectiles:** up to and including 0.50 caliber rounds
    b) **Medium-caliber projectiles:** larger than 0.50 caliber rounds but smaller than 57 millimeter (mm) projectiles
    c) **Large-caliber projectiles:** includes projectiles greater than or equal to a 57 mm projectile

d) **Missiles:** includes rockets and jet-propelled munitions
e) **Bombs:** Non-explosive practice bombs and mine shapes, ranging from 10 to 2,000 pounds (lb.) (4.5 to 907.2 kilograms [kg])
f) **Torpedoes:** includes aircraft deployed torpedoes
g) **Sonobuoys:** includes aircraft deployed sonobuoys

4. **Animal species of interest:** the six species of ESA-listed marine mammals and the non-ESA listed marine mammal species with the highest average seasonal density in the training and testing areas of interest. The sea turtle species with the highest average seasonal density in the training and testing areas of interest.

G.3 INPUT DATA

Input data for the direct strike analysis include animal species likely to be in the area and military items proposed for use under each of the three alternatives. Animal species data include: (1) species ID and status (i.e., threatened, endangered, or neither), (2) highest average seasonal density estimate for the species of interest, and (3) adult animal dimensions (length and width) for the species with the highest density. The animal's dimensions are used to calculate individual animal footprint areas (A = length*width), and animal densities are used to calculate the number of exposures (T) from the impact probability (P): T = N*P. Military items data include: (1) military items category (e.g., projectile, bomb, rocket, target), (2) military items dimensions (length and width), and (3) total number of military items used annually.

Military items input data, specifically the quantity (e.g., numbers of guns, bombs, and rockets), are different in magnitude among the three proposed alternatives (No Action Alternative, Alternative 1, and Alternative 2). All animal species input data, the military items identification and category, and military items dimensions, are the same for the three alternatives, only the quantities (i.e., total number of military items) are different.

G.4 OUTPUT DATA

Estimates of impact probability (P) and number of exposures (T) for a given species of interest, were made for the specified training or testing area with the highest annual number of military items used for each of the three alternatives. The calculations derived P and T from the highest annual number of military items used in the Study Area for the given alternative. Differences in P and T among the alternatives arise from different numbers of events (and therefore military items) for the three alternatives.

Results for marine mammals and sea turtles are presented in Table G-1 and Table G-2.

Table G-1: Estimated Annual Marine Mammal Exposures from Direct Strike of Munitions and Other Items by Area and Alternative

Pacific Marine Ecosystem						
HAWAII Operating Area						
Species	Training			Testing		
	No Action	Alternative 1	Alternative 2	No Action	Alternative 1	Alternative 2
Humpback	0.00011	0.00015	0.00015	<0.00001	0.00003	0.00003
Blue Whale	<0.00001	0.00001	0.00001	<0.00001	<0.00001	<0.00001
Fin Whale	<0.00001	0.00001	0.00001	<0.00001	<0.00001	<0.00001
Sei Whale	<0.00001	0.00001	0.00001	<0.00001	<0.00001	<0.00001
Sperm Whale	0.00015	0.00028	0.00028	0.00001	<0.00001	<0.00001
Hawaiian Monk Seal	<0.00001	0.00001	0.00001	<0.00001	<0.00001	<0.00001
Southwest Coast United States Continental Shelf Large Marine Ecosystem						
SOUTHERN CALIFORNIA Operating Area						
Species	Training			Testing		
	No Action	Alternative 1	Alternative 2	No Action	Alternative 1	Alternative 2
Humpback Whale	0.00032	0.00060	0.00060	0.00001	0.00005	0.00006
Blue Whale	0.00001	0.00002	0.00002	<0.00001	<0.00001	<0.00001
Fin Whale	0.00001	0.00002	0.00002	<0.00001	<0.00001	<0.00001
Sei Whale	0.00001	0.00003	0.00003	<0.00001	<0.00001	<0.00001
Sperm Whale	0.00044	0.00082	0.00082	0.00002	0.00007	0.00008
Guadalupe Fur Seal	0.00006	0.00006	0.00006	<0.00001	0.00001	0.00001

Table G-2: Estimated Sea Turtle Exposures from Direct Strike of Military Expended Materials by Area and Alternative

Pacific Marine Ecosystem						
HAWAII Operating Area						
Species	Training			Testing		
	No Action	Alternative 1	Alternative 2	No Action	Alternative 1	Alternative 2
Pacific Sea Turtle Guild	0.01361	0.02011	0.01937	0.00049	0.00432	0.00457

This Page Intentionally Left Blank

RECORD OF DECISION

ISSUANCE OF MARINE MAMMAL PROTECTION ACT (MMPA) REGULATIONS TO TAKE MARINE MAMMALS INCIDENTAL TO U.S. NAVY TRAINING AND TESTING ACTIVITIES IN THE HAWAII-SOUTHERN CALIFORNIA TRAINING AND TESTING STUDY AREA

Supported by: U.S. Navy Final Environmental Impact Statement/
Overseas Environmental Impact Statement for Hawaii-Southern California Training and Testing

National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of Protected Resources
Silver Spring, Maryland

In accordance with the National Environmental Policy Act (NEPA) and its implementing regulations and the National Oceanic and Atmospheric Administration's (NOAA's) Administrative Order 216-6 Environmental Review Procedures for Implementing the National Environmental Policy Act, this document comprises NOAA's National Marine Fisheries Service's (NMFS) Record of Decision (ROD) for issuance of regulations pursuant to section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1361 *et seq.*) to the U.S. Navy (Navy) for the taking of marine mammals incidental to the conduct of specified activities in the Hawaii-Southern California Training and Testing Study Area.

I. INTRODUCTION

In April 2012, NMFS received an application from the Navy requesting five-year regulations and authorizations for the take of 39 species of marine mammals incidental to Navy training and testing activities to be conducted within the Navy's Hawaii-Southern California Training and Testing (HSTT) Study Area, for the period of December 2013 through December 2018. These training and testing activities may incidentally take marine mammals present within the HSTT Study Area by exposing them to sound from active sonar, underwater detonations, airguns, and/or pile driving and removal at levels that NMFS associates with the take of marine mammals as defined by the MMPA. In addition, incidental takes of marine mammals may occur from ship strikes. NMFS' issuance of MMPA regulations to the Navy governing the incidental take of marine mammals is a federal action for which NMFS is responsible for analyzing the effects on the human environment pursuant to NMFS' NEPA procedures.

NMFS participated as a cooperating agency in the development of the Navy's Final Environmental Impact Statement/Overseas Environmental Impact Statement (hereinafter, FEIS), which contained an analysis of the effects of the Navy's activities on the human environment. NMFS worked closely with the Navy to provide information in NMFS' area of expertise to support the FEIS' effects analyses for endangered species, marine mammals, and other marine resources. In accordance with the NEPA regulations at 40 CFR 1506.3, NMFS analyzed the Draft EIS and concluded that NMFS' comments and suggestions have been addressed. NMFS adopted the Navy's FEIS in December 2013.

A. Navy Proposed Action

As described in Chapter 2 of the FEIS, the Navy proposed action is to conduct training and testing activities - which may include the use of active sonar and explosives - primarily within existing range complexes and operating areas located along the coast of Southern California and around the Hawaiian Islands. The proposed action also includes activities such as sonar maintenance and gunnery exercises conducted concurrently with ship transits and which may occur outside Navy range complexes and testing ranges. The proposed action includes pierside sonar testing conducted as part of overhaul, modernization, maintenance, and repair activities at shipyards and Navy piers within the Study Area.

The Navy's proposed training activities are categorized into eight functional warfare areas (anti-air warfare; amphibious warfare; strike warfare; anti-surface warfare; anti-submarine warfare; electronic warfare; mine warfare; and naval special warfare). Testing activities may occur independently of or in conjunction with training activities. Many testing activities are conducted similarly to Navy training activities and are also categorized under one of the primary mission areas. Other testing activities are unique and described within their specific testing categories.

B. NMFS' MMPA Decision Authorities

Sections 101(a)(5)(A) and (D) of the MMPA direct the Secretary of Commerce (Secretary) to allow, upon request, the incidental, but not intentional taking of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) during periods of not more than 5 consecutive years if certain findings are made and regulations are issued or, if the taking is limited to harassment and of no more than 1 year, the Secretary shall issue a notice of proposed authorization for public review.

As described in the Navy's application, the specified Navy activities to be conducted in the HSTT Study Area are expected to take marine mammals as defined by the MMPA, and the Navy requested incidental take authorization in accordance with Section 101(a)(5)(A) of the MMPA. In order to issue the regulations and subsequent Letters of Authorization (LOAs) under this section, NMFS must make the determination that the specified activities will result in a negligible impact on the affected species or stocks and not result in an unmitigable adverse impact on the availability of marine mammal species or stocks for taking for subsistence uses. In addition, NMFS, as part of its regulatory process, is required to prescribe the permissible methods of taking, the means of effecting the least practicable adverse impact on the species or stock and its habitat (i.e., mitigation) and to set forth requirements pertaining to monitoring and reporting of such taking.

NMFS has defined "negligible impact" as “an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.” (50 CFR § 216.103)

The National Defense Authorization Act (NDAA) (Public Law 108-136) amended the MMPA, by removing the “small numbers” and “specified geographical region” limitations and amending the definition of “harassment” as it applies to a “military readiness activity” to read as follows (Section 3(18)(B) of the MMPA):

(i) any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild [Level A Harassment]; or

(ii) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered [Level B Harassment].

The MMPA also contains a provision related to “military readiness activities” that requires NMFS, when making a determination of “least practicable adverse impact on such species or stock” to consider personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity. Before making the required determination, NMFS must consult with the Department of Defense regarding the mitigation measures and their effect on the aforementioned factors.

II. NMFS’ DECISION AND FACTORS CONSIDERED IN THE DECISION

A. The Decision

NMFS’ decision is to issue regulations and two 5-year LOAs (one for training and one for testing) for the unintentional take of marine mammals incidental to specified activities included within the FEIS Alternative 2, which was the preferred alternative identified in the Draft EIS and the action presented to NMFS in the Navy’s LOA application (as updated). The regulations will govern the unintentional taking of marine mammals incidental to training and testing activities conducted in the HSTT Study Area for the period of December 2013 through December 2018. Alternative 2 of the FEIS includes an analysis of all of the activities for which the Navy has requested incidental take authorization pursuant to the MMPA. The regulations will prescribe the permissible methods of taking, the means of effecting the least practicable adverse impact on the species or stock and its habitat (i.e., mitigation), and will set forth requirements pertaining to monitoring and reporting of such taking for the specified activities, as described in Alternative 2.

The Navy will be authorized to take individuals of 39 species of marine mammals by Level B harassment and 24 species of marine mammals by Level A harassment or mortality. NMFS will issue a final rule that establishes a framework in which incidental take can be authorized through issuance of LOAs.

B. Factors considered in Reaching the decision

In the FEIS, the affected environment and environmental consequences are both discussed in Chapter 3, within subsections arranged by Resource type, including: Sediments and Water Quality; Air Quality; Marine Habitats; Marine Mammals; Sea Turtles; Seabirds; Marine Vegetation; Marine Invertebrates; Fish; Cultural Resources; Socioeconomic Resources; Public Health and Safety. Supporting technical documents contain additional information on marine mammals and the modeling used by the Navy to quantitatively evaluate impacts to marine mammals. The Marine Mammals subchapter (3.4) and supporting technical documents contain the majority of the analysis that relates to NMFS' action of issuing incidental take regulations. Other sections of the FEIS contain analyses related to potential impacts on marine mammal habitat and further support NMFS' proposed issuance of regulations and the LOAs. In addition, Chapter 4 provides an assessment of potential cumulative impacts, including analyzing the potential for cumulatively significant impacts to the marine environment and marine mammals.

Within the Marine Mammals section (and supporting technical documents), the Navy's FEIS addresses potential acoustic impacts resulting from active sonar, explosive detonations, airguns, and pile driving and removal, as well as non-acoustic impacts (such as ship strikes). These sections describe in detail the acoustic thresholds that NMFS uses to indicate at what received sound levels marine mammals will be considered taken pursuant to the MMPA. The FEIS also describes in detail the analytical framework and model that the Navy uses to estimate take, based on NMFS' acoustic thresholds. Last, the Navy presents estimates (for each alternative) of the number of each species of marine mammal that will be exposed to levels of sound that NMFS has determined will result in Level A or Level B Harassment. The Navy uses these take estimates, combined with the other information included in this Chapter to conclude that none of the alternatives will result in any adverse population level effects on any of the affected species or stocks. The take estimates for the Navy's preferred alternative are the subject of the Navy's request to NMFS for MMPA Section 101(a)(5)(A) authorization.

As described above, the environmental consequences to the marine environment are of particular importance for NMFS' evaluation in reaching the decision to issue MMPA incidental take regulations. In particular, because NMFS' action is specific to authorizing unintentional take of marine mammals, the key factors considered in the decision are related to NMFS' statutory missions under the MMPA and the Endangered Species Act (ESA). The primary documents supporting this decision are the Navy's HSTT FEIS and the HSTT Biological Opinion.

As a cooperating agency, NMFS assisted the Navy by providing technical information and analyses to evaluate the effects of military readiness activities on marine mammals and their habitat. Via the MMPA process, NMFS reviewed the Navy's request to determine whether the total taking resulting from the activities would have a negligible impact on the affected species or stocks of marine mammals, would not have an unmitigable adverse impact on the availability of those species or stocks of marine mammals intended for subsistence uses, and that the permissible methods of taking and requirements pertaining to the mitigation, monitoring, and reporting of such takings are set forth. As supported by the FEIS, NMFS has made the requisite findings under the MMPA and will include these findings in a final rule.

Key relevant factors considered by NMFS in this decision include:

- Requiring mitigation. As noted above, for military readiness activities, NMFS is required to consider personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity when it makes its determination of "least practicable adverse impact." NMFS consulted with the Navy via the MMPA process and as a NEPA cooperating agency before making the required determination. NMFS and the Navy considered numerous mitigation measures and alternatives during the MMPA rulemaking process, including after the public comment period on the proposed rulemaking, with particular emphasis on whether these measures would be beneficial, effective, and practicable.

- Addressing uncertainty. The FEIS acknowledges a degree of uncertainty regarding the effects of underwater sound on marine mammals. NMFS provided extensive input in the FEIS process to address these uncertainties, and has included requirements for mitigation, monitoring, and reporting by the Navy in the final rule to manage uncertainty. The key issues and the manner in which they are addressed in the final rule include:

    1. Uncertainty regarding potential effects of sound sources on marine mammals (i.e., model input values) was addressed in the FEIS via taking a conservative approach to assure that potential effects are not under-estimated. For example, based on the onset mortality and slight lung injury criteria, many animals that are counted as a mortality or are estimated to suffer slight lung injury, may actually recover from their injuries or not incur injuries at all. As another example, many explosions from munitions such as bombs and missiles will actually occur upon impact with above-water targets; however, these sources were modeled as exploding at about 1 -m depth. This overestimates the amount of explosive and acoustic energy entering the water, and therefore the effects on marine mammals.
    2. Continuing management to reduce uncertainty will be implemented via the MMPA final rule by requiring extensive monitoring and reporting by the Navy, including the establishment and implementation of a monitoring plan specific to the HSTT Study Area, an Integrated Comprehensive Monitoring Plan, and a Strategic Planning Process. The Navy will update the status of its monitoring program and funded projects through their new Navy Marine Species Monitoring web portal. The Navy's monitoring program is designed to support NMFS' use of adaptive management throughout rule implementation, as presented in the FEIS and further explained in the final rule. The monitoring framework was made available for comment on the NMFS website concurrent with availability of the MMPA proposed rule and NMFS will provide one public comment period on the Navy's monitoring program during the 5-year regulations.
    3. Finally, while not a required component of the final rule, the Navy's FEIS describes the Navy's continuing commitment to marine mammal research, in particular research related to the effects of underwater sound on marine mammals. NMFS will continue to encourage and support the Navy's research efforts. The timeframe for completing the research and conducting an assessment of how that research factors into MMPA authorizations however, does not allow NMFS to wait for the results of the research prior to authorizing the Navy's request for incidental take.

NMFS finds that the FEIS appropriately acknowledges uncertainty and provides detailed analyses as to how existing information is incorporated to assess effects where uncertainties exist, and to address and manage uncertainty via mitigation, monitoring, reporting and research.

- Considering effects to ESA-listed marine mammals. The Navy consulted with NMFS pursuant to section 7 of the ESA, and NMFS also consulted internally on the issuance of LOAs under section 101(a)(5)(A) of the MMPA for training and testing activities in the HSTT Study Area. NMFS issued a Biological Opinion on the Navy's proposal to conduct training and testing activities in the HSTT Study Area from December 2013 through December 2018 and the Permits Division's proposal to issue regulations to authorize the Navy to "take" marine mammals incidental to the conduct of training and testing activities in the HSTT Study Area during the same period of time. The Biological Opinion concludes that the proposed regulations and any take associated with activities authorized by those regulations are not likely to jeopardize the continued existence of threatened or endangered species (or species proposed for listing) in the action area during any single year or as a result of the cumulative impacts of a 5-year authorization. The Biological Opinion includes an explanation of how the results of NMFS' baseline and effects analyses in Biological Opinions relate to those contained in the cumulative impact section of NEPA documents. In particular, these analyses consider the effects resulting from interactions of potential stressors, thereby augmenting the FEIS' cumulative impacts analysis.

  The Biological Opinion includes a discussion of the FEIS' marine mammal take estimates, but relies on exposure and response analyses. The exposure analysis identifies the listed resources that are likely to co-occur with effects in space and time and the nature of that co-occurrence, to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to an action's effects and the populations or sub-populations those individuals represent. The take estimate approach and the exposure/response approach are appropriate under the MMPA and ESA, respectively, and both were considered in reaching this decision regarding the issuance of a rule and 5-year LOAs for the Navy activities in the HSTT Study Area. The final rule addresses the manner in which the number of takes of listed marine mammals proposed to be authorized in LOAs issued under this regulation will be aligned with the exposure analysis methodologies and subsequent Incidental Take Statements issued in association with subsequent Biological Opinions.

- Approach to assessments. NEPA, ESA, and MMPA involve differing approaches to assessing effects on those resources considered under each statute, and this combination of analyses provides a robust basis for the decision on this action. The FEIS, Biological Opinion, and final rule for HSTT present the assessments in detail, but a few salient issues and difference are highlighted here. First, both the FEIS and the Biological Opinion include analysis of the significance of the Navy activities on marine mammals (listed marine mammals in the Biological Opinion). In the FEIS, the term "significance" is as commonly used in NEPA, without additional definition of significance related to marine mammals. The Biological Opinion describes how the use of the term is distinguished in the opinion among three different kinds of "significance," which includes an assessment of how any "significant" physical, chemical, or biotic responses are likely to have "significant" consequence for the fitness of the individual animal. As described earlier, the MMPA uses the term "negligible impact" (defined above). For this ROD, the FEIS evaluation of the significance of impacts to species was considered as input to NMFS' ESA and MMPA assessments; this decision is supported by the FEIS and also reached based on NMFS statutory responsibilities under the MMPA and ESA.

Coastal Zone Management Act Concerns. On January 13, 2013, the Navy submitted a Consistency Determination under 15 CFR Section 930 for the proposed action to the Hawaii Department of Business, Economic Development & Tourism. This was based on the Navy's determination that the conduct of HSTT activities is consistent to the maximum extent practicable with the enforceable policies of the Hawaii CZM Program. The Hawaii Office of Planning, CZM Program, State of Hawaii conditionally concurred with the Consistency Determination by letter on March 20, 2013.

On January 13, 2013, the Navy also submitted a Consistency Determination for the proposed action to the California Coastal Commission. The California Coastal Commission objected to the Navy's Consistency Determination on March 14, 2013, based on lack of sufficient information to determine the Program's consistency to the maximum extent practicable with the marine resource protection policy and the commercial fishing policies of the California Coastal Act. The Navy disagreed with the Commission's decision, but provided additional information to address the Commission's concerns on March 26, 2013.

Essential Fish Habitat. The Navy determined that their activities may adversely affect Essential Fish Habitat (EFH) within the HSTT Study Area and requested initiation of the Magnuson-Stevens Fishery Conservation and Management Act's EFH consultation process with NMFS Pacific Islands Regional Office (PIRO) on February 12, 2013. NMFS PIRO considered that the proposed activities may have more than minimal adverse effects to EFH and made recommendations to avoid, minimize, and offset adverse effects on April 8, 2013. The Navy responded in writing to each of NMFS PIRO's recommendations on April 17, 2013. Following some joint NMFS-Navy meetings, NMFS PIRO and the Navy agreed to a number of action items clarifying the Navy's proposed activities and providing further information to NMFS.

The Navy also requested initiation of the Magnuson-Stevens Fishery Conservation and Management Act's EFH consultation process with NMFS Southwest Regional Office (SWRO) on February 12, 2013. NMFS SWRO determined that the Navy's activities would have an adverse impact on EFH, but that the proposed conservation measures are sufficient to avoid, minimize, or offset impacts to EFH and provided no additional EFH Conservation Recommendations on April 3, 2013.

III. OTHER ALTERNATIVES CONSIDERED

The alternatives analyzed in the Navy's FEIS and their relationship to NMFS' alternatives are described here. NMFS' proposed action (issuance of regulations and LOAs) would authorize take of marine mammals incidental to a subset of the activities analyzed in the Navy's HSTT FEIS that are anticipated to result in the take of marine mammals, i.e., those activities that involve the use of active sonar, underwater detonations, airguns, and pile driving and removal. Thus, these components of the Navy's proposed action are the subject of NMFS' proposed MMPA regulatory action. (Note that, although NMFS fully (rather than partially) adopted the HSTT FEIS, the purely terrestrial activities described in the FEIS are not a component of NMFS' proposed action.) The Navy's FEIS contains a thorough analysis of the environmental consequences of their proposed action (with specific sections for MFAS/HFAS and underwater detonations) on the human environment, including a specific section on marine mammals.

A. Summary of the Alternatives Considered by the Navy

Three alternatives were analyzed in the FEIS, including two action alternatives (Alternatives 1 and 2) and the No Action Alternative.

No Action Alternative: The No Action Alternative is required by CEQ regulations as a baseline against which the impacts of the Proposed Action are compared. In the FEIS, the No Action Alternative is represented by baseline training and testing activities, as defined by existing Navy environmental planning documents. The baseline testing activities also include those testing events that have historically occurred in the Study Area and have been subject to previous analyses.

Alternative 1: Alternative 1 includes all ongoing Navy training associated with the No Action Alternative, and proposes an overall expansion of the Study Area plus adjustments to types and levels of activities from the baseline, as necessary to support current and planned Navy training and testing requirements. This Alternative considers analysis of areas where Navy training and testing would continue as in the past, but were not considered in previous environmental analyses. Alternative 1 would not expand the area where the Navy trains and tests, but would simply expand the area that is to be analyzed.

Alternative 2 (Preferred Alternative): Alternative 2 would include all of the activities described in Alternative 1 plus the establishment of new range capabilities, modifications of existing capabilities, and adjustments to type and levels of training and testing.

The following four alternatives were considered by the Navy, but not carried forward for analysis because, after careful consideration, the Navy determined that they did not meet the Navy's purpose and need for the Proposed Action:

- Alternative training and testing locations
- Reduced training and testing
- Mitigations including temporal or geographic constraints within the Study Area
- Simulated training and testing

B. Summary of Alternatives Considered by NMFS

For all of the Navy alternatives identified above, the Navy includes an associated list of standard protective measures specifically developed to minimize adverse impacts on marine mammals.

NMFS worked closely with the Navy throughout the development of the FEIS to identify additional mitigation measures (for marine mammals) that the Navy should consider in their analysis. As a result of this cooperating agency role, the Navy discussed and considered additional mitigation measures in its FEIS, but determined these were not able to be implemented either because the measures were not consistent with mission requirements or were prohibitively difficult to implement, or because the Navy's analysis concluded that the measures did not provide sufficient protective benefits to marine mammals. The inclusion of the analysis of these additional mitigation measures strengthens the FEIS' support and coverage of NMFS' FEIS alternatives, which are listed below. These alternatives are not enumerated in the Navy FEIS, but are supported by the analyses in that FEIS:

- The Navy's training activities (no active sonar) would continue at baseline levels. The Navy would not request, and NMFS would not issue, an incidental take authorization for an increased level of activity (for NMFS, this constitutes the NEPA-required No Action alternative);
- NMFS promulgates regulations and issues LOAs authorizing take of marine mammals incidental to a subset of the Navy training activities (i.e., those including the use of active sonar, underwater explosives, airguns, and pile driving and removal) described in the FEIS preferred alternative (Alternative 2), with the mitigation, monitoring and reporting measures presented in Chapter 5 of the FEIS (except those considered but eliminated); or
- NMFS promulgates regulations and issues LOAs authorizing take of marine mammals incidental to a subset of the Navy training activities (i.e., those including the use of active sonar, underwater explosives, airguns, and pile driving and removal) described in the Navy's preferred alternative (Alternative 2), but with additional mitigation requirements for marine mammals, potentially including measures considered but eliminated in Chapter 5 of the FEIS or other additional measures developed by NMFS or suggested to NMFS via public comment on the proposed rule.

Based on the FEIS and additionally supported by NMFS response to public comments in the preamble to the final rule, NMFS determined that the mitigation measures identified in the FEIS (Chapter 5, except those measures considered but eliminated) will effect the least practicable adverse impact on marine mammal species or stocks and their habitat. All of the measures chosen to be included in the MMPA final rule are components of the FEIS Alternative 2 (second bullet, above). Based on NMFS' purpose and the findings made in the final rule, NMFS selected to promulgate regulations and issue LOAs authorizing take of marine mammals incidental to a subset of the Navy training activities described in the FEIS preferred alternative, with the mitigation, monitoring, and reporting measures presented in Chapter 5 of the FEIS (except those considered but eliminated).

C. The Environmentally Preferable Alternative

The No Action Alternative described in the Navy's FEIS is the baseline level of training and testing being conducted in the HSTT Study Area, as defined by existing Navy environmental planning documents. Both Alternatives 1 and 2 (preferred alternative) include and expansion of the Study Area and an adjustment to the types and levels of activities from the baseline. The No Action is considered the environmentally preferred alternative.

IV. PUBLIC INVOLVEMENT

Public opportunities for review and comment have occurred in support of the FEIS preparation and the consideration of MMPA rulemaking. Detailed information on the publications in which the Notice of Intent to prepare an EIS and the Draft EIS were noticed are provided in Appendix E of the FEIS, and the FEIS was similarly made available on August 30, 2013.

NMFS personnel attended the information meetings and hearings on the Draft EIS, when available, which were held at various locations in Hawaii and California. The Navy received comments on the Draft EIS from individuals, agencies, and organizations. The comments expressed interest or concern for numerous issues including: marine mammals and effects from sonar and underwater detonations, fishing and tourism, airborne noise, NEPA process, alternatives selection, military expended materials, and mitigation measures. The FEIS addressed all oral and written comments received during the Draft EIS comment period. As a cooperating agency, NMFS assisted in the analysis and consideration of public comments in NMFS' areas of jurisdiction and expertise to support the development of the FEIS. The Navy ensured the FEIS was mailed to all individuals, agencies, and organizations that requested a copy of the final document, and that the FEIS remains available on the website at hstteis.com.

The Navy received four comment letters during the FEIS wait period and will include a summary of the comments in their ROD, when issued. NMFS was provided with and reviewed the FEIS comment letters. All of the comments on the HSTT FEIS that are related to NMFS' action (the issuance of an MMPA authorization) have been considered by NMFS in reaching this decision. The comments either (1) reiterated comments received on the Draft EIS and were already covered by Navy in the FEIS, (2) were related to mitigation and were similar to issues considered by NMFS and the Navy in the "Mitigation Measures Considered but Eliminated" section, or (3) were received as similar comments on the MMPA proposed rule and were considered in developing the final rule (these will be specifically addressed in the response to comments to be published in the preamble of the final rule).

Substantial public involvement also occurred in association with NMFS' rulemaking. On October 4, 2012 (77 FR 60678) NMFS published a notice of receipt of the application for LOAs for the Navy's training and testing activities conducted in the HSTT Study Area, with a request for comments and information open through November 5, 2012. On January 31, 2013 (78 FR 6978), NMFS published a proposed rule in response to the Navy's request to take marine mammals incidental to training and testing activities in the HSTT Study Area and requested comments, information, and suggestions concerning the request. During the 30-day public comment period, NMFS received comments from the Marine Mammal Commission, and several non-governmental organizations, including the Natural Resources Defense Council, Cascadia Research Collective, and Earthjustice (on behalf of the Center for Biological Diversity and Ocean Mammal Institute), as well as interested members of the public. The comments were considered in developing the final rule, and detailed responses to those comments are included in the preamble to the final rule. The categories of public comments addressed include additional mitigation recommendations, mitigation effectiveness, impact analyses, monitoring and reporting, general opposition to the rulemaking, and other comments not specific to a category.

Public input was carefully considered by NMFS in developing a final rule and in reaching this decision to issue the regulations for the activities specified in FEIS Alternative 2.

V. MITIGATION, MONITORING AND REPORTING MEASURES

The final rule includes detailed mitigation measures that must be implemented by the Navy when conducting specified activities in the HSTT Study Area. Inclusion of these requirements ensures that NMFS' action of issuing incidental take regulations specifies and requires all practicable means to avoid or minimize impacts to marine mammals from the selection of FEIS Alternative 2. In addition, NMFS' final rule will specify the requirements for the Navy to implement a monitoring and reporting program. In addition to the requirements that will be established in the rule and required of Navy, NMFS will meet annually with the Navy to discuss the required Navy monitoring reports, Navy R&D developments, and current science and whether mitigation or monitoring modifications are appropriate. This use of adaptive management via the MMPA process will allow NMFS to consider new data from different sources to determine (in coordination with the Navy) on an annual basis if mitigation or monitoring measures should be modified or added (or deleted) if new data suggests that such modifications are appropriate (or are not appropriate) for subsequent LOAs.

VI. CONCLUSIONS

Through the FEIS and as documented in this ROD, NMFS has considered the goals and objectives of the NMFS' proposed action and has analyzed a reasonable range of alternatives that adequately address the objective of the proposed action. Furthermore, NMFS has analyzed the associated environmental consequences of the identified alternatives and the mitigation measures and monitoring requirements needing to be analyzed and required under the final rule and LOAs. NMFS has also considered the public comments addressed to the Navy in the FEIS and the comments addressed to NMFS during the proposed rule comment period. Consequently, NMFS has selected the alternative of issuing regulations authorizing the unintentional harassment of marine mammals incidental to Navy activities in the HSTT Study Area in accordance with Alternative 2 of the FEIS for the period December 2013 through December 2018, including in that regulation specified requirements for mitigation, monitoring and reporting.

Signed: ______________________ Date: DEC 1 3 2013

Alan D. Risenhoover
Director, Office of Sustainable Fisheries,
performing the functions and duties of the
Deputy Assistant Administrator for Regulatory Programs